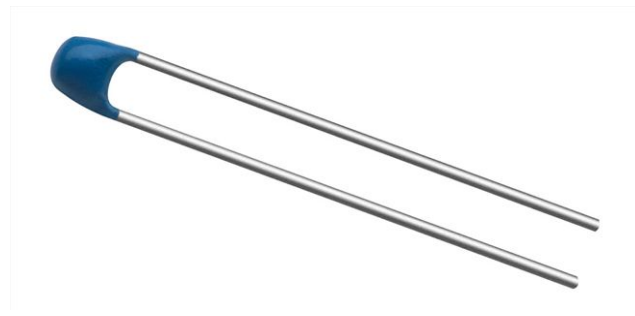


## NTC Thermistors, 2-Point Radial Leaded, Automotive Grade



### FEATURES

- High accuracy over a wide temperature range
- High stability over a long life
- Exceptional thermal shock withstanding performance
- AEC-Q200 qualified
- Compliant to RoHS Directive 2002/95/EC and in accordance to WEEE 2002/96/EC
- Fulfils the ELV 2000/53/EC


**RoHS**  
COMPLIANT

### APPLICATIONS

- Temperature measurement, sensing and control, temperature compensation in Automotive and Industrial applications
- Applications as EGR, ECT, IAT, and TMAP sensors

### DESCRIPTION

These thermistors consist of a NTC ceramic chip with two solid Tin plated Nickel leads. The thermistor body is coated with a blue insulating lacquer.

### PACKAGING

The thermistors are packed in bulk (qty = 500 pcs). Tape and reel available on request.

### DESIGN-IN SUPPORT

$R(T)$  table spreadsheet available on request at [nlr@vishay.com](mailto:nlr@vishay.com). Accuracy over the whole temperature range, see at the resistance vs. temperature tables.

### MOUNTING

By soldering or welding in any position. The thermistors are fully suitable to be potted in epoxy or silicon resins.

### QUICK REFERENCE DATA

| PARAMETER                                                                               | VALUE                    | UNIT      |
|-----------------------------------------------------------------------------------------|--------------------------|-----------|
| Resistance value at 25 °C                                                               | 2.06K to 30K             | $\Omega$  |
| Tolerance on $R_{25}$ -value                                                            | $\pm 1.93$ to $\pm 2.20$ | %         |
| $B_{25/85}$ -value                                                                      | 3528 to 4090             | K         |
| Tolerance on $B_{25/85}$ -value                                                         | $\pm 0.5$ to $\pm 0.75$  | %         |
| Operating temperature range                                                             | - 55 to 150              | °C        |
| Temperature accuracy between 25 °C and 85 °C measurement                                | $\pm 0.5$                | °C        |
| Maximum dissipation                                                                     | 100                      | mW        |
| Response time (in stirred air)                                                          | 7                        | s         |
| Climatic category (LCT/UCT/days)                                                        | 55/150/56                |           |
| Minimum dielectric withstanding voltage (tested according to IEC 60539 §4.7.2 method 1) | 500                      | $V_{RMS}$ |
| Weight                                                                                  | 0.1                      | g         |

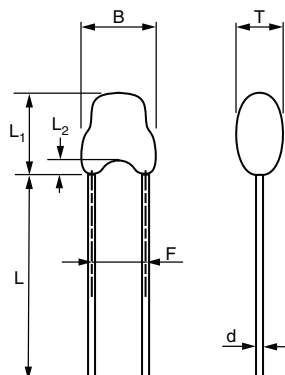
### ELECTRICAL DATA AND ORDERING INFORMATION

