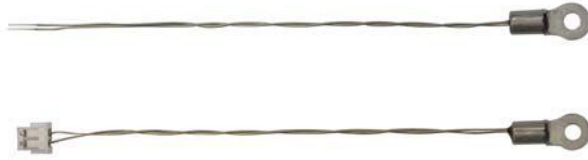


## NTC Thermistors, Mini Lug Sensors



| QUICK REFERENCE DATA   |                |                 |
|--|----------------|-----------------|
| PARAMETER  | VALUE          | UNIT            |
| Resistance value at 25 °C  | 10K to 47K     | Ω               |
| Tolerance on $R_{25}$ -value   | ± 2 to ± 3     | %               |
| $B_{25/85}$ -value   | 3740 to 3984   | K               |
| Tolerance on $B_{25/85}$ -value                                      | ± 0.5 to ± 1.5 | %               |
| Operating temperature range:<br>At zero dissipation                  | - 40 to + 125  | °C              |
| Response time  | 3.5            | s               |
| Thermal time constant $\tau$   | ≈ 5            | s               |
| Dissipation factor $\delta$  | 10             | mW/K            |
| Maximum power dissipation<br>at 25 °C                                | 100            | mW              |
| Min. dielectric withstanding<br>voltage between terminals<br>and lug | 1000           | V <sub>AC</sub> |
| Climatic category<br>(LCT/UCT/days)                                  | 40/125/56      | -               |
| Weight   |                |                 |
| without connector  | 0.5            | g               |
| with connector   | 0.6            | g               |

**Note**

- Other  $R_{25}$  values and tolerances available upon request

**FEATURES**

- Fast time response for surface applications compared to industry standard NTC lug sensors
- Reduced thermal gradient, due to the use of small dimensions and nickel conductor, allowing for an accurate surface temperature measurement
- The sensor is not suitable for being permanently in contact with water or liquids
- Small size connector and small lug ring tongue terminal, allowing for temperature sensing at locations where only limited space is available
- Connector ZHR-2 (optional)
- Compliant to RoHS Directive 2002/95/EC



RoHS  
COMPLIANT

**APPLICATIONS**

Thermistors used for surface temperature sensing and control in:

- Computer equipment
- MOSFETS, IC's, Power Electronics, heatsink temperature control
- Consumer appliances
- Industrial equipment
- Automotive equipment

**DESCRIPTION**

Miniature insulated chip thermistor with a negative temperature coefficient in accordance with IEC 60539. The device has no marking.

**MOUNTING**

- The sensor can be mounted by means of a screw. For stud size, metric 2 mm M2/American stud #1 or #2
- The end wire can be soldered, welded or crimped to a connector
- Optional connector for Wire-to-Wire or Wire-to-Board connections

| ELECTRICAL DATA AND ORDERING INFORMATION |                       |                           |                            |                        |  |              |
|--|-----------------------|---------------------------|----------------------------|------------------------|--|--------------|
| $R_{25}$ -VALUE<br>(kΩ)                  | $R_{25}$ -TOL.<br>(%) | $B_{25/85}$ -VALUE<br>(K) | $B_{25/85}$ -TOL.<br>(± %) | SAP MATERIAL<br>NUMBER | DESCRIPTION                                      | R/T<br>TABLE |
| 10                                       | ± 3                   | 3984                      | 0.5                        | NTCALUG03A103H         | NTC Mini Lug 10K 3 % 3984 K 0.5 %                | Table 1      |
| 10                                       | ± 3                   | 3984                      | 0.5                        | NTCALUG03A103HC        | NTC Mini Lug 10K 3 % 3984 K 0.5 % with connector | Table 1      |
| 10                                       | ± 2                   | 3984                      | 0.5                        | NTCALUG03A103G         | NTC Mini Lug 10K 2 % 3984 K 0.5 %                | Table 2      |
| 10                                       | ± 2                   | 3984                      | 0.5                        | NTCALUG03A103GC        | NTC Mini Lug 10K 2 % 3984 K 0.5 % with connector | Table 2      |
| 12                                       | ± 3                   | 3740                      | 1.5                        | NTCALUG03A123H         | NTC Mini Lug 12K 3 %                             | Table 3      |
| 12                                       | ± 3                   | 3740                      | 1.5                        | NTCALUG03A123HC        | NTC Mini Lug 12K 3 % with connector              | Table 3      |
| 47                                       | ± 3                   | 3740                      | 1.5                        | NTCALUG03A473H         | NTC Mini Lug 47K 3 %                             | Table 4      |
| 47                                       | ± 3                   | 3740                      | 1.5                        | NTCALUG03A473HC        | NTC Mini Lug 47 kΩ 3 % with connector            | Table 4      |

