

# NTC Thermistors, 2-Point Micro Chip Sensor Insulated Leads



## LINKS TO ADDITIONAL RESOURCES



| QUICK REFERENCE DATA  |                |                  |
|---|----------------|------------------|
| PARAMETER   | VALUE          | UNIT             |
| Resistance value at 25 °C   | 2.06K to 10K   | Ω                |
| Tolerance on $R_{25}$ -value  | ± 1.92; ± 2.19 | %                |
| $B_{25/85}$ -value  | 3511 to 3984   | K                |
| Tolerance on $B_{25/85}$  | ± 0.5 to ± 1   | %                |
| Temperature accuracy between 25 °C and 85 °C                                      | ± 0.5          | °C               |
| Operating temperature range   | -40 to +125    | °C               |
| Maximum power dissipation at 55 °C  | 50             | mW               |
| Dissipation factor $\delta$ (in still air)  | ≈ 0.8          | mW/K             |
| Response time (in stirred air) (in oil)   | ≈ 3<br>≈ 0.7   | s                |
| Minimum dielectric withstanding voltage between leads termination and coated body | 100            | V <sub>RMS</sub> |
| Weight  | ≈ 0.05         | g                |

## FEATURES

- Flexible insulated leads for special mounting or assembly
- Miniature sized very fast reacting
- Accurate over a wide temperature range
- High stability over a long life
- Exceptional withstanding in thermal shocks
- AEC-Q200 qualified
- Fulfills the ELV 2000/53/EC
- 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 in automotive and industrial applications

## DESCRIPTION

These thermistors consist of a micro NTC ceramic chip soldered between two ETFE insulated AWG #32 solid silver plated nickel leads. The thermistor body is coated with a ochre colored insulating lacquer.

## PACKAGING

The thermistors are packed in cardboard boxes; the smallest packing quantity is 1000 pieces.

## MARKING

The components are not marked.

## DESIGN-IN SUPPORT

For complete curve computation, please visit: [www.vishay.com/thermistors/ntc-curve-list/](http://www.vishay.com/thermistors/ntc-curve-list/).

## MOUNTING

Important mounting and handling instructions: see [www.vishay.com/doc?29222](http://www.vishay.com/doc?29222)

By soldering or welding in any position.

The parts can be potted in suitable resins.

| DIMENSIONS in millimeters |            |          |         |         |              |             |
|---------------------------|------------|----------|---------|---------|--------------|-------------|
|                           |            |          |         |         |              |             |
| $T_{MAX.}$                | $B_{MAX.}$ | L        | $L_1$   | $L_2$   | Ø $D_{MAX.}$ | Ø d         |
| 1.6                       | 1.6        | 41.0 ± 1 | 5.0 ± 1 | 5.0 ± 1 | 0.40         | 0.20 ± 0.01 |



| ELECTRICAL DATA AND ORDERING INFORMATION |                                |  |                                   |  |                  |
|--|--------------------------------|--|-----------------------------------|--|------------------|
| R <sub>25</sub> <sup>(1)</sup><br>(Ω)    | R <sub>25</sub> -TOL.<br>(± %) | B <sub>25/85</sub> <sup>(1)</sup><br>(K) | B <sub>25/85</sub> -TOL.<br>(± %) | SAP MATERIAL AND ORDERING NUMBER             |                  |
|  |                                |  |                                   | RoHS COMPLIANT WITH EXEMPTION <sup>(2)</sup> | RoHS COMPLIANT   |
| 2060                                     | 1.92                           | 3511                                     | 1.0                               | NTCLE305E4202SB                              | n/a              |
| 5000                                     | 2.19                           | 3984                                     | 0.5                               | NTCLE305E4502SB                              | NTCLE305E4502SBA |
| 10 000                                   | 2.19                           | 3984                                     | 0.5                               | NTCLE305E4103SB                              | NTCLE305E4103SBA |