| SAP MATERIAL AND ORDERING NUMBER | OLD 12NC CODE  | $R$ at 25 °C ( $\Omega$ ) | $\alpha$ at 25 °C (%/K) | $R_{25}$ Tol. ( $\pm$ %) | $B_{25/85}$ (K) | $B_{25/85}$ Tol. ( $\pm$ %) | $\Delta T_{max.}^{(1)}$ 25 °C to 85 °C ( $\pm$ °C) |
|----------------------------------|----------------|---------------------------|-------------------------|--------------------------|-----------------|-----------------------------|----------------------------------------------------|
| NTCLE203E3202SB0                 | 2381 640 20202 | 2060                      | 3.86                    | 1.93                     | 3528            | 0.50                        | 0.5                                                |
| NTCLE203E3222SB0                 | 2381 640 20222 | 2252                      | 4.39                    | 2.20                     | 3984            | 0.50                        | 0.5                                                |
| NTCLE203E3272SB0                 | 2381 640 20272 | 2780                      | 4.51                    | 2.20                     | 4090            | 0.75                        | 0.5                                                |
| NTCLE203E3302SB0                 | 2381 640 20302 | 3000                      | 4.39                    | 2.20                     | 3984            | 0.50                        | 0.5                                                |
| NTCLE203E3502SB0                 | 2381 640 20502 | 5000                      | 4.39                    | 2.20                     | 3984            | 0.50                        | 0.5                                                |
| NTCLE203E3103SB0                 | 2381 640 20103 | 10 000                    | 4.39                    | 2.20                     | 3984            | 0.50                        | 0.5                                                |
| NTCLE203E3303SB0                 | 2381 640 20303 | 30 000                    | 4.30                    | 2.20                     | 3935            | 0.75                        | 0.5                                                |

#### Note

<sup>(1)</sup>  $\Delta T$  is the temperature measurement accuracy in the defined temperature range

## DIMENSIONS in millimeters



|                |            |
|----------------|------------|
| B              | 4.2 max.   |
| d              | 0.5 ± 0.05 |
| L              | 41 ± 1     |
| L <sub>1</sub> | 6.0 max.   |
| L <sub>2</sub> | 2.0 ± 1.0  |
| F              | 2.54       |
| T              | 4.0 max.   |

## RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH $R_{25}$ AT 2060 $\Omega$

PART NUMBER: NTCLE203E3202SB0

| TEMP.<br>(°C) | RESISTANCE<br>( $\Omega$ ) | $R/R_{25}$ | $\Delta R/R$<br>(%) | $\alpha$<br>(%/K) | $\Delta T_{MAX.}$<br>(± °C) | $R_{MIN.}$<br>( $\Omega$ ) | $R_{MAX.}$<br>( $\Omega$ ) |
|---------------|----------------------------|------------|---------------------|-------------------|-----------------------------|----------------------------|----------------------------|
| -55.0         | 126 160                    | 61.243     | 4.14                | -6.82             | 0.61                        | 120 931                    | 131 389                    |
| -50.0         | 90 317                     | 43.843     | 3.96                | -6.55             | 0.60                        | 86 740                     | 93 893                     |
| -45.0         | 65 498                     | 31.795     | 3.78                | -6.30             | 0.60                        | 63 020                     | 67 976                     |
| -40.0         | 48 085                     | 23.342     | 3.61                | -6.06             | 0.60                        | 46 347                     | 49 823                     |
| -35.0         | 35 712                     | 17.336     | 3.45                | -5.84             | 0.59                        | 34 479                     | 36 945                     |
| -30.0         | 26 816                     | 13.018     | 3.30                | -5.62             | 0.59                        | 25 932                     | 27 700                     |
| -25.0         | 20 347                     | 9.8772     | 3.15                | -5.42             | 0.58                        | 19 706                     | 20 988                     |
| -20.0         | 15 592                     | 7.5688     | 3.01                | -5.23             | 0.57                        | 15 123                     | 16 060                     |
| -15.0         | 12 060                     | 5.8546     | 2.87                | -5.05             | 0.57                        | 11 715                     | 12 406                     |
| -10.0         | 9412.5                     | 4.5692     | 2.74                | -4.87             | 0.56                        | 9155.1                     | 9670.0                     |
| -5.0          | 7408.5                     | 3.5963     | 2.61                | -4.71             | 0.55                        | 7215.3                     | 7601.7                     |
| 0.0           | 5878.3                     | 2.8536     | 2.49                | -4.55             | 0.55                        | 5732.2                     | 6024.4                     |
| 5.0           | 4700.2                     | 2.2816     | 2.37                | -4.40             | 0.54                        | 4588.9                     | 4811.4                     |
| 10.0          | 3785.7                     | 1.8377     | 2.25                | -4.26             | 0.53                        | 3700.4                     | 3871.0                     |
| 15.0          | 3070.5                     | 1.4905     | 2.14                | -4.12             | 0.52                        | 3004.7                     | 3136.3                     |
| 20.0          | 2507.0                     | 1.2170     | 2.04                | -3.99             | 0.51                        | 2456.0                     | 2558.1                     |
| 25.0          | 2060.0                     | 1.0000     | 1.93                | -3.87             | 0.50                        | 2020.2                     | 2099.8                     |
| 30.0          | 1702.9                     | 0.82666    | 1.87                | -3.75             | 0.50                        | 1671.0                     | 1734.8                     |
| 35.0          | 1416.0                     | 0.68736    | 1.82                | -3.64             | 0.50                        | 1390.2                     | 1441.7                     |
| 40.0          | 1183.7                     | 0.57461    | 1.77                | -3.53             | 0.50                        | 1162.8                     | 1204.6                     |
| 45.0          | 994.40                     | 0.48272    | 1.72                | -3.44             | 0.50                        | 977.30                     | 1011.5                     |
| 50.0          | 839.19                     | 0.40737    | 1.68                | -3.35             | 0.50                        | 825.13                     | 853.25                     |
| 55.0          | 711.20                     | 0.34524    | 1.63                | -3.27             | 0.50                        | 699.57                     | 722.83                     |
| 60.0          | 605.10                     | 0.29374    | 1.60                | -3.19             | 0.50                        | 595.44                     | 614.76                     |
| 65.0          | 516.72                     | 0.25083    | 1.56                | -3.12             | 0.50                        | 508.65                     | 524.78                     |
| 70.0          | 442.75                     | 0.21493    | 1.53                | -3.06             | 0.50                        | 435.99                     | 449.52                     |
| 75.0          | 380.60                     | 0.18476    | 1.50                | -2.99             | 0.50                        | 374.90                     | 386.30                     |
| 80.0          | 328.16                     | 0.15930    | 1.47                | -2.94             | 0.50                        | 323.34                     | 332.98                     |
| 85.0          | 283.76                     | 0.13775    | 1.44                | -2.88             | 0.50                        | 279.67                     | 287.84                     |
| 90.0          | 246.02                     | 0.11943    | 1.44                | -2.83             | 0.51                        | 242.49                     | 249.55                     |
| 95.0          | 213.85                     | 0.10381    | 1.50                | -2.78             | 0.54                        | 210.64                     | 217.07                     |
| 100.0         | 186.34                     | 0.090458   | 1.57                | -2.73             | 0.57                        | 183.42                     | 189.26                     |
| 105.0         | 162.75                     | 0.079005   | 1.63                | -2.68             | 0.61                        | 160.10                     | 165.40                     |
| 110.0         | 142.46                     | 0.069155   | 1.69                | -2.64             | 0.64                        | 140.05                     | 144.87                     |
| 115.0         | 124.96                     | 0.060662   | 1.75                | -2.60             | 0.67                        | 122.77                     | 127.15                     |
| 120.0         | 109.84                     | 0.053321   | 1.81                | -2.56             | 0.71                        | 107.85                     | 111.83                     |
| 125.0         | 96.737                     | 0.046960   | 1.87                | -2.52             | 0.74                        | 94.930                     | 98.545                     |
| 130.0         | 85.358                     | 0.041436   | 1.92                | -2.48             | 0.77                        | 83.715                     | 87.000                     |
| 135.0         | 75.454                     | 0.036628   | 1.98                | -2.45             | 0.81                        | 73.961                     | 76.947                     |
| 140.0         | 66.817                     | 0.032436   | 2.03                | -2.41             | 0.84                        | 65.460                     | 68.175                     |
| 145.0         | 59.269                     | 0.028772   | 2.08                | -2.38             | 0.88                        | 58.035                     | 60.504                     |
| 150.0         | 52.661                     | 0.025564   | 2.13                | -2.35             | 0.91                        | 51.537                     | 53.785                     |

**RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH  $R_{25}$  AT 2252  $\Omega$ , 3 k $\Omega$ , 5 k $\Omega$  AND 10 k $\Omega$** 

| TEMP.<br>(°C) | PART NUMBER<br>NTCLE203E3222SB0 | PART NUMBER<br>NTCLE203E3302SB | PART NUMBER<br>NTCLE203E3502SB0 | PART NUMBER<br>NTCLE203E3103SB0 | $R/R_{25}$ | $\Delta R/R$<br>(%) | $\alpha$<br>(%/K) | $\Delta T$<br>(K) |
|---------------|---------------------------------|--------------------------------|---------------------------------|---------------------------------|------------|---------------------|-------------------|-------------------|
|               | RESISTANCE<br>( $\Omega$ )      | RESISTANCE<br>( $\Omega$ )     | RESISTANCE<br>( $\Omega$ )      | RESISTANCE<br>( $\Omega$ )      |            |                     |                   |                   |
| -55.0         | 214 790                         | 286 132                        | 476 887                         | 953 774                         | 95.377     | 4.70                | - 7.37            | 0.64              |
| -50.0         | 149 571                         | 199 251                        | 332 085                         | 664 169                         | 66.417     | 4.49                | - 7.11            | 0.63              |
| -45.0         | 105 475                         | 140 509                        | 234 182                         | 468 363                         | 46.836     | 4.29                | - 6.86            | 0.62              |
| -40.0         | 75 279                          | 100 282                        | 167 137                         | 334 274                         | 33.427     | 4.10                | - 6.63            | 0.62              |
| -35.0         | 54 346                          | 72 397                         | 120 661                         | 241 323                         | 24.132     | 3.91                | - 6.41            | 0.61              |
| -30.0         | 39 665                          | 52 840                         | 88 066                          | 176 133                         | 17.613     | 3.74                | - 6.19            | 0.60              |
| -25.0         | 29 253                          | 38 970                         | 64 950                          | 129 900                         | 12.9900    | 3.57                | - 5.99            | 0.60              |
| -20.0         | 21 791                          | 29 028                         | 48 381                          | 96 761                          | 9.6761     | 3.41                | - 5.79            | 0.59              |
| -15.0         | 16 387                          | 21 829                         | 36 382                          | 72 765                          | 7.2765     | 3.25                | - 5.61            | 0.58              |
| -10.0         | 12 435                          | 16 565                         | 27 609                          | 55 218                          | 5.5218     | 3.10                | - 5.43            | 0.57              |
| -5.0          | 9518.7                          | 12 680                         | 21 134                          | 42 268                          | 4.2268     | 2.96                | - 5.26            | 0.56              |
| 0.0           | 7347.0                          | 9787.3                         | 16 312                          | 32 624                          | 3.2624     | 2.82                | - 5.10            | 0.55              |
| 5.0           | 5715.9                          | 7614.4                         | 12 691                          | 25 381                          | 2.5381     | 2.68                | - 4.94            | 0.54              |
| 10.0          | 4480.8                          | 5969.1                         | 9948.4                          | 19 897                          | 1.9897     | 2.55                | - 4.80            | 0.53              |
| 15.0          | 3538.2                          | 4713.4                         | 7855.6                          | 15 711                          | 1.5711     | 2.43                | - 4.65            | 0.52              |
| 20.0          | 2813.4                          | 3747.8                         | 6246.4                          | 12 493                          | 1.2493     | 2.31                | - 4.52            | 0.51              |
| 25.0          | 2252.0                          | 3000.0                         | 5000.0                          | 10 000                          | 1.0000     | 2.19                | - 4.39            | 0.50              |
| 30.0          | 1814.2                          | 2416.8                         | 4028.0                          | 8056.0                          | 0.80560    | 2.13                | - 4.26            | 0.50              |
| 35.0          | 1470.5                          | 1958.9                         | 3264.9                          | 6529.7                          | 0.65297    | 2.07                | - 4.14            | 0.50              |
