

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



## LINKS TO ADDITIONAL RESOURCES



3D Models



Design Tools



Related Documents

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

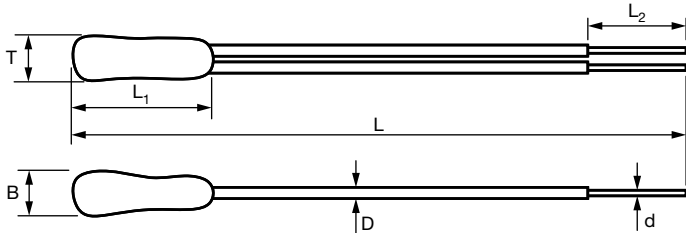
## DESIGN-IN SUPPORT

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 <sub>MAX.</sub>                                                                    | B <sub>MAX.</sub> | L        | L <sub>1</sub> | L <sub>2</sub> | Ø D <sub>MAX.</sub> | 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**

| $R_{25}$ <sup>(1)</sup><br>( $\Omega$ ) | $R_{25}$ -TOL.<br>( $\pm$ %) | $B_{25/85}$ <sup>(1)</sup><br>(K) | $B_{25/85}$ -TOL.<br>( $\pm$ %) | 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

<sup>(1)</sup> Other  $R_{25}$  and B-values available on request

<sup>(2)</sup> 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  $R_{25}$  AT 2060  $\Omega$** 

SAP PART AND ORDERING NUMBER: NTCLE305E4202SB(A)

| TEMPERATURE<br>(°C) | RESISTANCE<br>( $\Omega$ ) | $R_T/R_{25}$ | $R$ -TOL.<br>( $\pm$ %) | $\alpha$<br>(%/K) | T-TOL.<br>( $\pm$ °C) | $R_{MIN.}$<br>( $\Omega$ ) | $R_{MAX.}$<br>( $\Omega$ ) |
|---------------------|----------------------------|--------------|-------------------------|-------------------|-----------------------|----------------------------|----------------------------|
| -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<br>(°C) | RESISTANCE<br>( $\Omega$ ) | $R_T/R_{25}$ | R-TOL.<br>( $\pm$ %) | $\alpha$<br>(%/K) | T-TOL.<br>( $\pm$ °C) | $R_{MIN.}$<br>( $\Omega$ ) | $R_{MAX.}$<br>( $\Omega$ ) |
|---------------------|----------------------------|--------------|----------------------|-------------------|-----------------------|----------------------------|----------------------------|
| -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<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>( $\Omega$ ) |
|---------------------|----------------------------|------------|---------------------|-------------------|----------------------------------|----------------------------|----------------------------|
| -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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