

## NTC Thermistors, Radial Leaded, Standard Precision



### FEATURES

- Accuracy over a wide temperature range
- High stability over a long life
- Excellent price/performance ratio
- UL recognized, file E148885
- Material categorization:  
For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
COMPLIANT

### APPLICATIONS

- Temperature measurement, sensing and control, temperature compensation in industrial and consumer electronics

### DESCRIPTION

These thermistors have a negative temperature coefficient. The device consists of a chip with two solid copper tin plated leads. It is grey lacquered and color coded, but not insulated.

### PACKAGING

The thermistors are packed in bulk or tape on reel; see code numbers and relevant packaging quantities.

### DESIGN-IN SUPPORT

For complete Curve Computation, visit: [www.vishay.com/resistors-non-linear/curve-computation-list/](http://www.vishay.com/resistors-non-linear/curve-computation-list/)

### MARKING

The thermistors are marked with colored bands; see dimensions drawing and “Electrical data and ordering information”.

### MOUNTING

By soldering in any position.  
Not intended for potted applications.

| QUICK REFERENCE DATA   |   |      |
|--|---|------|
| PARAMETER  | VALUE                                     | UNIT |
| Resistance value at 25 °C  | 3.3 to 470K                               | Ω    |
| Tolerance on $R_{25}$ -value   | ± 2; ± 3; ± 5                             | %    |
| $B_{25/85}$ -value   | 2880 to 4570                              | K    |
| Tolerance on $B_{25/85}$ -value  | ± 0.5 to ± 3                              | %    |
| Operating temperature range:<br>At zero power dissipation;<br>continuously | - 40 to + 125                             | °C   |
| At zero power dissipation;<br>for short periods                            | ≤ 150                                     |      |
| Response time (in oil)   | ≈ 1.2                                     | s    |
| Thermal time constant $\tau$<br>(for information only)                     | 15  | s    |
| Dissipation factor $\delta$<br>(for information only)                      | 7<br>8.5<br>(for $R_{25}$ -value ≤ 680 Ω) | mW/K |
| Maximum power dissipation<br>at 55 °C                                      | 500                                       | mW   |
| Climatic category<br>(LCT/UCT/days)  | 40/125/56                                 | -    |
| Weight   | ≈ 0.3                                     | g    |

| ELECTRICAL DATA AND ORDERING INFORMATION |                           |       |                      |   |  |                           |        |       |
|--|---------------------------|-------|----------------------|---|--|---------------------------|--------|-------|
| $R_{25}$<br>(Ω)                          | $B_{25/85}$ -VALUE<br>(K) |       | UL APPROVED<br>(Y/N) | SAP MATERIAL NUMBER<br>NTCLE100E3...B0/T1/T2 <sup>(2)</sup> | OLD 12NC CODE<br>2381 640 3/4/6.... <sup>(1)</sup> | COLOR CODE <sup>(3)</sup> |        |       |
|  |                           | (± %) |                      |   |  | I                         | II     | III   |
| 3.3                                      | 2880                      | 3     | N                    | 338*B0  | *338   | Orange                    | Orange | Gold  |
| 4.7                                      | 2880                      | 3     | N                    | 478*B0  | *478   | Yellow                    | Violet | Gold  |
| 6.8                                      | 2880                      | 3     | N                    | 688*B0  | *688   | Blue                      | Grey   | Gold  |
| 10                                       | 2990                      | 3     | N                    | 109*B0  | *109   | Brown                     | Black  | Black |
| 15                                       | 3041                      | 3     | N                    | 159*B0  | *159   | Brown                     | Green  | Black |
| 22                                       | 3136                      | 3     | N                    | 229*B0  | *229   | Red                       | Red    | Black |
| 33                                       | 3390                      | 3     | Y                    | 339*B0  | *339   | Orange                    | Orange | Black |
| 47                                       | 3390                      | 3     | Y                    | 479*B0  | *479   | Yellow                    | Violet | Black |
| 68                                       | 3390                      | 3     | Y                    | 689*B0  | *689   | Blue                      | Grey   | Black |
| 100                                      | 3560                      | 1.5   | Y                    | 101*B0  | *101   | Brown                     | Black  | Brown |
| 150                                      | 3560                      | 1.5   | Y                    | 151*B0  | *151   | Brown                     | Green  | Brown |
| 220                                      | 3560                      | 1.5   | Y                    | 221*B0  | *221   | Red                       | Red    | Brown |
| 330                                      | 3560                      | 1.5   | Y                    | 331*B0  | *331   | Orange                    | Orange | Brown |

**ELECTRICAL DATA AND ORDERING INFORMATION**

| $R_{25}$<br>( $\Omega$ ) | $B_{25/85}$ -VALUE |            | UL APPROVED<br>(Y/N) | SAP MATERIAL NUMBER<br>NTCLE100E3...B0/T1/T2 <sup>(2)</sup> | OLD 12NC CODE<br>2381 640 3/4/6... <sup>(1)</sup> | COLOR CODE <sup>(3)</sup> |        |        |
|--------------------------|--------------------|------------|----------------------|---|---|---------------------------|--------|--------|
|                          | (K)                | ( $\pm$ %) |                      |   |   | I                         | II     | III    |
| 470                      | 3560               | 1.5        | Y                    | 471*B0  | *471  | Yellow                    | Violet | Brown  |
| 680                      | 3560               | 1.5        | Y                    | 681*B0  | *681  | Blue                      | Grey   | Brown  |
| 1000                     | 3528               | 0.5        | Y                    | 102*B0  | *102  | Brown                     | Black  | Red    |
| 1500                     | 3528               | 0.5        | Y                    | 152*B0  | *152  | Brown                     | Green  | Red    |
| 2000                     | 3528               | 0.5        | Y                    | 202*B0  | *202  | Red                       | Black  | Red    |
| 2200                     | 3977               | 0.75       | Y                    | 222*B0  | *222  | Red                       | Red    | Red    |
| 2700                     | 3977               | 0.75       | Y                    | 272*B0  | *272  | Red                       | violet | Red    |
| 3300                     | 3977               | 0.75       | Y                    | 332*B0  | *332  | Orange                    | Orange | Red    |
| 4700                     | 3977               | 0.75       | Y                    | 472*B0  | *472  | Yellow                    | Violet | Red    |
| 5000                     | 3977               | 0.75       | Y                    | 502*B0  | *502  | Green                     | Black  | Red    |
| 6800                     | 3977               | 0.75       | Y                    | 682*B0  | *682  | Blue                      | Grey   | Red    |
| 10 000                   | 3977               | 0.75       | Y                    | 103*B0  | *103  | Brown                     | Black  | Orange |
| 12 000                   | 3740               | 2          | Y                    | 123*B0  | *123  | Brown                     | Red    | Orange |
| 15 000                   | 3740               | 2          | Y                    | 153*B0  | *153  | Brown                     | Green  | Orange |
| 22 000                   | 3740               | 2          | Y                    | 223*B0  | *223  | Red                       | Red    | Orange |
| 33 000                   | 4090               | 1.5        | Y                    | 333*B0  | *333  | Orange                    | Orange | Orange |
| 47 000                   | 4090               | 1.5        | Y                    | 473*B0  | *473  | Yellow                    | Violet | Orange |
| 50 000                   | 4190               | 1.5        | Y                    | 503*B0  | *503  | Green                     | Black  | Orange |
| 68 000                   | 4190               | 1.5        | Y                    | 683*B0  | *683  | Blue                      | Grey   | Orange |
| 100 000                  | 4190               | 1.5        | Y                    | 104*B0  | *104  | Brown                     | Black  | Yellow |
| 150 000                  | 4370               | 2.5        | Y                    | 154*B0  | *154  | Brown                     | Green  | Yellow |
| 220 000                  | 4370               | 2.5        | Y                    | 224*B0  | *224  | Red                       | Red    | Yellow |
| 330 000                  | 4570               | 1.5        | N                    | 334*B0  | *334  | Orange                    | Orange | Yellow |
| 470 000                  | 4570               | 1.5        | N                    | 474*B0  | *474  | Yellow                    | Violet | Yellow |

**Notes**

- (1) Replace \* in 12NC by 3 for 5 %, 6 for 3 %, 4 for 2 %  
 (2) Replace \* in SAP by J for 5 %, H for 3 %, G for 2 %  
 (3) For  $R_{25} \pm 2$  % band IV is red,  $\pm 3$  % band IV is orange,  $\pm 5$  % band IV is gold

**DIMENSIONS** in millimeters

**DERATING AND TEMPERATURE TOLERANCES**

**Note**

- Zero power is considered as measuring power max. 1 % of max. power.

**PHYSICAL DIMENSIONS FOR RELEVANT TYPE** (all dimensions in millimeters)

| $R_{25}$ -VALUE                | $B_{MAX.}$    | d              | $H_1$ |      | $H_2$ MAX. | L            | P    | $T_{MAX.}$ |
|--------------------------------|---------------|----------------|-------|------|------------|--------------|------|------------|
|                                |               |                | MIN.  | MAX. |            |              |      |            |
| 3.3 $\Omega$ to 220 $\Omega$   | 5.0           | 0.6 $\pm$ 0.06 | 1.0   | 4.0  | 6.0        | 24 $\pm$ 1.5 | 2.54 | 4.0        |
| 330 $\Omega$ to 470 k $\Omega$ | 3.3 $\pm$ 0.5 | 0.6 $\pm$ 0.06 | 1.0   | 3.0  | 6.0        | 24 $\pm$ 1.5 | 2.54 | 3.0        |



TEMPERATURE DEVIATION AS A FUNCTION OF THE AMBIENT TEMPERATURE



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## R<sub>T</sub> VALUE AND TOLERANCE

These thermistors have a narrow tolerance on the B-value, the result of which provides a very small tolerance on the nominal resistance value over a wide temperature range. For this reason the usual graphs of  $R = f(T)$  are replaced by Resistance Values at Intermediate Temperatures Tables, together with a formula to calculate the characteristics with a high precision.

## FORMULAE TO DETERMINE NOMINAL RESISTANCE VALUES

The resistance values at intermediate temperatures, or the operating temperature values, can be calculated using the following interpolation laws (extended "Steinhart and Hart"):

$$R_{(T)} = R_{ref} \times e^{(A+B/T+C/T^2+D/T^3)} \quad (1)$$

$$T_{(R)} = \left( A_1 + B_1 \ln \frac{R}{R_{ref}} + C_1 \ln^2 \frac{R}{R_{ref}} + D_1 \ln^3 \frac{R}{R_{ref}} \right)^{-1} \quad (2)$$

where:

A, B, C, D, A<sub>1</sub>, B<sub>1</sub>, C<sub>1</sub> and D<sub>1</sub> are constant values depending on the material concerned; see table below.