| 40.0          | 1198.9                          | 1597.2                         | 2661.9                          | 5323.9                          | 0.53239    | 2.01                | - 4.03            | 0.50              |
| 45.0          | 983.06                          | 1309.6                         | 2182.6                          | 4365.3                          | 0.43653    | 1.96                | - 3.92            | 0.50              |
| 50.0          | 810.43                          | 1079.6                         | 1799.4                          | 3598.7                          | 0.35987    | 1.90                | - 3.81            | 0.50              |
| 55.0          | 671.61                          | 894.68                         | 1491.1                          | 2982.3                          | 0.29823    | 1.85                | - 3.71            | 0.50              |
| 60.0          | 559.36                          | 745.14                         | 1241.9                          | 2483.8                          | 0.24838    | 1.80                | - 3.61            | 0.50              |
| 65.0          | 468.11                          | 623.60                         | 1039.3                          | 2078.7                          | 0.20787    | 1.76                | - 3.51            | 0.50              |
| 70.0          | 393.57                          | 524.30                         | 873.83                          | 1747.7                          | 0.17477    | 1.71                | - 3.42            | 0.50              |
| 75.0          | 332.38                          | 442.78                         | 737.96                          | 1475.9                          | 0.14759    | 1.67                | - 3.34            | 0.50              |
| 80.0          | 281.91                          | 375.54                         | 625.90                          | 1251.8                          | 0.12518    | 1.63                | - 3.25            | 0.50              |
| 85.0          | 240.09                          | 319.83                         | 533.05                          | 1066.1                          | 0.10661    | 1.59                | - 3.17            | 0.50              |
| 90.0          | 205.29                          | 273.48                         | 455.79                          | 911.59                          | 0.091159   | 1.66                | - 3.09            | 0.54              |
| 95.0          | 176.21                          | 234.74                         | 391.23                          | 782.46                          | 0.078246   | 1.74                | - 3.02            | 0.58              |
| 100.0         | 151.81                          | 202.23                         | 337.06                          | 674.11                          | 0.067411   | 1.81                | - 2.94            | 0.62              |
| 105.0         | 131.26                          | 174.85                         | 291.42                          | 582.84                          | 0.058284   | 1.88                | - 2.87            | 0.66              |
| 110.0         | 113.88                          | 151.70                         | 252.84                          | 505.68                          | 0.050568   | 1.95                | - 2.81            | 0.70              |
| 115.0         | 99.130                          | 132.06                         | 220.09                          | 440.19                          | 0.044019   | 2.02                | - 2.74            | 0.74              |
| 120.0         | 86.569                          | 115.32                         | 192.21                          | 384.41                          | 0.038441   | 2.09                | - 2.68            | 0.78              |
| 125.0         | 75.836                          | 101.02                         | 168.37                          | 336.748                         | 0.033675   | 2.15                | - 2.62            | 0.82              |
| 130.0         | 66.632                          | 88.764                         | 147.94                          | 295.881                         | 0.029588   | 2.22                | - 2.56            | 0.87              |
| 135.0         | 58.716                          | 78.219                         | 130.36                          | 260.729                         | 0.026073   | 2.28                | - 2.50            | 0.91              |
| 140.0         | 51.886                          | 69.120                         | 115.20                          | 230.400                         | 0.023040   | 2.34                | - 2.45            | 0.96              |
| 145.0         | 45.975                          | 61.246                         | 102.08                          | 204.152                         | 0.020415   | 2.40                | - 2.39            | 1.00              |
| 150.0         | 40.845                          | 54.411                         | 90.685                          | 181.370                         | 0.018137   | 2.45                | - 2.34            | 1.05              |

## RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH $R_{25}$ AT 2780 $\Omega$

PART NUMBER: NTCLE203E3272SB0

| TEMP.<br>(°C) | RESISTANCE<br>( $\Omega$ ) | $R/R_{25}$ | $\Delta R/R$<br>(%) | $\alpha$<br>(%/K) | $\Delta T_{MAX.}$<br>( $\pm$ °C) | $R_{MIN.}$<br>( $\Omega$ ) | $R_{MAX.}$<br>( $\Omega$ ) |
|---------------|----------------------------|------------|---------------------|-------------------|----------------------------------|----------------------------|----------------------------|
| - 55.0        | 303 640                    | 109.22     | 6.11                | - 7.57            | 0.81                             | 285 073                    | 322 207                    |
| - 50.0        | 209 337                    | 75.301     | 5.79                | - 7.31            | 0.79                             | 197 211                    | 221 464                    |
| - 45.0        | 146 159                    | 52.575     | 5.48                | - 7.06            | 0.78                             | 138 143                    | 154 176                    |
| - 40.0        | 103 294                    | 37.156     | 5.19                | - 6.82            | 0.76                             | 97 933                     | 108 654                    |
| - 35.0        | 73 853                     | 26.566     | 4.91                | - 6.60            | 0.74                             | 70 228                     | 77 477                     |
| - 30.0        | 53 394                     | 19.206     | 4.64                | - 6.38            | 0.73                             | 50 918                     | 55 870                     |
| - 25.0        | 39 017                     | 14.035     | 4.38                | - 6.17            | 0.71                             | 37 309                     | 40 724                     |
| - 20.0        | 28 803                     | 10.361     | 4.13                | - 5.97            | 0.69                             | 27 614                     | 29 992                     |
| - 15.0        | 21 472                     | 7.7237     | 3.89                | - 5.78            | 0.67                             | 20 637                     | 22 306                     |
| - 10.0        | 16 157                     | 5.8119     | 3.66                | - 5.60            | 0.65                             | 15 566                     | 16 748                     |
| - 5.0         | 12 267                     | 4.4127     | 3.43                | - 5.42            | 0.63                             | 11 846                     | 12 688                     |
| 0.0           | 9394.1                     | 3.3792     | 3.22                | - 5.25            | 0.61                             | 9091.6                     | 9696.6                     |
| 5.0           | 7253.3                     | 2.6091     | 3.01                | - 5.09            | 0.59                             | 7034.7                     | 7471.8                     |
| 10.0          | 5644.6                     | 2.0304     | 2.81                | - 4.94            | 0.57                             | 5485.7                     | 5803.4                     |
| 15.0          | 4425.9                     | 1.5921     | 2.62                | - 4.79            | 0.55                             | 4309.9                     | 4542.0                     |
| 20.0          | 3495.6                     | 1.2574     | 2.44                | - 4.65            | 0.52                             | 3410.4                     | 3580.7                     |
| 25.0          | 2780.0                     | 1.0000     | 2.26                | - 4.51            | 0.50                             | 2717.3                     | 2842.7                     |
| 30.0          | 2225.7                     | 0.80060    | 2.19                | - 4.38            | 0.50                             | 2176.9                     | 2274.4                     |
| 35.0          | 1793.3                     | 0.64506    | 2.13                | - 4.26            | 0.50                             | 1755.1                     | 1831.5                     |
| 40.0          | 1453.8                     | 0.52294    | 2.07                | - 4.14            | 0.50                             | 1423.7                     | 1483.8                     |
| 45.0          | 1185.5                     | 0.42644    | 2.01                | - 4.02            | 0.50                             | 1161.6                     | 1209.3                     |
| 50.0          | 972.20                     | 0.34971    | 1.96                | - 3.91            | 0.50                             | 953.19                     | 991.22                     |
| 55.0          | 801.63                     | 0.28836    | 1.90                | - 3.81            | 0.50                             | 786.38                     | 816.88                     |
| 60.0          | 664.44                     | 0.23901    | 1.85                | - 3.70            | 0.50                             | 652.14                     | 676.74                     |
| 65.0          | 553.50                     | 0.19910    | 1.80                | - 3.60            | 0.50                             | 543.53                     | 563.48                     |
| 70.0          | 463.32                     | 0.16666    | 1.75                | - 3.51            | 0.50                             | 455.19                     | 471.45                     |
| 75.0          | 389.64                     | 0.14016    | 1.71                | - 3.42            | 0.50                             | 382.98                     | 396.30                     |
| 80.0          | 329.14                     | 0.11840    | 1.67                | - 3.33            | 0.50                             | 323.66                     | 334.62                     |
| 85.0          | 279.24                     | 0.10045    | 1.62                | - 3.25            | 0.50                             | 274.71                     | 283.77                     |
| 90.0          | 237.89                     | 0.08557    | 1.74                | - 3.16            | 0.55                             | 233.74                     | 242.04                     |
| 95.0          | 203.48                     | 0.07319    | 1.86                | - 3.09            | 0.60                             | 199.69                     | 207.26                     |
| 100.0         | 174.71                     | 0.062846   | 1.97                | - 3.01            | 0.66                             | 171.27                     | 178.16                     |
| 105.0         | 150.58                     | 0.054164   | 2.08                | - 2.94            | 0.71                             | 147.44                     | 153.71                     |
| 110.0         | 130.24                     | 0.046849   | 2.19                | - 2.87            | 0.76                             | 127.39                     | 133.09                     |
| 115.0         | 113.04                     | 0.040662   | 2.30                | - 2.80            | 0.82                             | 110.45                     | 115.64                     |
| 120.0         | 98.44                      | 0.035411   | 2.40                | - 2.73            | 0.88                             | 96.082                     | 100.80                     |
| 125.0         | 86.007                     | 0.030938   | 2.50                | - 2.67            | 0.94                             | 83.859                     | 88.155                     |
| 130.0         | 75.377                     | 0.027114   | 2.59                | - 2.61            | 0.99                             | 73.421                     | 77.333                     |
| 135.0         | 66.261                     | 0.023835   | 2.69                | - 2.55            | 1.06                             | 64.479                     | 68.043                     |
| 140.0         | 58.418                     | 0.021014   | 2.78                | - 2.49            | 1.12                             | 56.792                     | 60.043                     |
| 145.0         | 51.648                     | 0.018578   | 2.87                | - 2.44            | 1.18                             | 50.165                     | 53.132                     |
| 150.0         | 45.788                     | 0.016471   | 2.96                | - 2.38            | 1.24                             | 44.433                     | 47.144                     |

**RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH  $R_{25}$  AT 30 k $\Omega$** 

PART NUMBER: NTCLE203E3303SB0

| TEMP.<br>(°C) | RESISTANCE<br>( $\Omega$ ) | $R/R_{25}$ | $\Delta R/R$<br>(%) | $\alpha$<br>(%/K) | $\Delta T_{MAX.}$<br>( $\pm$ °C) | $R_{MIN.}$<br>( $\Omega$ ) | $R_{MAX.}$<br>( $\Omega$ ) |
|---------------|----------------------------|------------|---------------------|-------------------|----------------------------------|----------------------------|----------------------------|
| - 55.0        | 2 557 277                  | 85.243     | 5.87                | - 7.10            | 0.83                             | 2 407 214                  | 2 707 340                  |
| - 50.0        | 1 803 830                  | 60.128     | 5.56                | - 6.87            | 0.81                             | 1 703 566                  | 1 904 094                  |
| - 45.0        | 1 286 911                  | 42.897     | 5.26                | - 6.64            | 0.79                             | 1 219 190                  | 1 354 632                  |
| - 40.0        | 928 204                    | 30.940     | 4.98                | - 6.43            | 0.77                             | 881 990                    | 974 418                    |
| - 35.0        | 676 539                    | 22.551     | 4.71                | - 6.22            | 0.76                             | 644 692                    | 708 387                    |
| - 30.0        | 498 097                    | 16.603     | 4.45                | - 6.03            | 0.74                             | 475 947                    | 520 248                    |
| - 25.0        | 370 280                    | 12.343     | 4.20                | - 5.84            | 0.72                             | 354 739                    | 385 821                    |
| - 20.0        | 277 825                    | 9.2608     | 3.96                | - 5.66            | 0.70                             | 266 831                    | 288 819                    |
| - 15.0        | 210 316                    | 7.0105     | 3.73                | - 5.48            | 0.68                             | 202 478                    | 218 154                    |
| - 10.0        | 160 574                    | 5.3525     | 3.50                | - 5.31            | 0.66                             | 154 947                    | 166 202                    |
| - 5.0         | 123 604                    | 4.1201     | 3.29                | - 5.15            | 0.64                             | 119 536                    | 127 672                    |
| 0.0           | 95 895                     | 3.1965     | 3.09                | - 5.00            | 0.62                             | 92 937                     | 98 854                     |
| 5.0           | 74 960                     | 2.4987     | 2.89                | - 4.85            | 0.59                             | 72 797                     | 77 124                     |
| 10.0          | 59 021                     | 1.9674     | 2.70                | - 4.71            | 0.57                             | 57 430                     | 60 612                     |
| 15.0          | 46 794                     | 1.5598     | 2.51                | - 4.58            | 0.55                             | 45 619                     | 47 969                     |
| 20.0          | 37 348                     | 1.2449     | 2.33                | - 4.44            | 0.52                             | 36 477                     | 38 219                     |
| 25.0          | 30 000                     | 1.0000     | 2.16                | - 4.32            | 0.50                             | 29 352                     | 30 648                     |
| 30.0          | 24 246                     | 0.80821    | 2.10                | - 4.20            | 0.50                             | 23 737                     | 24 755                     |
| 35.0          | 19 712                     | 0.65707    | 2.04                | - 4.08            | 0.50                             | 19 310                     | 20 114                     |
| 40.0          | 16 117                     | 0.53723    | 1.99                | - 3.97            | 0.50                             | 15 797                     | 16 437                     |
| 45.0          | 13 250                     | 0.44165    | 1.93                | - 3.86            | 0.50                             | 12 994                     | 13 506                     |
| 50.0          | 10 950                     | 0.36499    | 1.88                | - 3.76            | 0.50                             | 10 744                     | 11 156                     |
| 55.0          | 9094.9                     | 0.30316    | 1.83                | - 3.66            | 0.50                             | 8928.3                     | 9261.5                     |
