

# NTC Thermistors, Pipe PVC Long Leads Sensors



## FEATURES

- Accurate over wide temperature range
- High stability
- Excellent price/performance ratio
- High adhesive strength between PVC wire and the encapsulating lacquer
- Material categorization:  
for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
COMPLIANT

## LINKS TO ADDITIONAL RESOURCES



3D Models



Design Tools



Related Documents

| QUICK REFERENCE DATA                                                   |                         |                 |
|------------------------------------------------------------------------|-------------------------|-----------------|
| PARAMETER                                                              | VALUE                   | UNIT            |
| Resistance value at 25 °C ( $R_{25}$ )                                 | 2.2K to 100K            | $\Omega$        |
| Tolerance on $R_{25}$ -value <sup>(1)</sup>                            | $\pm 3$                 | %               |
| $B_{25/85}$ -value                                                     | 3977 to 4190            | K               |
| Tolerance on $B_{25/85}$ -value                                        | $\pm 0.75$ to $\pm 1.5$ | %               |
| Operating temperature range at zero dissipation                        | -40 to +85              | °C              |
| Maximum power dissipation at 55 °C                                     | 250                     | mW              |
| Min. dielectric withstanding voltage between terminals and sensor body | 1500                    | V <sub>AC</sub> |
| Dissipation factor                                                     | 6.0                     | mW/K            |
| Response time <sup>(2)</sup>                                           | $\approx 10$            | s               |
| Weight                                                                 | $\approx 6$             | g               |

### Notes

- (1) Tighter tolerances on  $R_{25}$  are available upon request
- (2) Response time in silicone oil MS 200/50. This is the time needed for the sensor to reach 63.2 % of the total temperature difference when subjected to a temperature change from 25 °C in air to 85 °C in oil

## APPLICATIONS

Temperature measurement, sensing and control in remote locations and for various environmental conditions.

## DESCRIPTION

These sensors exist of a small NTC chip reflow soldered between two AWG #24 UL-2468 style wires. They are lacquered and insulated potted into a brass pipe.

## MARKING

UL mark on wire, no mark on body.

## PACKAGING

The thermistors are packed in cardboard boxes; each box containing 500 pieces.

## DESIGN-IN SUPPORT

Other wire length and wire type (UL-2651 style PVC 105 °C), other wire gauges are available on request. The products can be provided with a connector on request.

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

## MOUNTING

By soldering or clamping the wire ends, in any position. Body can be inserted or taped attached. Not intended for fluid immersed applications.

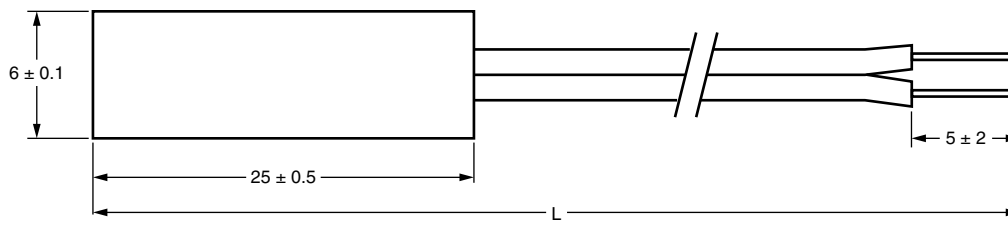
| ELECTRICAL DATA AND ORDERING INFORMATION |                              |                    |                                 |                                              |                 |
|------------------------------------------|------------------------------|--------------------|---------------------------------|----------------------------------------------|-----------------|
| $R_{25}$<br>( $\Omega$ )                 | $R_{25}$ -TOL.<br>( $\pm$ %) | $B_{25/85}$<br>(K) | $B_{25/85}$ -TOL.<br>( $\pm$ %) | SAP MATERIAL AND ORDERING NUMBER             |                 |
|                                          |                              |                    |                                 | RoHS COMPLIANT WITH EXEMPTION <sup>(1)</sup> | RoHS COMPLIANT  |
| 2200                                     | 3                            | 3977               | 0.75                            | NTCLP100E3222H                               | NTCLP100E3222HA |
| 4700                                     | 3                            | 3977               | 0.75                            | NTCLP100E3472H                               | NTCLP100E3472HA |
| 5000                                     | 3                            | 3977               | 0.75                            | NTCLP100E3502H                               | NTCLP100E3502HA |
| 10 000                                   | 3                            | 3977               | 0.75                            | NTCLP100E3103H                               | NTCLP100E3103HA |
| 47 000                                   | 3                            | 4090               | 1.5                             | NTCLP100E3473H                               | NTCLP100E3473HA |
| 100 000                                  | 3                            | 4190               | 1.5                             | NTCLP100E3104H                               | NTCLP100E3104HA |