R<sub>ref.</sub> is the resistance value at a reference temperature (in this event 25 °C, R<sub>ref.</sub> = R<sub>25</sub>).

T is the temperature in K.

Formulae numbered and are interchangeable with an error of max. 0.005 °C in the range 25 °C to 125 °C and max. 0.015 °C in the range - 40 °C to + 25 °C.

## DETERMINATION OF THE RESISTANCE/TEMPERATURE DEVIATION FROM NOMINAL VALUE

The total resistance deviation is obtained by combining the "R<sub>25</sub>-tolerance" and the "resistance deviation due to B-tolerance".

When:

X = R<sub>25</sub>-tolerance

Y = resistance deviation due to B-tolerance

Z = complete resistance deviation,

then:  $Z = \left[ \left( 1 + \frac{X}{100} \right) \times \left( 1 + \frac{Y}{100} \right) - 1 \right] \times 100 \%$  or  $Z \approx X + Y$

When:

TCR = temperature coefficient

ΔT = temperature deviation,

then:  $\Delta T = \frac{Z}{TCR}$

The temperature tolerances are plotted in the graphs on the previous page.

**Example:** at 0 °C, assume X = 5 %, Y = 0.89 % and TCR = 5.08 %/K (see table ), then:

$$Z = \left\{ \left[ 1 + \frac{5}{100} \right] \times \left[ 1 + \frac{0.89}{100} \right] - 1 \right\} \times 100 \%$$

$$= \{ 1.05 \times 1.0089 - 1 \} \times 100 \% = 5.9345 \% (\approx 5.93 \%)$$

$$\Delta T = \frac{Z}{TCR} = \frac{5.93}{5.08} = 1.167 \text{ } ^\circ\text{C} (\approx 1.17 \text{ } ^\circ\text{C})$$

A NTC with a R<sub>25</sub>-value of 10 kΩ has a value of 32.56 kΩ between - 1.17 °C and + 1.17 °C.

## PARAMETER FOR DETERMINING NOMINAL RESISTANCE VALUES

| NUMBER | B <sub>25/85</sub> (K) | NAME                               | TOL. B (%) | A         | B (K)    | C (K <sup>2</sup> ) | D (K <sup>3</sup> ) | A <sub>1</sub> | B <sub>1</sub> (K <sup>-1</sup> ) | C <sub>1</sub> (K <sup>-2</sup> ) | D <sub>1</sub> (K <sup>-3</sup> ) |
|--------|------------------------|------------------------------------|------------|-----------|----------|---------------------|---------------------|----------------|-----------------------------------|-----------------------------------|-----------------------------------|
| 1      | 2880                   | Mat O. with B <sub>n</sub> = 2880K | 3          | - 9.094   | 2251.74  | 229098              | - 2.744820E+07      | 3.354016E-03   | 3.495020E-04                      | 2.095959E-06                      | 4.260615E-07                      |
| 2      | 2990                   | Mat P. with B <sub>n</sub> = 3990K | 3          | - 10.2296 | 2887.62  | 132336              | - 2.502510E+07      | 3.354016E-03   | 3.415560E-04                      | 4.955455E-06                      | 4.364236E-07                      |
| 3      | 3041                   | Mat Q. with B <sub>n</sub> = 3041K | 3          | - 11.1334 | 3658.73  | - 102895            | 5.166520E+05        | 3.354016E-03   | 3.349290E-04                      | 3.683843E-06                      | 7.050455E-07                      |
| 4      | 3136                   | Mat R. with B <sub>n</sub> = 3136K | 3          | - 12.4493 | 4702.74  | - 402687            | 3.196830E+07        | 3.354016E-03   | 3.243880E-04                      | 2.658012E-06                      | - 2.701560E-07                    |
| 5      | 3390                   | Mat S. with B <sub>n</sub> = 3390K | 3          | - 12.6814 | 4391.97  | - 232807            | 1.509643E+07        | 3.354016E-03   | 2.993410E-04                      | 2.135133E-06                      | - 5.672000E-09                    |
| 6      | 3528 <sup>(1)</sup>    | Mat I. with B <sub>n</sub> = 3528K | 0.5        | - 12.0596 | 3687.667 | - 7617.13           | - 5.914730E+06      | 3.354016E-03   | 2.909670E-04                      | 1.632136E-06                      | 7.192200E-08                      |
|        | 3528 <sup>(2)</sup>    |                                    |            | - 21.0704 | 11903.95 | - 2504699           | 2.470338E+08        | 3.354016E-03   | 2.933908E-04                      | 3.494314E-06                      | - 7.712690E-07                    |
| 7      | 3560                   | Mat H. with B <sub>n</sub> = 3560K | 1.5        | - 13.0723 | 4190.574 | - 47158.4           | - 1.199256E+07      | 3.354016E-03   | 2.884193E-04                      | 4.118032E-06                      | 1.786790E-07                      |
| 8      | 3740                   | Mat B. with B <sub>n</sub> = 3740K | 2          | - 13.8973 | 4557.725 | - 98275             | - 7.522357E+06      | 3.354016E-03   | 2.744032E-04                      | 3.666944E-06                      | 1.375492E-07                      |
| 9      | 3977                   | Mat A. with B <sub>n</sub> = 3977K | 0.75       | - 14.6337 | 4791.842 | - 115334            | - 3.730535E+06      | 3.354016E-03   | 2.569850E-04                      | 2.620131E-06                      | 6.383091E-08                      |
| 10     | 4090                   | Mat C. with B <sub>n</sub> = 4090K | 1.5        | - 15.5322 | 5229.973 | - 160451            | - 5.414091E+06      | 3.354016E-03   | 2.519107E-04                      | 3.510939E-06                      | 1.105179E-07                      |
| 11     | 4190                   | Mat D. with B <sub>n</sub> = 4190K | 1.5        | - 16.0349 | 5459.339 | - 191141            | - 3.328322E+06      | 3.354016E-03   | 2.460382E-04                      | 3.405377E-06                      | 1.034240E-07                      |
| 12     | 4370                   | Mat E. with B <sub>n</sub> = 4370K | 2.5        | - 16.8717 | 5759.15  | - 194267            | - 6.869149E+06      | 3.354016E-03   | 2.367720E-04                      | 3.585140E-06                      | 1.255349E-07                      |
| 13     | 4570                   | Mat F. with B <sub>n</sub> = 4570K | 1.5        | - 17.6439 | 6022.726 | - 203157            | - 7.183526E+06      | 3.354016E-03   | 2.264097E-04                      | 3.278184E-06                      | 1.097628E-07                      |

### Notes

<sup>(1)</sup> Temperature < 25 °C

<sup>(2)</sup> Temperature ≥ 25 °C



For complete Curve Computation, visit: [www.vishay.com/resistors-non-linear/curve-computation-list/](http://www.vishay.com/resistors-non-linear/curve-computation-list/)

| <b>RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH <math>R_{25}</math> AT (3.3, 4.7, 6.8) <math>\Omega</math></b> |                                 |                                 |                                 |              |                                       |
|---|---------------------------------|---------------------------------|---------------------------------|--------------|---------------------------------------|
| $T_{OPER}$<br>(°C)  | PART NUMBER<br>NTCLE100E3338*** | PART NUMBER<br>NTCLE100E3478*** | PART NUMBER<br>NTCLE100E3688*** | TCR<br>(%/K) | $\Delta R/R$ DUE TO $B_{tol.}$<br>(%) |
|   | $R_T$<br>( $\Omega$ )           | $R_T$<br>( $\Omega$ )           | $R_T$<br>( $\Omega$ )           |              |                                       |
| -40   | 45.00                           | 64.09                           | 92.73                           | -4.97        | 8.08                                  |
| -35   | 35.25                           | 50.20                           | 72.63                           | -4.80        | 7.30                                  |
| -30   | 27.84                           | 39.64                           | 57.36                           | -4.64        | 6.55                                  |
| -25   | 22.16                           | 31.56                           | 45.66                           | -4.48        | 5.84                                  |
| -20   | 17.78                           | 25.32                           | 36.63                           | -4.33        | 5.15                                  |
| -15   | 14.37                           | 20.46                           | 29.60                           | -4.19        | 4.49                                  |
| -10   | 11.69                           | 16.65                           | 24.09                           | -4.05        | 3.85                                  |
| -5  | 9.582                           | 13.65                           | 19.74                           | -3.92        | 3.24                                  |
| 0   | 7.904                           | 11.26                           | 16.29                           | -3.79        | 2.65                                  |
| 5   | 6.560                           | 9.344                           | 13.52                           | -3.66        | 2.08                                  |
| 10  | 5.479                           | 7.803                           | 11.29                           | -3.55        | 1.54                                  |
| 15  | 4.602                           | 6.554                           | 9.482                           | -3.43        | 1.01                                  |
| 20  | 3.886                           | 5.535                           | 8.008                           | -3.32        | 0.49                                  |
| 25  | 3.300                           | 4.700                           | 6.800                           | -3.22        | 0.00                                  |
| 30  | 2.816                           | 4.011                           | 5.803                           | -3.12        | 0.48                                  |
| 35  | 2.415                           | 3.440                           | 4.977                           | -3.02        | 0.94                                  |
| 40  | 2.081                           | 2.964                           | 4.289                           | -2.93        | 1.39                                  |
| 45  | 1.801                           | 2.566                           | 3.712                           | -2.84        | 1.82                                  |
| 50  | 1.566                           | 2.230                           | 3.227                           | -2.76        | 2.24                                  |
| 55  | 1.367                           | 1.947                           | 2.817                           | -2.68        | 2.65                                  |
| 60  | 1.198                           | 1.706                           | 2.469                           | -2.60        | 3.04                                  |
| 65  | 1.054                           | 1.501                           | 2.172                           | -2.52        | 3.43                                  |
| 70  | 0.9308                          | 1.326                           | 1.918                           | -2.45        | 3.80                                  |
| 75  | 0.8248                          | 1.175                           | 1.700                           | -2.38        | 4.16                                  |
| 80  | 0.7334                          | 1.044                           | 1.511                           | -2.32        | 4.51                                  |
| 85  | 0.6542                          | 0.9318                          | 1.348                           | -2.25        | 4.85                                  |
| 90  | 0.5854                          | 0.8338                          | 1.206                           | -2.19        | 5.19                                  |
| 95  | 0.5255                          | 0.7484                          | 1.083                           | -2.13        | 5.51                                  |
| 100   | 0.4730                          | 0.6737                          | 0.9748                          | -2.07        | 5.82                                  |
| 105   | 0.4270                          | 0.6082                          | 0.8799                          | -2.02        | 6.13                                  |
| 110   | 0.3865                          | 0.5505                          | 0.7965                          | -1.97        | 6.43                                  |
| 115   | 0.3508                          | 0.4996                          | 0.7228                          | -1.92        | 6.72                                  |
| 120   | 0.3192                          | 0.4545                          | 0.6576                          | -1.87        | 7.00                                  |
| 125   | 0.2911                          | 0.4145                          | 0.5998                          | -1.82        | 7.28                                  |
| 130   | 0.2661                          | 0.3789                          | 0.5483                          | -1.77        | 7.55                                  |
| 135   | 0.2438                          | 0.3472                          | 0.5023                          | -1.73        | 7.81                                  |
| 140   | 0.2238                          | 0.3188                          | 0.4612                          | -1.69        | 8.07                                  |
| 145   | 0.2059                          | 0.2933                          | 0.4244                          | -1.65        | 8.32                                  |
| 150   | 0.1899                          | 0.2704                          | 0.3912                          | -1.61        | 8.56                                  |