**Note**

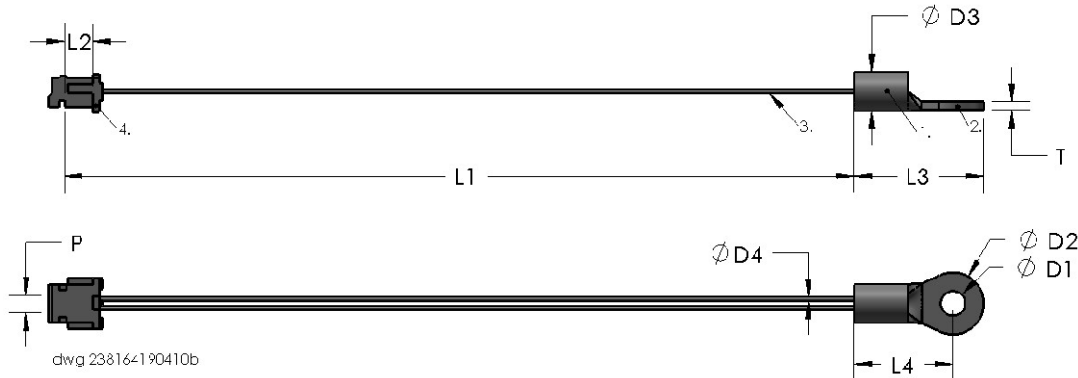
- Ordering information can be found on: [www.vishay.com/doc?33036](http://www.vishay.com/doc?33036)

# NTCALUG03 Mini Lug Series

Vishay BCcomponents NTC Thermistors, Mini Lug Sensors



## DIMENSIONS in millimeters



| L <sub>1</sub> | L <sub>2</sub> | L <sub>3</sub> | L <sub>4</sub> | L <sub>1</sub> + L <sub>3</sub><br>(item without<br>connector) | Ø D <sub>1</sub> | Ø D <sub>2</sub> | Ø D <sub>3</sub> | Ø D <sub>4</sub> | T         | Pitch P   |
|----------------|----------------|----------------|----------------|--|------------------|------------------|------------------|------------------|-----------|-----------|
| 70 ± 5         | 4 ± 1          | 11.5 ± 0.3     | 8.8 ± 0.3      | 81.5 ± 5   | 2.2 ± 0.3        | 5.5 ± 0.3        | 3.4 ± 0.3        | 0.35 ± 0.1       | 0.8 ± 0.1 | 1.5 ± 0.3 |

### Notes

- (1) Vishay Thermistor chip NTC, with epoxy coating and middle buffer layer
- (2) Metal ring lug, tin plated
- (3) Insulated leads: AWG#32, monostranded, diam 0.20 mm, silver plated Nickel, PEI insulation, diameter 0.35 mm
- (4) End wire stripped or 2-poles connector crimped (optional)