### Notes

- Preferred versions for new designs
- (1) 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

**DIMENSIONS** in millimeters

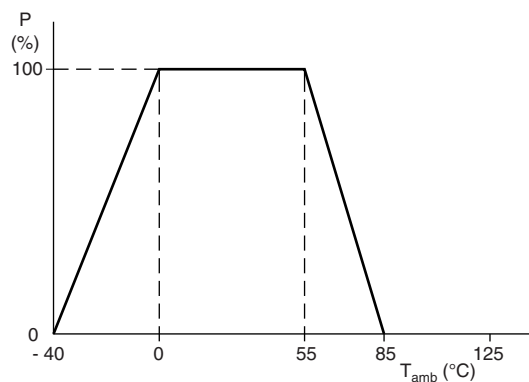
Brass-pipe type NTCLP100E...


 $L = 400 \text{ mm} + 15 / - 0$ 

Other wire lengths or connector attached available on request.

**DERATING**

Power derating curve.


**Note**

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



| RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH $R_{25}$ AT 2.2 k $\Omega$ , 4.7 k $\Omega$ , 5.0 k $\Omega$ , AND 10 k $\Omega$ |                               |                               |                               |                               |                 |                   |                  |
|--------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-----------------|-------------------|------------------|
| T <sub>OPER</sub><br>(°C)                                                                                                            | PART NR.<br>NTCLP100E3222H(A) | PART NR.<br>NTCLP100E3472H(A) | PART NR.<br>NTCLP100E3502H(A) | PART NR.<br>NTCLP100E3103H(A) | R-TOL.<br>(± %) | $\alpha$<br>(%/K) | T-TOL.<br>(± °C) |
|                                                                                                                                      | $R_T$<br>( $\Omega$ )         | $R_T$<br>( $\Omega$ )         | $R_T$<br>( $\Omega$ )         | $R_T$<br>( $\Omega$ )         |                 |                   |                  |
| -40                                                                                                                                  | 73 061                        | 156 084                       | 166 047                       | 332 094                       | 5.87            | -6.62             | 0.89             |
| -35                                                                                                                                  | 52 778                        | 112 753                       | 119 950                       | 239 900                       | 5.60            | -6.39             | 0.88             |
| -30                                                                                                                                  | 38 544                        | 82 344                        | 87 600                        | 175 200                       | 5.33            | -6.18             | 0.86             |
| -25                                                                                                                                  | 28 443                        | 60 765                        | 64 643                        | 129 287                       | 5.08            | -5.98             | 0.85             |
| -20                                                                                                                                  | 21 199                        | 45 288                        | 48 179                        | 96 358                        | 4.83            | -5.78             | 0.84             |
| -15                                                                                                                                  | 15 950                        | 34 075                        | 36 250                        | 72 500                        | 4.60            | -5.60             | 0.82             |
| -10                                                                                                                                  | 12 110                        | 25 872                        | 27 523                        | 55 046                        | 4.37            | -5.42             | 0.81             |
| -5                                                                                                                                   | 9275                          | 19 814                        | 21 078                        | 42 157                        | 4.15            | -5.25             | 0.79             |
| 0                                                                                                                                    | 7162                          | 15 300                        | 16 277                        | 32 554                        | 3.94            | -5.09             | 0.77             |
| 5                                                                                                                                    | 5574                          | 11 909                        | 12 669                        | 25 339                        | 3.74            | -4.93             | 0.76             |
| 10                                                                                                                                   | 4372                          | 9340                          | 9936                          | 19 872                        | 3.55            | -4.79             | 0.74             |
| 15                                                                                                                                   | 3454                          | 7378                          | 7849                          | 15 698                        | 3.36            | -4.64             | 0.72             |
| 20                                                                                                                                   | 2747                          | 5869                          | 6244                          | 12 488                        | 3.18            | -4.51             | 0.70             |
| 25                                                                                                                                   | 2200                          | 4700                          | 5000                          | 10 000                        | 3.00            | -4.38             | 0.69             |
| 30                                                                                                                                   | 1773                          | 3788                          | 4030                          | 8059                          | 3.17            | -4.25             | 0.75             |
| 35                                                                                                                                   | 1438                          | 3071                          | 3267                          | 6535                          | 3.33            | -4.13             | 0.81             |
| 40                                                                                                                                   | 1173                          | 2505                          | 2665                          | 5330                          | 3.49            | -4.02             | 0.87             |
| 45                                                                                                                                   | 961.8                         | 2055                          | 2186                          | 4372                          | 3.65            | -3.91             | 0.93             |
| 50                                                                                                                                   | 793.2                         | 1694                          | 1803                          | 3605                          | 3.80            | -3.80             | 1.00             |
| 55                                                                                                                                   | 657.5                         | 1405                          | 1494                          | 2989                          | 3.94            | -3.70             | 1.07             |
| 60                                                                                                                                   | 547.8                         | 1170                          | 1245                          | 2490                          | 4.08            | -3.60             | 1.13             |
| 65                                                                                                                                   | 458.6                         | 979.7                         | 1042                          | 2084                          | 4.22            | -3.51             | 1.20             |
| 70                                                                                                                                   | 385.7                         | 823.9                         | 876.5                         | 1753                          | 4.35            | -3.42             | 1.27             |
| 75                                                                                                                                   | 325.8                         | 696.0                         | 740.5                         | 1481                          | 4.48            | -3.33             | 1.35             |
| 80                                                                                                                                   | 276.4                         | 590.5                         | 628.2                         | 1256                          | 4.60            | -3.25             | 1.42             |
| 85                                                                                                                                   | 235.5                         | 503.0                         | 585.2                         | 1070                          | 4.73            | -3.17             | 1.49             |



| RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH $R_{25}$ AT 47 k $\Omega$ |                               |                        |                   |                         |
|-------------------------------------------------------------------------------|-------------------------------|------------------------|-------------------|-------------------------|
| $T_{OPER}$<br>(°C)                                                            | PART NR.<br>NTCLP100E3473H(A) | $R-TOL.$<br>( $\pm$ %) | $\alpha$<br>(%/K) | $T-TOL.$<br>( $\pm$ °C) |
|                                                                               | $R_T$<br>( $\Omega$ )         |                        |                   |                         |
| -40                                                                           | 1 589 068                     | 8.91                   | -6.54             | 1.36                    |
| -35                                                                           | 1 151 627                     | 8.34                   | -6.34             | 1.32                    |
| -30                                                                           | 842 790                       | 7.79                   | -6.15             | 1.27                    |
| -25                                                                           | 622 597                       | 7.27                   | -5.96             | 1.22                    |
| -20                                                                           | 464 110                       | 6.77                   | -5.79             | 1.17                    |
| -15                                                                           | 348 989                       | 6.28                   | -5.62             | 1.12                    |
| -10                                                                           | 264 628                       | 5.82                   | -5.45             | 1.07                    |
| -5                                                                            | 202 280                       | 5.37                   | -5.30             | 1.01                    |
| 0                                                                             | 155 823                       | 4.94                   | -5.14             | 0.96                    |
| 5                                                                             | 120 932                       | 4.52                   | -5.00             | 0.91                    |
| 10                                                                            | 94 528                        | 4.12                   | -4.86             | 0.85                    |
| 15                                                                            | 74 399                        | 3.74                   | -4.72             | 0.79                    |
| 20                                                                            | 58 945                        | 3.36                   | -4.59             | 0.73                    |
| 25                                                                            | 47 000                        | 3.00                   | -4.47             | 0.67                    |
| 30                                                                            | 37 706                        | 3.35                   | -4.35             | 0.77                    |
| 35                                                                            | 30 429                        | 3.69                   | -4.23             | 0.87                    |
| 40                                                                            | 24 696                        | 4.02                   | -4.12             | 0.97                    |
| 45                                                                            | 20 154                        | 4.33                   | -4.01             | 1.08                    |
| 50                                                                            | 16 534                        | 4.64                   | -3.91             | 1.19                    |
| 55                                                                            | 13 633                        | 4.94                   | -3.81             | 1.30                    |
| 60                                                                            | 11 296                        | 5.23                   | -3.71             | 1.41                    |
| 65                                                                            | 9404                          | 5.51                   | -3.62             | 1.52                    |
| 70                                                                            | 7865                          | 5.78                   | -3.53             | 1.64                    |
| 75                                                                            | 6607                          | 6.04                   | -3.44             | 1.75                    |
| 80                                                                            | 5573                          | 6.30                   | -3.36             | 1.87                    |
| 85                                                                            | 4721                          | 6.55                   | -3.28             | 2.00                    |

**RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH  $R_{25}$  AT 100 k $\Omega$** 

| $T_{OPER}$<br>(°C) | PART NR.<br>NTCLP100E3104H(A) | $R-TOL.$<br>( $\pm$ %) | $\alpha$<br>(%/K) | $T-TOL.$<br>( $\pm$ °C) |
|--------------------|-------------------------------|------------------------|-------------------|-------------------------|
|                    | $R_T$<br>( $\Omega$ )         |                        |                   |                         |
| -40                | 3 666 299                     | 9.05                   | -6.69             | 1.35                    |
| -35                | 2 637 588                     | 8.47                   | -6.49             | 1.31                    |
| -30                | 1 916 576                     | 7.91                   | -6.29             | 1.26                    |
| -25                | 1 406 111                     | 7.37                   | -6.10             | 1.21                    |
| -20                | 1 041 184                     | 6.86                   | -5.92             | 1.16                    |
| -15                | 777 846                       | 6.36                   | -5.75             | 1.11                    |
| -10                | 586 097                       | 5.89                   | -5.58             | 1.06                    |
| -5                 | 445 257                       | 5.43                   | -5.42             | 1.00                    |
| 0                  | 340 942                       | 4.99                   | -5.26             | 0.95                    |
| 5                  | 263 054                       | 4.56                   | -5.11             | 0.89                    |
| 10                 | 204 446                       | 4.15                   | -4.97             | 0.84                    |
| 15                 | 160 014                       | 3.75                   | -4.83             | 0.78                    |
| 20                 | 126 087                       | 3.37                   | -4.70             | 0.72                    |
| 25                 | 100 000                       | 3.00                   | -4.57             | 0.66                    |
| 30                 | 79 808                        | 3.36                   | -4.45             | 0.75                    |
| 35                 | 64 077                        | 3.70                   | -4.33             | 0.86                    |
| 40                 | 51 745                        | 4.04                   | -4.22             | 0.96                    |
| 45                 | 42 021                        | 4.36                   | -4.11             | 1.06                    |
| 50                 | 34 308                        | 4.68                   | -4.00             | 1.17                    |
| 55                 | 28 156                        | 4.98                   | -3.90             | 1.28                    |
| 60                 | 23 222                        | 5.28                   | -3.80             | 1.39                    |
| 65                 | 19 246                        | 5.57                   | -3.71             | 1.50                    |
| 70                 | 16 025                        | 5.85                   | -3.62             | 1.62                    |
| 75                 | 13 402                        | 6.12                   | -3.53             | 1.73                    |
| 80                 | 11 258                        | 6.38                   | -3.45             | 1.85                    |
| 85                 | 9496                          | 6.64                   | -3.36             | 1.97                    |

**TESTS AND REQUIREMENTS**

| <b>STABILITY TESTS</b> |                             |                                   |                    |
|------------------------|-----------------------------|-----------------------------------|--------------------|
| IEC                    | TEST                        | PROCEDURE                         | DRIFT REQUIREMENT  |
| 60068-2-2              | Endurance dry heat          | 85 °C; 1000 h                     | $\Delta R/R < 5$ % |
| 60068-2-1              | Endurance cold              | -40 °C; 1000 h                    | $\Delta R/R < 5$ % |
| 60539                  | Endurance max. dissipation  | 250 mW; 55 °C; 1000 h             | $\Delta R/R < 5$ % |
| 60068-2-3              | Damp heat, steady state     | 56 days at 40 °C; 90 % to 95 % RH | $\Delta R/R < 7$ % |
| 60068-20-14            | Rapid change of temperature | -40 °C to +85 °C; 50 cycles       | $\Delta R/R < 5$ % |



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