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| RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R <sub>25</sub> AT (10, 15, 22) Ω |                                 |              |                                      |                                 |              |                                      |                                 |              |                                      |
|---|---------------------------------|--------------|--------------------------------------|---------------------------------|--------------|--------------------------------------|---------------------------------|--------------|--------------------------------------|
| T <sub>OPER</sub><br>(°C)   | PART NUMBER<br>NTCLE100E3109*** |              |                                      | PART NUMBER<br>NTCLE100E3159*** |              |                                      | PART NUMBER<br>NTCLE100E3229*** |              |                                      |
|   | R <sub>T</sub><br>(Ω)           | TCR<br>(%/K) | ΔR/R DUE TO B <sub>tol.</sub><br>(%) | R <sub>T</sub><br>(Ω)           | TCR<br>(%/K) | ΔR/R DUE TO B <sub>tol.</sub><br>(%) | R <sub>T</sub><br>(Ω)           | TCR<br>(%/K) | ΔR/R DUE TO B <sub>tol.</sub><br>(%) |
| -40   | 136.7                           | -4.86        | 8.39                                 | 224.8                           | -5.16        | 8.65                                 | 374.9                           | -5.54        | 8.80                                 |
| -35   | 107.6                           | -4.72        | 7.58                                 | 174.5                           | -4.98        | 7.79                                 | 285.8                           | -5.31        | 7.95                                 |
| -30   | 85.32                           | -4.58        | 6.81                                 | 136.6                           | -4.80        | 6.98                                 | 220.4                           | -5.10        | 7.14                                 |
| -25   | 68.10                           | -4.44        | 6.06                                 | 107.9                           | -4.64        | 6.21                                 | 171.7                           | -4.90        | 6.36                                 |
| -20   | 54.72                           | -4.31        | 5.35                                 | 85.94                           | -4.48        | 5.47                                 | 135.0                           | -4.71        | 5.61                                 |
| -15   | 44.25                           | -4.18        | 4.66                                 | 68.96                           | -4.33        | 4.76                                 | 107.2                           | -4.53        | 4.89                                 |
| -10   | 36.02                           | -4.06        | 4.00                                 | 55.74                           | -4.19        | 4.08                                 | 85.79                           | -4.37        | 4.20                                 |
| -5  | 29.49                           | -3.94        | 3.37                                 | 45.37                           | -4.05        | 3.43                                 | 69.21                           | -4.22        | 3.53                                 |
| 0   | 24.30                           | -3.82        | 2.75                                 | 37.17                           | -3.92        | 2.81                                 | 56.26                           | -4.07        | 2.89                                 |
| 5   | 20.13                           | -3.71        | 2.16                                 | 30.65                           | -3.80        | 2.20                                 | 46.05                           | -3.94        | 2.27                                 |
| 10  | 16.77                           | -3.60        | 1.59                                 | 25.42                           | -3.68        | 1.62                                 | 37.94                           | -3.81        | 1.67                                 |
| 15  | 14.04                           | -3.50        | 1.04                                 | 21.21                           | -3.57        | 1.06                                 | 31.45                           | -3.69        | 1.10                                 |
| 20  | 11.82                           | -3.39        | 0.51                                 | 17.79                           | -3.46        | 0.52                                 | 26.23                           | -3.57        | 0.54                                 |
| 25  | 10.00                           | -3.30        | 0.00                                 | 15.00                           | -3.36        | 0.00                                 | 22.00                           | -3.47        | 0.00                                 |
| 30  | 8.500                           | -3.20        | 0.50                                 | 12.76                           | -3.26        | 0.49                                 | 18.55                           | -3.36        | 0.52                                 |
| 35  | 7.259                           | -3.11        | 0.98                                 | 10.86                           | -3.17        | 0.98                                 | 15.72                           | -3.26        | 1.02                                 |
| 40  | 6.226                           | -3.03        | 1.44                                 | 9.291                           | -3.08        | 1.46                                 | 13.38                           | -3.17        | 1.51                                 |
| 45  | 5.363                           | -2.94        | 1.89                                 | 7.982                           | -2.99        | 1.92                                 | 11.45                           | -3.08        | 1.98                                 |
| 50  | 4.639                           | -2.86        | 2.33                                 | 6.887                           | -2.91        | 2.36                                 | 9.833                           | -3.00        | 2.44                                 |
| 55  | 4.029                           | -2.78        | 2.75                                 | 5.966                           | -2.83        | 2.79                                 | 8.482                           | -2.92        | 2.88                                 |
| 60  | 3.512                           | -2.71        | 3.16                                 | 5.189                           | -2.75        | 3.21                                 | 7.346                           | -2.84        | 3.32                                 |
| 65  | 3.073                           | -2.64        | 3.56                                 | 4.529                           | -2.68        | 3.62                                 | 6.386                           | -2.76        | 3.73                                 |
| 70  | 2.698                           | -2.57        | 3.95                                 | 3.968                           | -2.61        | 4.02                                 | 5.572                           | -2.69        | 4.14                                 |
| 75  | 2.377                           | -2.50        | 4.32                                 | 3.488                           | -2.54        | 4.41                                 | 4.879                           | -2.62        | 4.53                                 |
| 80  | 2.101                           | -2.43        | 4.69                                 | 3.077                           | -2.48        | 4.78                                 | 4.286                           | -2.56        | 4.91                                 |
| 85  | 1.864                           | -2.37        | 5.04                                 | 2.722                           | -2.41        | 5.15                                 | 3.777                           | -2.50        | 5.29                                 |
| 90  | 1.658                           | -2.31        | 5.38                                 | 2.416                           | -2.35        | 5.51                                 | 3.339                           | -2.44        | 5.65                                 |
| 95  | 1.479                           | -2.25        | 5.72                                 | 2.151                           | -2.30        | 5.85                                 | 2.960                           | -2.38        | 6.00                                 |
| 100   | 1.323                           | -2.20        | 6.05                                 | 1.920                           | -2.24        | 6.19                                 | 2.632                           | -2.32        | 6.34                                 |
| 105   | 1.187                           | -2.14        | 6.36                                 | 1.719                           | -2.19        | 6.53                                 | 2.347                           | -2.27        | 6.68                                 |
| 110   | 1.068                           | -2.09        | 6.67                                 | 1.543                           | -2.13        | 6.85                                 | 2.098                           | -2.22        | 7.00                                 |
| 115   | 0.9635                          | -2.04        | 6.98                                 | 1.389                           | -2.08        | 7.17                                 | 1.880                           | -2.17        | 7.32                                 |
| 120   | 0.8712                          | -1.99        | 7.27                                 | 1.253                           | -2.03        | 7.48                                 | 1.689                           | -2.12        | 7.62                                 |
| 125   | 0.7897                          | -1.94        | 7.56                                 | 1.133                           | -1.99        | 7.78                                 | 1.521                           | -2.07        | 7.93                                 |
| 130   | 0.7174                          | -1.90        | 7.84                                 | 1.027                           | -1.94        | 8.08                                 | 1.373                           | -2.03        | 8.22                                 |
| 135   | 0.6533                          | -1.85        | 8.11                                 | 0.9326                          | -1.90        | 8.37                                 | 1.242                           | -1.98        | 8.50                                 |
| 140   | 0.5961                          | -1.81        | 8.37                                 | 0.8490                          | -1.86        | 8.65                                 | 1.126                           | -1.94        | 8.78                                 |
| 145   | 0.5451                          | -1.77        | 8.63                                 | 0.7744                          | -1.82        | 8.93                                 | 1.023                           | -1.90        | 9.06                                 |
| 150   | 0.4995                          | -1.73        | 8.89                                 | 0.7079                          | -1.78        | 9.20                                 | 0.9309                          | -1.86        | 9.32                                 |