Notes

Preferred versions for new designs

(1) Other R<sub>25</sub> and B-values available on request

(2) RoHS exemption 7(c)-I: electrical and electronic components containing lead in a glass or ceramic other than dielectric ceramic in capacitors, e.g. piezo-electronic devices, or in a glass or ceramic matrix compound

| RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R <sub>25</sub> AT 2060 Ω |                   |                                 |                 |            |                  |                          |                          |
|---|-------------------|---------------------------------|-----------------|------------|------------------|--------------------------|--------------------------|
| SAP PART AND ORDERING NUMBER: NTCLE305E4202SB(A)                              |                   |                                 |                 |            |                  |                          |                          |
| TEMPERATURE<br>(°C)   | RESISTANCE<br>(Ω) | R <sub>T</sub> /R <sub>25</sub> | R-TOL.<br>(± %) | α<br>(%/K) | T-TOL.<br>(± °C) | R <sub>MIN.</sub><br>(Ω) | R <sub>MAX.</sub><br>(Ω) |
| -40.0   | 47 326            | 22.974                          | 5.27            | - 6.03     | 0.87             | 44 832                   | 49 820                   |
| -35.0   | 35 203            | 17.089                          | 4.95            | -5.81      | 0.85             | 33 461                   | 36 945                   |
| -30.0   | 26 473            | 12.851                          | 4.64            | -5.60      | 0.83             | 25 245                   | 27 700                   |
| -25.0   | 20 115            | 9.7643                          | 4.34            | -5.39      | 0.81             | 19 241                   | 20 988                   |
| -20.0   | 15 435            | 7.4925                          | 4.06            | -5.20      | 0.78             | 14 808                   | 16 061                   |
| -15.0   | 11 954            | 5.8031                          | 3.78            | -5.02      | 0.75             | 11 502                   | 12 407                   |
| -10.0   | 9341.4            | 4.5347                          | 3.52            | -4.85      | 0.73             | 9012.6                   | 9670.2                   |
| -5.0  | 7361.4            | 3.5735                          | 3.27            | -4.68      | 0.70             | 7120.9                   | 7601.8                   |
| 0.0   | 5847.7            | 2.8387                          | 3.02            | -4.53      | 0.67             | 5671.0                   | 6024.5                   |
| 5.0   | 4680.9            | 2.2723                          | 2.79            | -4.38      | 0.64             | 4550.5                   | 4811.4                   |
| 10.0  | 3774.3            | 1.8322                          | 2.56            | -4.24      | 0.60             | 3677.7                   | 3870.9                   |
| 15.0  | 3064.4            | 1.4876                          | 2.34            | -4.10      | 0.57             | 2992.7                   | 3136.2                   |
| 20.0  | 2504.6            | 1.2158                          | 2.13            | -3.97      | 0.54             | 2451.3                   | 2557.9                   |
| 25.0  | 2060.0            | 1.0000                          | 1.92            | -3.85      | 0.50             | 2020.4                   | 2099.6                   |
