# 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 | ± 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 δ (in still air) | ≈ 0.8 | mW/K |
| Response time (in stirred air) (in oil) | ≈ 3 ≈ 0.7 | s |
| Minimum dielectric withstanding voltage between leads termination and coated body | 100 | $V_{RMS}$ |
| 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

Pb-free Available

e4

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 ocher 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

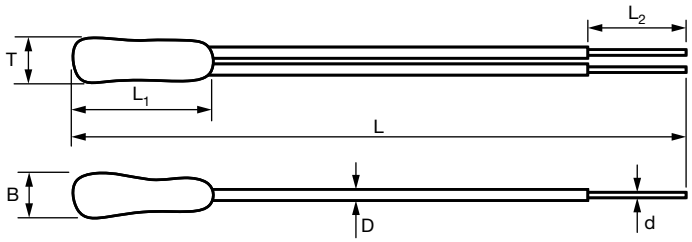
For complete curve computation, please visit: www.vishay.com/thermistors/ntc-curve-list/.

## MOUNTING

**Important mounting and handling instructions: see 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 |



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## ELECTRICAL DATA AND ORDERING INFORMATION

| $R_{25}$ (1) (Ω) | $R_{25}$-TOL. (± %) | $B_{25/85}$ (1) (K) | $B_{25/85}$-TOL. (± %) | SAP MATERIAL AND ORDERING NUMBER | |
|---|---|---|---|---|---|
| | | | | RoHS COMPLIANT WITH EXEMPTION (2) | 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 $R_{25}$ 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 $R_{25}$ AT 2060 Ω

**SAP PART AND ORDERING NUMBER: NTCLE305E4202SB(A)**

| TEMPERATURE (°C) | RESISTANCE (Ω) | $R_T/R_{25}$ | $R$-TOL. (± %) | α (%/K) | T-TOL. (± °C) | $R_{MIN.}$ (Ω) | $R_{MAX.}$ (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 |


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| RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH $R_{25}$ AT 5 kΩ | | | | | | | |
|---|---|---|---|---|---|---|---|
| SAP PART AND ORDERING NUMBER: NTCLE305E4502SB(A) | | | | | | | |
| TEMPERATURE (°C) | RESISTANCE (Ω) | $R_T/R_{25}$ | $R$-TOL. (± %) | α (%/K) | T-TOL. (± °C) | $R_{MIN.}$ (Ω) | $R_{MAX.}$ (Ω) |
| -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 |



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| RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH $R_{25}$ AT 10 kΩ | | | | | | | |
|---|---|---|---|---|---|---|---|
| SAP PART AND ORDERING NUMBER: NTCLE305E4103SB(A) | | | | | | | |
| TEMPERATURE (°C) | RESISTANCE (Ω) | $R/R_{25}$ | $\Delta R/R$ (%) | α (%/K) | $\Delta T_{MAX.}$ (± °C) | $R_{MIN.}$ (Ω) | $R_{MAX.}$ (Ω) |
| -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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