For complete Curve Computation, visit: [www.vishay.com/resistors-non-linear/curve-computation-list/](http://www.vishay.com/resistors-non-linear/curve-computation-list/)

| <b>RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH <math>R_{25}</math> AT (33, 47, 68) <math>\Omega</math></b> |                                 |                                 |                                 |              |                                       |
|--|---------------------------------|---------------------------------|---------------------------------|--------------|---------------------------------------|
| $T_{OPER}$<br>(°C)   | PART NUMBER<br>NTCLE100E3339*** | PART NUMBER<br>NTCLE100E3479*** | PART NUMBER<br>NTCLE100E3689*** | TCR<br>(%/K) | $\Delta R/R$ DUE TO $B_{tol.}$<br>(%) |
|  | $R_T$<br>( $\Omega$ )           | $R_T$<br>( $\Omega$ )           | $R_T$<br>( $\Omega$ )           |              |                                       |
| -40  | 707.0                           | 1007                            | 1457                            | -5.94        | 9.30                                  |
| -35  | 528.5                           | 752.7                           | 1089                            | -5.70        | 8.44                                  |
| -30  | 399.5                           | 569.0                           | 823.3                           | -5.49        | 7.60                                  |
| -25  | 305.3                           | 434.8                           | 629.1                           | -5.28        | 6.79                                  |
| -20  | 235.6                           | 335.6                           | 485.5                           | -5.09        | 6.01                                  |
| -15  | 183.5                           | 261.4                           | 378.2                           | -4.90        | 5.25                                  |
| -10  | 144.3                           | 205.5                           | 297.3                           | -4.73        | 4.51                                  |
| -5   | 114.3                           | 162.8                           | 235.6                           | -4.57        | 3.80                                  |
| 0  | 91.34                           | 130.1                           | 188.2                           | -4.42        | 3.11                                  |
| 5  | 73.51                           | 104.7                           | 151.5                           | -4.27        | 2.45                                  |
| 10   | 59.59                           | 84.87                           | 122.8                           | -4.13        | 1.80                                  |
| 15   | 48.63                           | 69.26                           | 100.2                           | -4.00        | 1.18                                  |
| 20   | 39.94                           | 56.88                           | 82.29                           | -3.88        | 0.58                                  |
| 25   | 33.00                           | 47.00                           | 68.00                           | -3.76        | 0.00                                  |
| 30   | 27.43                           | 39.06                           | 56.51                           | -3.64        | 0.56                                  |
| 35   | 22.92                           | 32.64                           | 47.23                           | -3.54        | 1.11                                  |
| 40   | 19.26                           | 27.42                           | 39.68                           | -3.43        | 1.63                                  |
| 45   | 16.26                           | 23.16                           | 33.50                           | -3.34        | 2.14                                  |
| 50   | 13.79                           | 19.65                           | 28.42                           | -3.24        | 2.63                                  |
| 55   | 11.76                           | 16.74                           | 24.23                           | -3.15        | 3.11                                  |
| 60   | 10.06                           | 14.33                           | 20.74                           | -3.07        | 3.57                                  |
| 65   | 8.652                           | 12.32                           | 17.83                           | -2.98        | 4.02                                  |
| 70   | 7.468                           | 10.64                           | 15.39                           | -2.90        | 4.45                                  |
| 75   | 6.471                           | 9.216                           | 13.33                           | -2.83        | 4.87                                  |
| 80   | 5.628                           | 8.015                           | 11.60                           | -2.76        | 5.27                                  |
| 85   | 4.912                           | 6.996                           | 10.12                           | -2.69        | 5.66                                  |
| 90   | 4.302                           | 6.127                           | 8.865                           | -2.62        | 6.04                                  |
| 95   | 3.780                           | 5.384                           | 7.790                           | -2.55        | 6.41                                  |
| 100  | 3.332                           | 4.746                           | 6.867                           | -2.49        | 6.77                                  |
| 105  | 2.946                           | 4.196                           | 6.071                           | -2.43        | 7.11                                  |
| 110  | 2.613                           | 3.721                           | 5.384                           | -2.37        | 7.45                                  |
| 115  | 2.324                           | 3.310                           | 4.788                           | -2.32        | 7.77                                  |
| 120  | 2.072                           | 2.951                           | 4.270                           | -2.26        | 8.09                                  |
| 125  | 1.853                           | 2.639                           | 3.818                           | -2.21        | 8.39                                  |
| 130  | 1.661                           | 2.365                           | 3.422                           | -2.16        | 8.69                                  |
| 135  | 1.492                           | 2.125                           | 3.075                           | -2.11        | 8.97                                  |
| 140  | 1.344                           | 1.914                           | 2.770                           | -2.07        | 9.25                                  |
| 145  | 1.213                           | 1.728                           | 2.500                           | -2.02        | 9.52                                  |
| 150  | 1.098                           | 1.564                           | 2.262                           | -1.98        | 9.79                                  |



For complete Curve Computation, visit: [www.vishay.com/resistors-non-linear/curve-computation-list/](http://www.vishay.com/resistors-non-linear/curve-computation-list/)

| <b>RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH <math>R_{25}</math> AT (100, 150, 220, 330, 470, 680) <math>\Omega</math></b> |                                 |                                 |                                 |                                 |                                 |                                 |              |  |
|--|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|--------------|--|
| $T_{OPER}$<br>(°C)   | PART NUMBER<br>NTCLE100E3101*** | PART NUMBER<br>NTCLE100E3151*** | PART NUMBER<br>NTCLE100E3221*** | PART NUMBER<br>NTCLE100E3331*** | PART NUMBER<br>NTCLE100E3471*** | PART NUMBER<br>NTCLE100E3681*** | TCR<br>(%/K) | $\Delta R/R$<br>DUE<br>TO<br>$B_{tot.}$<br>(%) |
|  | $R_T$<br>( $\Omega$ )           | $R_T$<br>( $\Omega$ )           | $R_T$<br>( $\Omega$ )           | $R_T$<br>( $\Omega$ )           | $R_T$<br>( $\Omega$ )           | $R_T$<br>( $\Omega$ )           |              |  |
| -40  | 2193                            | 3289                            | 4824                            | 7236                            | 10 305                          | 14 910                          | -5.75        | 4.99   |
| -35  | 1652                            | 2478                            | 3635                            | 5452                            | 7766                            | 11 235                          | -5.57        | 4.51   |
| -30  | 1256                            | 1884                            | 2763                            | 4144                            | 5902                            | 8540                            | -5.40        | 4.05   |
| -25  | 962.5                           | 1444                            | 2117                            | 3176                            | 4524                            | 6545                            | -5.24        | 3.61   |
| -20  | 743.6                           | 1115                            | 1636                            | 2454                            | 3495                            | 5057                            | -5.08        | 3.19   |
| -15  | 579.0                           | 868.5                           | 1274                            | 1911                            | 2721                            | 3937                            | -4.93        | 2.78   |
| -10  | 454.2                           | 681.2                           | 999.1                           | 1499                            | 2135                            | 3088                            | -4.78        | 2.38   |
| -5   | 358.8                           | 538.2                           | 789.4                           | 1184                            | 1686                            | 2440                            | -4.64        | 2.01   |
| 0  | 285.4                           | 428.2                           | 628.0                           | 942.0                           | 1342                            | 1941                            | -4.51        | 1.64   |
| 5  | 228.6                           | 342.9                           | 502.9                           | 754.4                           | 1074                            | 1554                            | -4.38        | 1.29   |
| 10   | 184.2                           | 276.4                           | 405.3                           | 608.0                           | 866.0                           | 1253                            | -4.25        | 0.95   |
| 15   | 149.4                           | 224.1                           | 328.7                           | 493.1                           | 702.2                           | 1016                            | -4.13        | 0.62   |
| 20   | 121.9                           | 182.8                           | 268.2                           | 402.2                           | 572.9                           | 828.8                           | -4.01        | 0.31   |
| 25   | 100.0                           | 150.0                           | 220.0                           | 330.0                           | 470.0                           | 680.0                           | -3.90        | 0.00   |
| 30   | 82.49                           | 123.7                           | 181.5                           | 272.2                           | 387.7                           | 561.0                           | -3.80        | 0.30   |
| 35   | 68.41                           | 102.6                           | 150.5                           | 225.8                           | 321.5                           | 465.2                           | -3.69        | 0.58   |
| 40   | 57.02                           | 85.54                           | 125.5                           | 188.2                           | 268.0                           | 387.8                           | -3.59        | 0.86   |
| 45   | 47.77                           | 71.65                           | 105.1                           | 157.6                           | 224.5                           | 324.8                           | -3.50        | 1.13   |
| 50   | 40.20                           | 60.30                           | 88.44                           | 132.7                           | 188.9                           | 273.3                           | -3.40        | 1.39   |
| 55   | 33.98                           | 50.98                           | 74.76                           | 112.1                           | 159.7                           | 231.1                           | -3.31        | 1.64   |
| 60   | 28.86                           | 43.28                           | 63.48                           | 95.23                           | 135.6                           | 196.2                           | -3.23        | 1.88   |
| 65   | 24.61                           | 36.91                           | 54.13                           | 81.20                           | 115.6                           | 167.3                           | -3.15        | 2.12   |
| 70   | 21.07                           | 31.60                           | 46.35                           | 69.52                           | 99.01                           | 143.3                           | -3.07        | 2.35   |
| 75   | 18.11                           | 27.16                           | 39.84                           | 59.76                           | 85.11                           | 123.1                           | -2.99        | 2.57   |
| 80   | 15.62                           | 23.43                           | 34.37                           | 51.56                           | 73.43                           | 106.2                           | -2.91        | 2.79   |
| 85   | 13.53                           | 20.29                           | 29.76                           | 44.65                           | 63.59                           | 92.00                           | -2.84        | 3.00   |
| 90   | 11.76                           | 17.63                           | 25.86                           | 38.80                           | 55.26                           | 79.95                           | -2.77        | 3.21   |
| 95   | 10.25                           | 15.38                           | 22.55                           | 33.83                           | 48.18                           | 69.71                           | -2.71        | 3.41   |
| 100  | 8.968                           | 13.45                           | 19.73                           | 29.59                           | 42.15                           | 60.98                           | -2.64        | 3.60   |
| 105  | 7.871                           | 11.81                           | 17.32                           | 25.97                           | 36.99                           | 53.52                           | -2.58        | 3.79   |
| 110  | 6.928                           | 10.39                           | 15.24                           | 22.86                           | 32.56                           | 47.11                           | -2.52        | 3.97   |
| 115  | 6.117                           | 9.176                           | 13.46                           | 20.19                           | 28.75                           | 41.60                           | -2.46        | 4.15   |
| 120  | 5.416                           | 8.125                           | 11.92                           | 17.87                           | 25.46                           | 36.83                           | -2.41        | 4.33   |
| 125  | 4.809                           | 7.214                           | 10.58                           | 15.87                           | 22.60                           | 32.70                           | -2.35        | 4.50   |
| 130  | 4.282                           | 6.422                           | 9.419                           | 14.13                           | 20.12                           | 29.11                           | -2.30        | 4.66   |
| 135  | 3.822                           | 5.732                           | 8.408                           | 12.61                           | 17.96                           | 25.99                           | -2.25        | 4.83   |
| 140  | 3.420                           | 5.130                           | 7.523                           | 11.29                           | 16.07                           | 23.25                           | -2.20        | 4.99   |
| 145  | 3.068                           | 4.601                           | 6.749                           | 10.12                           | 14.42                           | 20.86                           | -2.15        | 5.14   |
| 150  | 2.758                           | 4.137                           | 6.068                           | 9.102                           | 12.96                           | 18.76                           | -2.10        | 5.29   |