| 60.0          | 7591.1                     | 0.25304    | 1.78                | - 3.57            | 0.50                             | 7455.7                     | 7726.5                     |
| 65.0          | 6365.6                     | 0.21219    | 1.74                | - 3.48            | 0.50                             | 6255.0                     | 6476.3                     |
| 70.0          | 5362.2                     | 0.17874    | 1.69                | - 3.39            | 0.50                             | 5271.3                     | 5453.0                     |
| 75.0          | 4536.5                     | 0.15122    | 1.65                | - 3.30            | 0.50                             | 4461.6                     | 4611.4                     |
| 80.0          | 3854.1                     | 0.12847    | 1.61                | - 3.22            | 0.50                             | 3792.1                     | 3916.2                     |
| 85.0          | 3287.6                     | 0.10959    | 1.57                | - 3.14            | 0.50                             | 3236.0                     | 3339.2                     |
| 90.0          | 2815.3                     | 0.09384    | 1.69                | - 3.06            | 0.55                             | 2767.9                     | 2862.8                     |
| 95.0          | 2419.9                     | 0.08066    | 1.80                | - 2.99            | 0.60                             | 2376.4                     | 2463.4                     |
| 100.0         | 2087.7                     | 0.069588   | 1.91                | - 2.92            | 0.65                             | 2047.8                     | 2127.5                     |
| 105.0         | 1807.3                     | 0.060244   | 2.01                | - 2.85            | 0.71                             | 1770.9                     | 1843.7                     |
| 110.0         | 1569.9                     | 0.052330   | 2.12                | - 2.78            | 0.76                             | 1536.7                     | 1603.1                     |
| 115.0         | 1368.2                     | 0.045605   | 2.22                | - 2.72            | 0.82                             | 1337.8                     | 1398.5                     |
| 120.0         | 1196.1                     | 0.039870   | 2.32                | - 2.66            | 0.87                             | 1168.4                     | 1223.8                     |
| 125.0         | 1048.9                     | 0.034963   | 2.41                | - 2.60            | 0.93                             | 1023.6                     | 1074.2                     |
| 130.0         | 922.52                     | 0.030751   | 2.50                | - 2.54            | 0.99                             | 899.42                     | 945.62                     |
| 135.0         | 813.69                     | 0.027123   | 2.60                | - 2.48            | 1.05                             | 792.57                     | 834.81                     |
| 140.0         | 719.69                     | 0.023990   | 2.68                | - 2.43            | 1.11                             | 700.37                     | 739.01                     |
| 145.0         | 638.25                     | 0.021275   | 2.77                | - 2.38            | 1.17                             | 620.56                     | 655.94                     |
| 150.0         | 567.50                     | 0.018917   | 2.86                | - 2.32            | 1.23                             | 551.29                     | 583.70                     |

| RELIABILITY DATA                 |                        |                                           |
|----------------------------------|------------------------|-------------------------------------------|
| TEST DENOMINATION                | METHOD                 | $\Delta R_{25}/R_{25 \text{ max.}}^{(1)}$ |
| High temperature storage         | MIL-STD-202 method 108 | ± 1 %                                     |
| Thermal cycling                  | JESD22 method JA-104   | ± 2 %                                     |
| Operational life                 | MIL-STD-202 method 108 | ± 1 %                                     |
| Soldering heat                   | MIL-STD-202 method 204 | ± 3 %                                     |
| Moisture resistance              | MIL-STD-202 method 106 | ± 1 %                                     |
| Vibration                        | MIL-STD-202 method 204 | ± 1 %                                     |
| Biased humidity (85 °C, 85 % RH) | MIL-STD-202 method 108 | ± 2 %                                     |
| Thermal shock                    | MIL-STD-202 method 107 | ± 2 %                                     |
| Mechanical shocks                | MIL-STD-202-213        | ± 1 %                                     |

**Note**

- Valid for NTCLE203E3103SB0



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