| 30.0  | 1704.5            | 0.82744                         | 1.86            | -3.73      | 0.50             | 1672.7                   | 1736.3                   |
| 35.0  | 1418.6            | 0.68864                         | 1.81            | -3.62      | 0.50             | 1392.9                   | 1444.3                   |
| 40.0  | 1186.9            | 0.57618                         | 1.76            | -3.52      | 0.50             | 1166.1                   | 1207.8                   |
| 45.0  | 997.97            | 0.48445                         | 1.71            | -3.42      | 0.50             | 980.90                   | 1015.0                   |
| 50.0  | 842.90            | 0.40917                         | 1.67            | -3.33      | 0.50             | 828.85                   | 856.95                   |
| 55.0  | 714.92            | 0.34705                         | 1.63            | -3.25      | 0.50             | 703.29                   | 726.55                   |
| 60.0  | 608.74            | 0.29550                         | 1.59            | -3.18      | 0.50             | 599.06                   | 618.41                   |
| 65.0  | 520.21            | 0.25253                         | 1.55            | -3.11      | 0.50             | 512.13                   | 528.30                   |
| 70.0  | 446.08            | 0.21654                         | 1.52            | -3.04      | 0.50             | 439.29                   | 452.86                   |
| 75.0  | 383.73            | 0.18628                         | 1.49            | -2.98      | 0.50             | 378.01                   | 389.45                   |
| 80.0  | 331.09            | 0.16072                         | 1.46            | -2.92      | 0.50             | 326.25                   | 335.93                   |
| 85.0  | 286.48            | 0.13907                         | 1.43            | -2.87      | 0.50             | 282.37                   | 290.59                   |
| 90.0  | 248.55            | 0.12065                         | 1.57            | -2.81      | 0.56             | 244.64                   | 252.45                   |
| 95.0  | 216.18            | 0.10494                         | 1.70            | -2.77      | 0.62             | 212.50                   | 219.87                   |
| 100.0   | 188.49            | 0.091501                        | 1.83            | -2.72      | 0.67             | 185.04                   | 191.95                   |
| 105.0   | 164.73            | 0.079964                        | 1.96            | -2.67      | 0.73             | 161.50                   | 167.95                   |
| 110.0   | 144.27            | 0.070036                        | 2.08            | -2.63      | 0.79             | 141.27                   | 147.28                   |
| 115.0   | 126.63            | 0.061470                        | 2.20            | -2.59      | 0.85             | 123.84                   | 129.42                   |
| 120.0   | 111.36            | 0.054061                        | 2.32            | -2.55      | 0.91             | 108.78                   | 113.95                   |
| 125.0   | 98.133            | 0.047637                        | 2.43            | -2.51      | 0.97             | 95.746                   | 100.52                   |



| RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH $R_{25}$ AT 5 k $\Omega$ |                         |              |                   |                |                    |                         |                         |
|--|-------------------------|--------------|-------------------|----------------|--------------------|-------------------------|-------------------------|
| SAP PART AND ORDERING NUMBER: NTCLE305E4502SB(A)                             |                         |              |                   |                |                    |                         |                         |
| TEMPERATURE (°C)   | RESISTANCE ( $\Omega$ ) | $R_T/R_{25}$ | R-TOL. ( $\pm$ %) | $\alpha$ (%/K) | T-TOL. ( $\pm$ °C) | $R_{MIN.}$ ( $\Omega$ ) | $R_{MAX.}$ ( $\Omega$ ) |
| -40  | 167 137                 | 33.427       | 4.10              | -6.63          | 0.62               | 160 290                 | 173 984                 |
| -35  | 120 661                 | 24.132       | 3.91              | -6.41          | 0.61               | 115 939                 | 125 383                 |
| -30  | 88 066                  | 17.613       | 3.74              | -6.19          | 0.60               | 84 775                  | 91 358                  |
| -25  | 64 950                  | 12.990       | 3.57              | -5.99          | 0.60               | 62 632                  | 67 268                  |
| -20  | 48 381                  | 9.6761       | 3.41              | -5.79          | 0.59               | 46 732                  | 50 029                  |
| -15  | 36 382                  | 7.2765       | 3.25              | -5.61          | 0.58               | 35 199                  | 37 565                  |
| -10  | 27 609                  | 5.5218       | 3.10              | -5.43          | 0.57               | 26 753                  | 28 465                  |
| -5   | 21 134                  | 4.2268       | 2.96              | -5.26          | 0.56               | 20 509                  | 21 759                  |
| 0  | 16 312                  | 3.2624       | 2.82              | -5.10          | 0.55               | 15 852                  | 16 772                  |
| 5  | 12 691                  | 2.5381       | 2.68              | -4.94          | 0.54               | 12 350                  | 13 031                  |
| 10   | 9948.4                  | 1.9897       | 2.55              | -4.80          | 0.53               | 9694.3                  | 10 203                  |
| 15   | 7855.6                  | 1.5711       | 2.43              | -4.65          | 0.52               | 7664.7                  | 8046.5                  |
| 20   | 6246.4                  | 1.2493       | 2.31              | -4.52          | 0.51               | 6102.1                  | 6390.6                  |
| 25   | 5000.0                  | 1.0000       | 2.19              | -4.39          | 0.50               | 4890.3                  | 5109.7                  |
| 30   | 4028.0                  | 0.80560      | 2.13              | -4.26          | 0.50               | 3942.2                  | 4113.8                  |
| 35   | 3264.9                  | 0.65297      | 2.07              | -4.14          | 0.50               | 3197.3                  | 3332.5                  |
| 40   | 2661.9                  | 0.53239      | 2.01              | -4.03          | 0.50               | 2608.4                  | 2715.5                  |
| 45   | 2182.6                  | 0.43653      | 1.96              | -3.92          | 0.50               | 2139.9                  | 2225.4                  |
| 50   | 1799.4                  | 0.35987      | 1.90              | -3.81          | 0.50               | 1765.1                  | 1833.6                  |
| 55   | 1491.1                  | 0.29823      | 1.85              | -3.71          | 0.50               | 1463.5                  | 1518.8                  |
| 60   | 1241.9                  | 0.24838      | 1.80              | -3.61          | 0.50               | 1219.5                  | 1264.3                  |
| 65   | 1039.3                  | 0.20787      | 1.76              | -3.51          | 0.50               | 1021.1                  | 1057.6                  |
| 70   | 873.83                  | 0.17477      | 1.71              | -3.42          | 0.50               | 858.87                  | 888.79                  |
| 75   | 737.96                  | 0.14759      | 1.67              | -3.34          | 0.50               | 725.65                  | 750.27                  |
| 80   | 625.90                  | 0.12518      | 1.63              | -3.25          | 0.50               | 615.72                  | 636.08                  |
| 85   | 533.05                  | 0.10661      | 1.59              | -3.17          | 0.50               | 524.60                  | 541.51                  |
| 90   | 455.79                  | 0.091159     | 1.66              | -3.09          | 0.54               | 448.21                  | 463.37                  |
| 95   | 391.23                  | 0.078246     | 1.74              | -3.02          | 0.58               | 384.43                  | 398.03                  |
| 100  | 337.06                  | 0.067411     | 1.81              | -2.94          | 0.62               | 330.95                  | 343.16                  |
| 105  | 291.42                  | 0.058284     | 1.88              | -2.87          | 0.66               | 285.93                  | 296.91                  |
| 110  | 252.84                  | 0.050568     | 1.95              | -2.81          | 0.70               | 247.90                  | 257.78                  |
| 115  | 220.09                  | 0.044019     | 2.02              | -2.74          | 0.74               | 215.64                  | 224.54                  |
| 120  | 192.21                  | 0.038441     | 2.09              | -2.68          | 0.78               | 188.19                  | 196.22                  |
| 125  | 168.37                  | 0.033675     | 2.15              | -2.62          | 0.82               | 164.75                  | 172.00                  |



| RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH $R_{25}$ AT 10 k $\Omega$ |                         |            |                  |                |                               |                         |                         |
|---|-------------------------|------------|------------------|----------------|-------------------------------|-------------------------|-------------------------|
| SAP PART AND ORDERING NUMBER: NTCLE305E4103SB(A)                              |                         |            |                  |                |                               |                         |                         |
| TEMPERATURE (°C)  | RESISTANCE ( $\Omega$ ) | $R/R_{25}$ | $\Delta R/R$ (%) | $\alpha$ (%/K) | $\Delta T_{MAX.}$ ( $\pm$ °C) | $R_{MIN.}$ ( $\Omega$ ) | $R_{MAX.}$ ( $\Omega$ ) |
| -40   | 334 274                 | 33.427     | 4.10             | -6.63          | 0.62                          | 320 580                 | 347 969                 |
| -35   | 241 323                 | 24.132     | 3.91             | -6.41          | 0.61                          | 231 879                 | 250 767                 |
| -30   | 176 133                 | 17.613     | 3.74             | -6.19          | 0.60                          | 169 549                 | 182 716                 |
| -25   | 129 900                 | 12.990     | 3.57             | -5.99          | 0.60                          | 125 264                 | 134 536                 |
| -20   | 96 761                  | 9.6761     | 3.41             | -5.79          | 0.59                          | 93 465                  | 100 058                 |
| -15   | 72 765                  | 7.2765     | 3.25             | -5.61          | 0.58                          | 70 399                  | 75 130                  |
| -10   | 55 218                  | 5.5218     | 3.10             | -5.43          | 0.57                          | 53 506                  | 56 931                  |
| -5  | 42 268                  | 4.2268     | 2.96             | -5.26          | 0.56                          | 41 018                  | 43 518                  |
| 0   | 32 624                  | 3.2624     | 2.82             | -5.10          | 0.55                          | 31 705                  | 33 544                  |
| 5   | 25 381                  | 2.5381     | 2.68             | -4.94          | 0.54                          | 24 700                  | 26 063                  |
| 10  | 19 897                  | 1.9897     | 2.55             | -4.80          | 0.53                          | 19 389                  | 20 405                  |
| 15  | 15 711                  | 1.5711     | 2.43             | -4.65          | 0.52                          | 15 329                  | 16 093                  |
| 20  | 12 493                  | 1.2493     | 2.31             | -4.52          | 0.51                          | 12 204                  | 12 781                  |
| 25  | 10 000                  | 1.0000     | 2.19             | -4.39          | 0.50                          | 9780.7                  | 10 219                  |
| 30  | 8056.0                  | 0.80560    | 2.13             | -4.26          | 0.50                          | 7884.3                  | 8227.6                  |
| 35  | 6529.7                  | 0.65297    | 2.07             | -4.14          | 0.50                          | 6394.5                  | 6664.9                  |
| 40  | 5323.9                  | 0.53239    | 2.01             | -4.03          | 0.50                          | 5216.7                  | 5431.1                  |
| 45  | 4365.3                  | 0.43653    | 1.96             | -3.92          | 0.50                          | 4279.8                  | 4450.7                  |
| 50  | 3598.7                  | 0.35987    | 1.90             | -3.81          | 0.50                          | 3530.2                  | 3667.3                  |
| 55  | 2982.3                  | 0.29823    | 1.85             | -3.71          | 0.50                          | 2927.0                  | 3037.6                  |
| 60  | 2483.8                  | 0.24838    | 1.80             | -3.61          | 0.50                          | 2439.0                  | 2528.6                  |
| 65  | 2078.7                  | 0.20787    | 1.76             | -3.51          | 0.50                          | 2042.1                  | 2115.2                  |
| 70  | 1747.7                  | 0.17477    | 1.71             | -3.42          | 0.50                          | 1717.7                  | 1777.6                  |
| 75  | 1475.9                  | 0.14759    | 1.67             | -3.34          | 0.50                          | 1451.3                  | 1500.5                  |
| 80  | 1251.8                  | 0.12518    | 1.63             | -3.25          | 0.50                          | 1231.4                  | 1272.2                  |
| 85  | 1066.1                  | 0.10661    | 1.59             | -3.17          | 0.50                          | 1049.2                  | 1083.0                  |
| 90  | 911.59                  | 0.091159   | 1.66             | -3.09          | 0.54                          | 896.42                  | 926.75                  |
| 95  | 782.46                  | 0.078246   | 1.74             | -3.02          | 0.58                          | 768.85                  | 796.06                  |
| 100   | 674.11                  | 0.067411   | 1.81             | -2.94          | 0.62                          | 661.89                  | 686.33                  |
| 105   | 582.84                  | 0.058284   | 1.88             | -2.87          | 0.66                          | 571.86                  | 593.83                  |
| 110   | 505.68                  | 0.050568   | 1.95             | -2.81          | 0.70                          | 495.79                  | 515.56                  |
| 115   | 440.19                  | 0.044019   | 2.02             | -2.74          | 0.74                          | 431.28                  | 449.09                  |
| 120   | 384.41                  | 0.038441   | 2.09             | -2.68          | 0.78                          | 376.38                  | 392.44                  |
| 125   | 336.75                  | 0.033675   | 2.15             | -2.62          | 0.82                          | 329.50                  | 344.00                  |



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