For complete Curve Computation, visit: [www.vishay.com/resistors-non-linear/curve-computation-list/](http://www.vishay.com/resistors-non-linear/curve-computation-list/)

| <b>RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH <math>R_{25}</math> AT (1, 1.5, 2) k<math>\Omega</math></b> |                                 |                                 |                                 |              |                                       |
|--|---------------------------------|---------------------------------|---------------------------------|--------------|---------------------------------------|
| $T_{OPER}$<br>(°C)   | PART NUMBER<br>NTCLE100E3102*** | PART NUMBER<br>NTCLE100E3152*** | PART NUMBER<br>NTCLE100E3202*** | TCR<br>(%/K) | $\Delta R/R$ DUE TO $B_{tol.}$<br>(%) |
|  | $R_T$<br>( $\Omega$ )           | $R_T$<br>( $\Omega$ )           | $R_T$<br>( $\Omega$ )           |              |                                       |
| -40  | 23 342                          | 35 013                          | 46 684                          | - 6.06       | 1.65                                  |
| -35  | 17 336                          | 26 004                          | 34 672                          | - 5.84       | 1.49                                  |
| -30  | 13 018                          | 19 526                          | 26 035                          | - 5.62       | 1.34                                  |
| -25  | 9877                            | 14 816                          | 19 754                          | - 5.42       | 1.19                                  |
| -20  | 7569                            | 11 353                          | 15 138                          | - 5.23       | 1.05                                  |
| -15  | 5855                            | 8782                            | 11 709                          | - 5.05       | 0.92                                  |
| -10  | 4569                            | 6854                            | 9138                            | - 4.87       | 0.79                                  |
| -5   | 3596                            | 5395                            | 7193                            | - 4.71       | 0.66                                  |
| 0  | 2854                            | 4280                            | 5707                            | - 4.55       | 0.54                                  |
| 5  | 2282                            | 3422                            | 4563                            | - 4.40       | 0.43                                  |
| 10   | 1838                            | 2757                            | 3675                            | - 4.26       | 0.31                                  |
| 15   | 1491                            | 2236                            | 2981                            | - 4.12       | 0.21                                  |
| 20   | 1217                            | 1826                            | 2434                            | - 3.99       | 0.10                                  |
| 25   | 1000                            | 1500                            | 2000                            | - 3.87       | 0.00                                  |
| 30   | 826.6                           | 1240                            | 1653                            | - 3.75       | 0.10                                  |
| 35   | 687.3                           | 1031                            | 1375                            | - 3.63       | 0.19                                  |
| 40   | 574.6                           | 861.9                           | 1149                            | - 3.53       | 0.28                                  |
| 45   | 482.7                           | 724.0                           | 965.4                           | - 3.42       | 0.37                                  |
| 50   | 407.4                           | 611.0                           | 814.7                           | - 3.32       | 0.46                                  |
| 55   | 345.2                           | 517.8                           | 690.5                           | - 3.23       | 0.54                                  |
| 60   | 293.7                           | 440.6                           | 587.4                           | - 3.14       | 0.62                                  |
| 65   | 250.8                           | 376.2                           | 501.6                           | - 3.05       | 0.70                                  |
| 70   | 214.9                           | 322.4                           | 429.8                           | - 2.97       | 0.78                                  |
| 75   | 184.7                           | 277.1                           | 369.5                           | - 2.89       | 0.86                                  |
| 80   | 159.3                           | 238.9                           | 318.6                           | - 2.81       | 0.93                                  |
| 85   | 137.7                           | 206.6                           | 275.5                           | - 2.73       | 1.01                                  |
| 90   | 119.4                           | 179.1                           | 238.8                           | - 2.66       | 1.08                                  |
| 95   | 103.8                           | 155.7                           | 207.6                           | - 2.59       | 1.15                                  |
| 100  | 90.45                           | 135.7                           | 180.9                           | - 2.53       | 1.22                                  |
| 105  | 79.00                           | 118.5                           | 158.0                           | - 2.46       | 1.29                                  |
| 110  | 69.15                           | 103.7                           | 138.3                           | - 2.40       | 1.35                                  |
| 115  | 60.66                           | 90.99                           | 121.3                           | - 2.34       | 1.42                                  |
| 120  | 53.32                           | 79.98                           | 106.6                           | - 2.29       | 1.48                                  |
| 125  | 46.96                           | 70.44                           | 93.92                           | - 2.23       | 1.55                                  |
| 130  | 41.43                           | 62.15                           | 82.87                           | - 2.18       | 1.61                                  |
| 135  | 36.63                           | 54.94                           | 73.25                           | - 2.13       | 1.67                                  |
| 140  | 32.43                           | 48.65                           | 64.87                           | - 2.08       | 1.73                                  |
| 145  | 28.77                           | 43.16                           | 57.54                           | - 2.03       | 1.79                                  |
| 150  | 25.56                           | 38.34                           | 51.12                           | - 1.98       | 1.85                                  |



For complete Curve Computation, visit: [www.vishay.com/resistors-non-linear/curve-computation-list/](http://www.vishay.com/resistors-non-linear/curve-computation-list/)

| <b>RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH <math>R_{25}</math> AT (2.2, 2.7, 3.3, 4.7, 5.0, 6.8, 10) k<math>\Omega</math></b> |                                 |                                 |                                 |                                 |                                 |                                 |                                 |              |  |
|---|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|--------------|--|
| T <sub>OPER</sub><br>(°C)   | PART NUMBER<br>NTCLE100E3222*** | PART NUMBER<br>NTCLE100E3272*** | PART NUMBER<br>NTCLE100E3332*** | PART NUMBER<br>NTCLE100E3472*** | PART NUMBER<br>NTCLE100E3502*** | PART NUMBER<br>NTCLE100E3682*** | PART NUMBER<br>NTCLE100E3103*** | TCR<br>(%/K) | $\Delta R/R$<br>DUE<br>TO<br>$B_{tol.}$<br>(%) |
|   | $R_T$<br>( $\Omega$ )           | $R_T$<br>( $\Omega$ )           | $R_T$<br>( $\Omega$ )           | $R_T$<br>( $\Omega$ )           | $R_T$<br>( $\Omega$ )           | $R_T$<br>( $\Omega$ )           | $R_T$<br>( $\Omega$ )           |              |  |
| -40   | 73 061                          | 89 665                          | 109 591                         | 156 084                         | 166 047                         | 225 824                         | 332 094                         | -6.62        | 2.79   |
| -35   | 52 778                          | 64 773                          | 79 167                          | 112 753                         | 119 950                         | 163 132                         | 239 900                         | -6.39        | 2.52   |
| -30   | 38 544                          | 47 304                          | 57 816                          | 82 344                          | 87 600                          | 119 136                         | 175 200                         | -6.18        | 2.26   |
| -25   | 28 443                          | 34 907                          | 42 665                          | 60 765                          | 64 643                          | 87 915                          | 129 287                         | -5.98        | 2.02   |
| -20   | 21 199                          | 26 017                          | 31 798                          | 45 288                          | 48 179                          | 65 524                          | 96 358                          | -5.78        | 1.78   |
| -15   | 15 950                          | 19 575                          | 23 925                          | 34 075                          | 36 250                          | 49 300                          | 72 500                          | -5.60        | 1.55   |
| -10   | 12 110                          | 14 862                          | 18 165                          | 25 872                          | 27 523                          | 37 431                          | 55 046                          | -5.42        | 1.33   |
| -5  | 9275                            | 11 382                          | 13 912                          | 19 814                          | 21 078                          | 28 667                          | 42 157                          | -5.25        | 1.12   |
| 0   | 7162                            | 8790                            | 10 743                          | 15 300                          | 16 277                          | 22 137                          | 32 554                          | -5.09        | 0.92   |
| 5   | 5574                            | 6841                            | 8362                            | 11 909                          | 12 669                          | 17 230                          | 25 339                          | -4.93        | 0.72   |
| 10  | 4372                            | 5365                            | 6558                            | 9340                            | 9936                            | 13 513                          | 19 872                          | -4.79        | 0.53   |
| 15  | 3454                            | 4239                            | 5180                            | 7378                            | 7849                            | 10 675                          | 15 698                          | -4.64        | 0.35   |
| 20  | 2747                            | 3372                            | 4121                            | 5869                            | 6244                            | 8492                            | 12 488                          | -4.51        | 0.17   |
| 25  | 2200                            | 2700                            | 3300                            | 4700                            | 5000                            | 6800                            | 10 000                          | -4.38        | 0.00   |
| 30  | 1773                            | 2176                            | 2659                            | 3788                            | 4030                            | 5480                            | 8059                            | -4.25        | 0.17   |
| 35  | 1438                            | 1764                            | 2156                            | 3071                            | 3267                            | 4444                            | 6535                            | -4.13        | 0.32   |
| 40  | 1173                            | 1439                            | 1759                            | 2505                            | 2665                            | 3624                            | 5330                            | -4.02        | 0.48   |
| 45  | 961.8                           | 1180                            | 1443                            | 2055                            | 2186                            | 2973                            | 4372                            | -3.91        | 0.63   |
| 50  | 793.2                           | 973.4                           | 1190                            | 1694                            | 1803                            | 2452                            | 3605                            | -3.80        | 0.77   |
| 55  | 657.5                           | 806.9                           | 986.3                           | 1405                            | 1494                            | 2032                            | 2989                            | -3.70        | 0.91   |
| 60  | 547.8                           | 672.3                           | 821.7                           | 1170                            | 1245                            | 1693                            | 2490                            | -3.60        | 1.05   |
| 65  | 458.6                           | 562.8                           | 687.9                           | 979.7                           | 1042                            | 1417                            | 2084                            | -3.51        | 1.18   |
| 70  | 385.7                           | 473.3                           | 578.5                           | 823.9                           | 876.5                           | 1192                            | 1753                            | -3.42        | 1.31   |
| 75  | 325.8                           | 399.8                           | 488.7                           | 696.0                           | 740.5                           | 1007                            | 1481                            | -3.33        | 1.44   |
| 80  | 276.4                           | 339.2                           | 414.6                           | 590.5                           | 628.2                           | 854.3                           | 1256                            | -3.25        | 1.56   |
| 85  | 235.5                           | 289.0                           | 353.2                           | 503.0                           | 535.2                           | 727.8                           | 1070                            | -3.17        | 1.68   |
| 90  | 201.4                           | 247.2                           | 302.1                           | 430.2                           | 457.7                           | 622.5                           | 915.4                           | -3.09        | 1.79   |
| 95  | 172.9                           | 212.2                           | 259.4                           | 369.4                           | 393.0                           | 534.5                           | 786.0                           | -3.01        | 1.90   |
| 100   | 149.0                           | 182.9                           | 223.5                           | 318.3                           | 338.6                           | 460.6                           | 677.3                           | -2.94        | 2.01   |
| 105   | 128.9                           | 158.2                           | 193.3                           | 275.3                           | 292.9                           | 398.3                           | 585.7                           | -2.87        | 2.12   |
| 110   | 111.8                           | 137.2                           | 167.7                           | 238.9                           | 254.2                           | 345.7                           | 508.3                           | -2.80        | 2.22   |
| 115   | 97.37                           | 119.5                           | 146.1                           | 208.0                           | 221.3                           | 301.0                           | 442.6                           | -2.74        | 2.32   |
| 120   | 85.05                           | 104.4                           | 127.6                           | 181.7                           | 193.3                           | 262.9                           | 386.6                           | -2.67        | 2.42   |
| 125   | 74.52                           | 91.46                           | 111.8                           | 159.2                           | 169.4                           | 230.3                           | 338.7                           | -2.61        | 2.51   |
| 130   | 65.49                           | 80.38                           | 98.24                           | 139.9                           | 148.8                           | 202.4                           | 297.7                           | -2.55        | 2.61   |
| 135   | 57.72                           | 70.84                           | 86.59                           | 123.3                           | 131.2                           | 178.4                           | 262.4                           | -2.50        | 2.70   |
| 140   | 51.02                           | 62.62                           | 76.53                           | 109.0                           | 116.0                           | 157.7                           | 231.9                           | -2.44        | 2.78   |
| 145   | 45.22                           | 55.49                           | 67.83                           | 96.60                           | 102.8                           | 139.8                           | 205.5                           | -2.39        | 2.87   |
| 150   | 40.18                           | 49.31                           | 60.27                           | 85.84                           | 91.32                           | 124.2                           | 182.6                           | -2.34        | 2.96   |



For complete Curve Computation, visit: [www.vishay.com/resistors-non-linear/curve-computation-list/](http://www.vishay.com/resistors-non-linear/curve-computation-list/)

| <b>RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH <math>R_{25}</math> AT (12, 15, 22) k<math>\Omega</math></b> |                                 |                                 |                                 |              |                                       |
|---|---------------------------------|---------------------------------|---------------------------------|--------------|---------------------------------------|
| $T_{OPER}$<br>(°C)  | PART NUMBER<br>NTCLE100E3123*** | PART NUMBER<br>NTCLE100E3153*** | PART NUMBER<br>NTCLE100E3223*** | TCR<br>(%/K) | $\Delta R/R$ DUE TO $B_{tol.}$<br>(%) |
|   | $R_T$<br>(k $\Omega$ )          | $R_T$<br>(k $\Omega$ )          | $R_T$<br>(k $\Omega$ )          |              |                                       |
| - 40  | 309.4                           | 386.7                           | 567.2                           | - 6.07       | 7.00                                  |
| - 35  | 229.5                           | 286.9                           | 420.8                           | - 5.88       | 6.32                                  |
| - 30  | 171.8                           | 214.8                           | 315.0                           | - 5.70       | 5.68                                  |
| - 25  | 129.8                           | 162.3                           | 238.0                           | - 5.52       | 5.06                                  |
| - 20  | 98.93                           | 123.7                           | 181.4                           | - 5.35       | 4.46                                  |
| - 15  | 76.02                           | 95.02                           | 139.4                           | - 5.19       | 3.89                                  |
| - 10  | 58.88                           | 73.60                           | 107.9                           | - 5.03       | 3.34                                  |
| - 5   | 45.95                           | 57.44                           | 84.25                           | - 4.88       | 2.81                                  |
| 0   | 36.13                           | 45.16                           | 66.24                           | - 4.74       | 2.30                                  |
| 5   | 28.61                           | 35.76                           | 52.45                           | - 4.60       | 1.80                                  |
| 10  | 22.80                           | 28.51                           | 41.81                           | - 4.47       | 1.33                                  |
| 15  | 18.30                           | 22.87                           | 33.55                           | - 4.34       | 0.87                                  |
| 20  | 14.77                           | 18.47                           | 27.08                           | - 4.22       | 0.43                                  |
| 25  | 12.00                           | 15.00                           | 22.00                           | - 4.10       | 0.00                                  |
| 30  | 9.804                           | 12.25                           | 17.97                           | - 3.99       | 0.41                                  |
| 35  | 8.054                           | 10.07                           | 14.77                           | - 3.88       | 0.81                                  |
| 40  | 6.652                           | 8.315                           | 12.20                           | - 3.77       | 1.20                                  |
| 45  | 5.522                           | 6.903                           | 10.12                           | - 3.67       | 1.58                                  |
| 50  | 4.607                           | 5.759                           | 8.447                           | - 3.58       | 1.94                                  |
| 55  | 3.862                           | 4.828                           | 7.081                           | - 3.48       | 2.29                                  |
| 60  | 3.252                           | 4.066                           | 5.963                           | - 3.39       | 2.64                                  |
| 65  | 2.751                           | 3.439                           | 5.044                           | - 3.30       | 2.97                                  |
| 70  | 2.337                           | 2.921                           | 4.284                           | - 3.22       | 3.29                                  |
| 75  | 1.993                           | 2.492                           | 3.654                           | - 3.14       | 3.60                                  |
| 80  | 1.707                           | 2.134                           | 3.129                           | - 3.06       | 3.91                                  |
| 85  | 1.467                           | 1.834                           | 2.690                           | - 2.99       | 4.20                                  |
| 90  | 1.266                           | 1.582                           | 2.321                           | - 2.92       | 4.49                                  |
| 95  | 1.096                           | 1.370                           | 2.010                           | - 2.85       | 4.77                                  |
| 100   | 0.9524                          | 1.190                           | 1.746                           | - 2.78       | 5.04                                  |
| 105   | 0.8302                          | 1.038                           | 1.522                           | - 2.71       | 5.31                                  |
| 110   | 0.7260                          | 0.9075                          | 1.331                           | - 2.65       | 5.56                                  |
| 115   | 0.6369                          | 0.7961                          | 1.168                           | - 2.59       | 5.82                                  |
| 120   | 0.5604                          | 0.7005                          | 1.027                           | - 2.53       | 6.06                                  |
| 125   | 0.4945                          | 0.6181                          | 0.9065                          | - 2.47       | 6.30                                  |
| 130   | 0.4375                          | 0.5469                          | 0.8022                          | - 2.42       | 6.53                                  |
| 135   | 0.3882                          | 0.4853                          | 0.7117                          | - 2.37       | 6.76                                  |
| 140   | 0.3454                          | 0.4317                          | 0.6332                          | - 2.31       | 6.98                                  |
| 145   | 0.3080                          | 0.3850                          | 0.5647                          | - 2.26       | 7.20                                  |
| 150   | 0.2754                          | 0.3442                          | 0.5049                          | - 2.22       | 7.41                                  |



For complete Curve Computation, visit: [www.vishay.com/resistors-non-linear/curve-computation-list/](http://www.vishay.com/resistors-non-linear/curve-computation-list/)

| RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R <sub>25</sub> AT (33, 47, 50, 68, 100) kΩ |                           |                        |              |   |                        |                        |                        |              |   |
|---|---------------------------|------------------------|--------------|---|------------------------|------------------------|------------------------|--------------|---|
| T <sub>OPER</sub><br>(°C)   | PART NUMBER<br>NTCLE100E3 |                        |              |   |                        |                        |                        |              |   |
|   | 333***                    | 473***                 | TCR<br>(%/K) | ΔR/R DUE<br>TO B <sub>tol.</sub><br>(%) | 503***                 | 683***                 | 104***                 | TCR<br>(%/K) | ΔR/R DUE<br>TO B <sub>tol.</sub><br>(%) |
|   | R <sub>T</sub><br>(kΩ)    | R <sub>T</sub><br>(kΩ) |              |   | R <sub>T</sub><br>(kΩ) | R <sub>T</sub><br>(kΩ) | R <sub>T</sub><br>(kΩ) |              |   |
| -40   | 1116                      | 1589                   | -6.54        | 5.74                                    | 1833                   | 2493                   | 3666                   | -6.69        | 5.88                                    |
| -35   | 808.6                     | 1152                   | -6.34        | 5.19                                    | 1319                   | 1794                   | 2638                   | -6.49        | 5.31                                    |
| -30   | 591.7                     | 842.8                  | -6.15        | 4.66                                    | 958.3                  | 1303                   | 1917                   | -6.29        | 4.77                                    |
| -25   | 437.1                     | 622.6                  | -5.96        | 4.15                                    | 703.1                  | 956.2                  | 1406                   | -6.10        | 4.25                                    |
| -20   | 325.9                     | 464.1                  | -5.79        | 3.66                                    | 520.6                  | 708.0                  | 1041                   | -5.92        | 3.75                                    |
| -15   | 245.0                     | 349.0                  | -5.62        | 3.19                                    | 388.9                  | 528.9                  | 777.8                  | -5.75        | 3.27                                    |
| -10   | 185.8                     | 264.6                  | -5.45        | 2.74                                    | 293.0                  | 398.5                  | 586.1                  | -5.58        | 2.80                                    |
| -5  | 142.0                     | 202.3                  | -5.30        | 2.30                                    | 222.6                  | 302.8                  | 445.3                  | -5.42        | 2.36                                    |
| 0   | 109.4                     | 155.8                  | -5.14        | 1.88                                    | 170.5                  | 231.8                  | 340.9                  | -5.26        | 1.93                                    |
| 5   | 84.91                     | 120.9                  | -5.00        | 1.48                                    | 131.5                  | 178.9                  | 263.1                  | -5.11        | 1.52                                    |
| 10  | 66.37                     | 94.53                  | -4.86        | 1.09                                    | 102.2                  | 139.0                  | 204.4                  | -4.97        | 1.12                                    |
| 15  | 52.24                     | 74.40                  | -4.72        | 0.71                                    | 80.01                  | 108.8                  | 160.0                  | -4.83        | 0.73                                    |
| 20  | 41.39                     | 58.95                  | -4.59        | 0.35                                    | 63.04                  | 85.74                  | 126.1                  | -4.70        | 0.36                                    |
| 25  | 33.00                     | 47.00                  | -4.47        | 0.00                                    | 50.00                  | 68.00                  | 100.0                  | -4.57        | 0.00                                    |
| 30  | 26.47                     | 37.71                  | -4.35        | 0.34                                    | 39.90                  | 54.27                  | 79.81                  | -4.45        | 0.35                                    |
| 35  | 21.37                     | 30.43                  | -4.23        | 0.67                                    | 32.04                  | 43.57                  | 64.08                  | -4.33        | 0.68                                    |
| 40  | 17.34                     | 24.70                  | -4.12        | 0.99                                    | 25.87                  | 35.19                  | 51.75                  | -4.22        | 1.01                                    |
| 45  | 14.15                     | 20.15                  | -4.01        | 1.29                                    | 21.01                  | 28.57                  | 42.02                  | -4.11        | 1.33                                    |
| 50  | 11.61                     | 16.53                  | -3.91        | 1.59                                    | 17.15                  | 23.33                  | 34.31                  | -4.00        | 1.63                                    |
| 55  | 9.572                     | 13.63                  | -3.81        | 1.88                                    | 14.08                  | 19.15                  | 28.16                  | -3.90        | 1.93                                    |
| 60  | 7.931                     | 11.30                  | -3.71        | 2.16                                    | 11.61                  | 15.79                  | 23.22                  | -3.80        | 2.21                                    |
| 65  | 6.603                     | 9.404                  | -3.62        | 2.43                                    | 9.623                  | 13.09                  | 19.25                  | -3.71        | 2.49                                    |
| 70  | 5.522                     | 7.865                  | -3.53        | 2.70                                    | 8.012                  | 10.90                  | 16.02                  | -3.62        | 2.76                                    |
| 75  | 4.639                     | 6.607                  | -3.44        | 2.95                                    | 6.701                  | 9.114                  | 13.40                  | -3.53        | 3.03                                    |
| 80  | 3.913                     | 5.573                  | -3.36        | 3.20                                    | 5.629                  | 7.655                  | 11.26                  | -3.45        | 3.28                                    |
| 85  | 3.315                     | 4.721                  | -3.28        | 3.45                                    | 4.748                  | 6.457                  | 9.496                  | -3.36        | 3.53                                    |
| 90  | 2.819                     | 4.015                  | -3.20        | 3.68                                    | 4.021                  | 5.469                  | 8.042                  | -3.28        | 3.77                                    |
| 95  | 2.406                     | 3.427                  | -3.13        | 3.91                                    | 3.419                  | 4.649                  | 6.837                  | -3.21        | 4.01                                    |
| 100   | 2.062                     | 2.936                  | -3.05        | 4.13                                    | 2.918                  | 3.968                  | 5.835                  | -3.13        | 4.24                                    |
| 105   | 1.773                     | 2.525                  | -2.98        | 4.35                                    | 2.499                  | 3.399                  | 4.998                  | -3.06        | 4.46                                    |
| 110   | 1.530                     | 2.179                  | -2.92        | 4.56                                    | 2.148                  | 2.921                  | 4.296                  | -2.99        | 4.68                                    |
| 115   | 1.324                     | 1.886                  | -2.85        | 4.77                                    | 1.853                  | 2.519                  | 3.705                  | -2.93        | 4.89                                    |
| 120   | 1.150                     | 1.638                  | -2.79        | 4.97                                    | 1.603                  | 2.180                  | 3.206                  | -2.86        | 5.09                                    |
| 125   | 1.002                     | 1.427                  | -2.73        | 5.17                                    | 1.392                  | 1.892                  | 2.783                  | -2.80        | 5.29                                    |
| 130   | 0.8757                    | 1.247                  | -2.67        | 5.36                                    | 1.212                  | 1.648                  | 2.423                  | -2.74        | 5.49                                    |
| 135   | 0.7675                    | 1.093                  | -2.61        | 5.54                                    | 1.058                  | 1.439                  | 2.116                  | -2.68        | 5.68                                    |
| 140   | 0.6746                    | 0.9608                 | -2.55        | 5.73                                    | 0.9269                 | 1.261                  | 1.854                  | -2.62        | 5.87                                    |
| 145   | 0.5946                    | 0.8468                 | -2.50        | 5.90                                    | 0.8141                 | 1.107                  | 1.628                  | -2.57        | 6.05                                    |
| 150   | 0.5254                    | 0.7483                 | -2.45        | 6.08                                    | 0.7170                 | 0.9752                 | 1.434                  | -2.51        | 6.23                                    |



For complete Curve Computation, visit: [www.vishay.com/resistors-non-linear/curve-computation-list/](http://www.vishay.com/resistors-non-linear/curve-computation-list/)

| RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R <sub>25</sub> AT (150, 220, 330, 470) kΩ |                           |                        |              |   |                        |                        |              |   |
|--|---------------------------|------------------------|--------------|---|------------------------|------------------------|--------------|---|
| T <sub>OPER</sub><br>(°C)  | PART NUMBER<br>NTCLE100E3 |                        |              |   |                        |                        |              |   |
|  | 154***                    | 224***                 | TCR<br>(%/K) | ΔR/R DUE<br>TO B <sub>tol.</sub><br>(%) | 334***                 | 474***                 | TCR<br>(%/K) | ΔR/R DUE<br>TO B <sub>tol.</sub><br>(%) |
|  | R <sub>T</sub><br>(kΩ)    | R <sub>T</sub><br>(kΩ) |              |   | R <sub>T</sub><br>(kΩ) | R <sub>T</sub><br>(kΩ) |              |   |
| - 40   | 6153                      | 9024                   | - 6.83       | 10.22                                   | 16 044                 | 22 850                 | - 7.14       | 6.41                                    |
| - 35   | 4394                      | 6444                   | - 6.64       | 9.24                                    | 11 282                 | 16 068                 | - 6.94       | 5.80                                    |
| - 30   | 3168                      | 4646                   | - 6.45       | 8.29                                    | 8013                   | 11 413                 | - 6.74       | 5.20                                    |
| - 25   | 2305                      | 3381                   | - 6.27       | 7.39                                    | 5747                   | 8185                   | - 6.55       | 4.64                                    |
| - 20   | 1693                      | 2483                   | - 6.09       | 6.52                                    | 4161                   | 5926                   | - 6.37       | 4.09                                    |
| - 15   | 1254                      | 1839                   | - 5.92       | 5.68                                    | 3040                   | 4329                   | - 6.19       | 3.57                                    |
| - 10   | 936.4                     | 1373                   | - 5.75       | 4.88                                    | 2240                   | 3190                   | - 6.02       | 3.06                                    |
| - 5  | 705.0                     | 1034                   | - 5.60       | 4.10                                    | 1665                   | 2371                   | - 5.85       | 2.57                                    |
| 0  | 535.0                     | 784.7                  | - 5.44       | 3.36                                    | 1248                   | 1777                   | - 5.69       | 2.11                                    |
| 5  | 409.1                     | 600.0                  | - 5.29       | 2.64                                    | 942.3                  | 1342                   | - 5.54       | 1.65                                    |
| 10   | 315.1                     | 462.1                  | - 5.15       | 1.94                                    | 717.1                  | 1021                   | - 5.39       | 1.22                                    |
| 15   | 244.4                     | 358.4                  | - 5.01       | 1.27                                    | 549.8                  | 783.0                  | - 5.24       | 0.80                                    |
| 20   | 190.8                     | 279.9                  | - 4.88       | 0.63                                    | 424.5                  | 604.6                  | - 5.10       | 0.39                                    |
| 25   | 150.0                     | 220.0                  | - 4.75       | 0.00                                    | 330.0                  | 470.0                  | - 4.97       | 0.00                                    |
| 30   | 118.6                     | 174.0                  | - 4.63       | 0.60                                    | 258.2                  | 367.8                  | - 4.84       | 0.38                                    |
| 35   | 94.42                     | 138.5                  | - 4.51       | 1.19                                    | 203.4                  | 289.6                  | - 4.72       | 0.75                                    |
| 40   | 75.58                     | 110.9                  | - 4.39       | 1.76                                    | 161.1                  | 229.5                  | - 4.59       | 1.10                                    |
| 45   | 60.85                     | 89.24                  | - 4.28       | 2.30                                    | 128.4                  | 182.9                  | - 4.48       | 1.45                                    |
| 50   | 49.25                     | 72.24                  | - 4.17       | 2.83                                    | 103.0                  | 146.7                  | - 4.37       | 1.78                                    |
| 55   | 40.08                     | 58.78                  | - 4.07       | 3.35                                    | 83.00                  | 118.2                  | - 4.26       | 2.10                                    |
| 60   | 32.78                     | 48.08                  | - 3.97       | 3.85                                    | 67.26                  | 95.80                  | - 4.15       | 2.41                                    |
| 65   | 26.94                     | 39.51                  | - 3.87       | 4.33                                    | 54.79                  | 78.04                  | - 4.05       | 2.72                                    |
| 70   | 22.25                     | 32.63                  | - 3.78       | 4.80                                    | 44.85                  | 63.88                  | - 3.95       | 3.01                                    |
| 75   | 18.46                     | 27.07                  | - 3.69       | 5.26                                    | 36.90                  | 52.55                  | - 3.86       | 3.30                                    |
| 80   | 15.38                     | 22.56                  | - 3.60       | 5.70                                    | 30.49                  | 43.43                  | - 3.77       | 3.58                                    |
| 85   | 12.87                     | 18.88                  | - 3.52       | 6.14                                    | 25.31                  | 36.05                  | - 3.68       | 3.85                                    |
| 90   | 10.82                     | 15.87                  | - 3.44       | 6.56                                    | 21.10                  | 30.06                  | - 3.59       | 4.11                                    |
| 95   | 9.129                     | 13.39                  | - 3.36       | 6.96                                    | 17.67                  | 25.16                  | - 3.51       | 4.37                                    |
| 100  | 7.732                     | 11.34                  | - 3.28       | 7.36                                    | 14.85                  | 21.15                  | - 3.43       | 4.62                                    |
| 105  | 6.574                     | 9.642                  | - 3.21       | 7.75                                    | 12.53                  | 17.85                  | - 3.35       | 4.86                                    |
| 110  | 5.610                     | 8.228                  | - 3.14       | 8.13                                    | 10.62                  | 15.12                  | - 3.28       | 5.10                                    |
| 115  | 4.804                     | 7.046                  | - 3.07       | 8.49                                    | 9.029                  | 12.86                  | - 3.21       | 5.33                                    |
| 120  | 4.128                     | 6.054                  | - 3.00       | 8.85                                    | 7.704                  | 10.97                  | - 3.14       | 5.55                                    |
| 125  | 3.559                     | 5.219                  | - 2.94       | 9.20                                    | 6.597                  | 9.396                  | - 3.07       | 5.77                                    |
| 130  | 3.078                     | 4.514                  | - 2.87       | 9.54                                    | 5.668                  | 8.072                  | - 3.00       | 5.99                                    |
| 135  | 2.670                     | 3.916                  | - 2.81       | 9.87                                    | 4.885                  | 6.958                  | - 2.94       | 6.20                                    |
| 140  | 2.323                     | 3.408                  | - 2.75       | 10.20                                   | 4.224                  | 6.016                  | - 2.88       | 6.40                                    |
| 145  | 2.028                     | 2.974                  | - 2.69       | 10.52                                   | 3.663                  | 5.217                  | - 2.82       | 6.60                                    |
| 150  | 1.774                     | 2.603                  | - 2.64       | 10.83                                   | 3.186                  | 4.538                  | - 2.76       | 6.79                                    |

**PACKAGING  
TAPE SPECIFICATIONS**

Thermistors on tape


 Taped according to IEC 60286-2  
(cover tape may differ from shown)

**1E pitch**  
NTCLE100E3...T1

| DIMENSIONS in millimeters                |                |                    |           |  |
|--|----------------|--------------------|-----------|--|
| DETAILS                                  | SYMBOL         | DIMENSIONS NOMINAL | TOLERANCE | REMARKS  |
| Body diameter                            | D              | 3.3                | ± 0.5     | 5 max. for 3.3 Ω to 220 Ω  |
| Lead diameter                            | d              | 0.6                | ± 0.06    |  |
| Feed hole diameter                       | D <sub>0</sub> | 4.0                | ± 0.2     |  |
| Lead to lead distance                    | F              | 2.54               | ± 0.3     | Guaranteed between component and tape  |
| Distance component to tape centre        | H              | 22.0               | ± 1.0     | 1 to 4 max. for 3.3 Ω to 220 Ω   |
| Component height                         | H <sub>1</sub> | 32.2               | max.      |  |
| Component alignment                      | Δh             | 0                  | ± 2.0     |  |
| Distance top/bottom of components        | H <sub>2</sub> | 6                  | max.      |  |
| Length of lacquer under the comp. bottom | H <sub>3</sub> | 2                  | ± 1       |  |
| Length of snapped lead                   | L              | 11.0               | max.      |  |
| Pitch between thermistors                | P              | 12.7               | ± 1.0     | Cumulative pitch error ± 1 mm/20 pitches guaranteed between component and tape |
| Feed hole pitch                          | P <sub>0</sub> | 12.7               | ± 0.3     |  |
| Feed hole center to lead center          | P <sub>1</sub> | 5.08               | ± 0.7     |  |
| Component alignment                      | Δp             | 0                  | ± 1.3     |  |
| Total thickness                          | T              | 3.0                | max.      | 4 max. for 3.3 Ω to 220 Ω with cardboard tape 0.5 ± 0.1                        |
| Total tape thickness                     | t              | 0.9                | max.      |  |
| Tape width                               | W              | 18.0               | ± 1.0     | None of the hold down tapes may cover the holes                                |
| Hold down tape width                     | W <sub>0</sub> | 5.0                | ± 0.3     |  |
| Hole position                            | W <sub>1</sub> | 9.0                | ± 0.5     |  |
| Hold down tape position                  | W <sub>2</sub> | 1.5                | ± 1.0     |  |

Thermistors on tape


 Taped according to IEC 60286-2  
 (cover tape may differ from shown)

**2E pitch**

NTCLE100E3...T2

| DIMENSIONS in millimeters                |                |                    |                |  |
|--|----------------|--------------------|----------------|--|
| DETAILS                                  | SYMBOL         | DIMENSIONS NOMINAL | TOLERANCE      | REMARKS  |
| Body diameter                            | D              | 3.3                | ± 0.5          | 5 max. for 3.3 Ω to 220 Ω  |
| Lead diameter                            | d              | 0.6                | ± 0.06         |  |
| Feed hole diameter                       | D <sub>0</sub> | 4.0                | ± 0.2          |  |
| Lead to lead distance                    | F              | 5.0                | + 0.6<br>- 0.1 | Guaranteed between component and tape  |
| Distance component to tape centre        | H              | 20.0               | ± 2.0          | 12 max. for 100 Ω to 220 Ω   |
| Component height                         | H <sub>0</sub> | 16.0               | ± 0.5          |  |
| Component alignment                      | H <sub>1</sub> | 10.0               | max.           |  |
| Distance top/bottom of components        | Δh             | 0.0                | ± 2.0          |  |
| Length of lacquer under the comp. bottom | H <sub>3</sub> | 0.0                | ± 2.0          | Not defined  |
| Length of snapped lead                   | L              | 11.0               | max.           |  |
| Pitch between thermistors                | P              | 12.7               | ± 1.0          | Cumulative pitch error<br>± 1 mm/20 pitches<br>guaranteed between component and tape |
| Feed hole pitch                          | P <sub>0</sub> | 12.7               | ± 0.3          |  |
| Feed hole center to lead center          | P <sub>1</sub> | 3.81               | ± 0.7          |  |
| Component alignment                      | Δp             | 0.0                | ± 1.3          |  |
| Total thickness                          | T              | 3.0                | max.           | 4 max. for 3.3 Ω to 220 Ω with cardboard tape 0.5 ± 0.1                              |
| Total tape thickness                     | t              | 0.9                | max.           |  |
| Tape width                               | W              | 18.0               | ± 1.0<br>- 0.5 | None of the hold down tapes may cover the holes                                      |
| Hold down tape width                     | W <sub>0</sub> | 5.0                | ± 0.3          |  |
| Hole position                            | W <sub>1</sub> | 9.0                | ± 0.5          |  |
| Hold down tape position                  | W <sub>2</sub> | 1.5                | ± 1.0          |  |

**REEL SPECIFICATIONS**

**CODE NUMBERS AND RELEVANT**

| PARAMETER                             |                         | Quantity                          |
|---------------------------------------|-------------------------|-----------------------------------|
| <b>BULK</b>                           | <b>NTCLE100E3....B0</b> | 500                               |
| <b>TAPE AND REEL<br/>1E PITCH (1)</b> | <b>NTCLE100E3....T1</b> | 1500 per reel,<br>2 reels per box |
| <b>TAPE AND REEL<br/>2E PITCH (1)</b> | <b>NTCLE100E3....T2</b> | 1500 per reel,<br>2 reels per box |

**CHARACTERISTICS OF TAPED PRODUCTS**

Minimum pull-out force of the component: 5 N

Minimum peel-off force of adhesive tape: 6 N

Minimum tearing force tape: 15 N

Minimum pull-off force of tape-reel: 5 N

**STORAGE CONDITIONS**

Storage temperature range: - 25 °C to + 40 °C

Maximum relative humidity: 80 %, non-condensing

**TESTS AND REQUIREMENTS**

Essentially all tests are carried out in accordance with "IEC publication 60068-2; Environmental testing", except where indicated.

| <b>STABILITY TESTS</b>        |                            |   |   |  |
|-------------------------------|----------------------------|---|---|--|
| CECC 32 100<br>CLAUSE         | IEC 60068-2<br>TEST METHOD | TEST  | PROCEDURE   | REQUIREMENTS                             |
| D3; 4.20.1                    |                            | Endurance   | 25 °C; 1000 h   | $\Delta R/R < 1 \%$                      |
|                               | 1                          | Endurance   | - 40 °C; 1000 h   | $\Delta R/R < 1 \%$                      |
|                               | 539                        | Endurance   | 500 mW; 55 °C; 1000 h   | $\Delta R/R < 3 \%$ (1)                  |
|                               | 2                          | Dry heat, (steady state)                            | 125 °C; 1000 h  | $\Delta R/R < 3 \%$                      |
| D1; 4.19                      | 3                          | Damp heat (steady state)                            | 56 days at 40 °C; 90 % to 95 % RH   | $\Delta R/R < 3 \%$                      |
| C2; 4.14                      | 14                         | Rapid change of temperature                         | - 40 °C to + 125 °C; 50 cycles  | $\Delta R/R < 2 \%$                      |
| <b>Other applicable tests</b> |                            |   |   |  |
|                               | 21                         | Robustness of leads:<br>Tensile strength<br>Bending | Loading force 10 N<br>Loading force 5 N   | $\Delta R/R \leq 1 \%$                   |
|                               | 58                         | Soldering:<br>Solderability<br>Resistance to heat   | 240 °C max.; duration 4 s max.<br>265 °C max.; duration 5 s max.  | $\Delta R/R \leq 1 \%$ (2)               |
|                               | 27                         | Impact  | Free fall; 1 m  | $\Delta R/R \leq 1 \%$                   |
|                               | 29                         | Shock   | 490 m/s; half sinewave  | $\Delta R/R \leq 1 \%$                   |
|                               | 45                         | Resistance to solvent<br>(isopropanol)              | Ambient temp for 5 minutes;<br>5 N with hydrophylic cotton wool   | No traces of lacquer<br>on cotton wool   |
|                               | 6                          | Vibration   | 1.5 mm peak to peak: 10 Hz to 58 Hz<br>10 gp: 50 Hz to 500 Hz 1 octave/min. 2 h in<br>each direction in three orthogonal directions | No visible damage<br>$\Delta R/R < 1 \%$ |
|                               | 60695-2-2                  | Inflammability                                      | 1980, needle flame test   | Non-flammable                            |

**Notes**

 (1) For  $R_{25} \geq 100 \text{ k}\Omega$  the drift requirement is  $\Delta R/R < 5 \%$ 

 (2) For  $R_{25}$  from 2.2 k $\Omega$  to 10 k $\Omega$ , requirement is  $\pm 2 \%$  max.





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