## MOUNTING

- With screw size metric M2, or American stud 1-2
- For the type without connector ('103'), the electrical connection can be made by soldering, crimping or welding.
- For the type with connector ('103C'), the connector can mate with following counter-connectors <sup>(5)</sup>:
  - A. One of the PCB connector - Through Hole:
    - JST B 2B-ZR (top entry)
    - JST S 2B-ZR (side entry)
    - JST B 2B-ZR-3.4 (top entry, for 1.6 mm board)
    - JST S 2B-ZR-3.4 (side entry, for 1.6 mm board)
  - B. One of the PCB Board connector - SMT Surface Mount:
    - JST S 2B-ZR-SM2-TF (SM2 side entry)
    - JST B 2B-ZR-SM3-TF (SM3 top entry)
    - JST S 2B-ZR-SM3A-TF (SM3 side entry)
    - JST B 2B-ZR-SM4-TF (SM4 top entry)
    - JST S 2B-ZR-SM4A-TF (SM4 side entry)
  - C. The Wire-to-wire connector:
    - JST ZMR-02 housing (x 1) + JST SMM-033T-P0.5 terminals (x 2)

### Note

- <sup>(5)</sup> Additional details and dimensions can be found in JST ZH and JST ZM datasheets.

## PACKAGING

Available in plastic bags of 250 pieces. SPQ = 2000 pieces

## DESIGN-IN SUPPORT

- Other resistance curves and tolerances are available on request
- Consult Vishay for other lead length, other connector crimping or other features
- Other applicable screw size are available, for example stud size metric 3 mm/American 3 to 4
- 3D solid models: [www.vishay.com/doc?29106](http://www.vishay.com/doc?29106)
- NTC curve computation: [www.vishay.com/thermistors/curve-computation-list/](http://www.vishay.com/thermistors/curve-computation-list/)



# NTCALUG03 Mini Lug Series

NTC Thermistors, Mini Lug Sensors Vishay BCcomponents

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TABLE 1

|                 |  |
|-----------------|--|
| NTCALUG03A103H  | NTC Mini Lug 10K 3 % 3984 K 0.5 %                |
| NTCALUG03A103HC | NTC Mini Lug 10K 3 % 3984 K 0.5 % with connector |

| RESISTANCE TEMPERATURE CHARACTERISTICS |                  |                |                  |                |                |                |                |
|--|------------------|----------------|------------------|----------------|----------------|----------------|----------------|
| TEMP. (°C)                             | $R_{(T)}/R_{25}$ | RESISTANCE (Ω) | $\Delta R/R$ (%) | $\alpha$ (%/K) | $\Delta T$ (K) | $R_{MIN.}$ (Ω) | $R_{MAX.}$ (Ω) |
| - 40                                   | 33.427           | 334 274        | 4.92             | - 6.63         | 0.74           | 317 833        | 350 716        |
| - 35                                   | 24.132           | 241 323        | 4.73             | - 6.41         | 0.74           | 229 899        | 252 747        |
| - 30                                   | 17.613           | 176 133        | 4.56             | - 6.19         | 0.74           | 168 107        | 184 158        |
| - 25                                   | 12.990           | 129 900        | 4.39             | - 5.99         | 0.73           | 124 202        | 135 598        |
| - 20                                   | 9.676            | 96 761         | 4.22             | - 5.79         | 0.73           | 92 675         | 100 848        |
| - 15                                   | 7.276            | 72 765         | 4.07             | - 5.61         | 0.73           | 69 806         | 75 723         |
| - 10                                   | 5.522            | 55 218         | 3.92             | - 5.43         | 0.72           | 53 056         | 57 380         |
| - 5                                    | 4.227            | 42 268         | 3.77             | - 5.26         | 0.72           | 40 674         | 43 861         |
| 0                                      | 3.262            | 32 624         | 3.63             | - 5.10         | 0.71           | 31 440         | 33 808         |
| 5                                      | 2.538            | 25 381         | 3.49             | - 4.94         | 0.71           | 24 494         | 26 268         |
| 10                                     | 1.990            | 19 897         | 3.36             | - 4.80         | 0.70           | 19 227         | 20 566         |
| 15                                     | 1.571            | 15 711         | 3.24             | - 4.65         | 0.70           | 15 202         | 16 220         |
| 20                                     | 1.249            | 12 493         | 3.12             | - 4.52         | 0.69           | 12 103         | 12 882         |
| 25                                     | 1.000            | 10 000         | 3.00             | - 4.39         | 0.68           | 9700.0         | 10 300         |
| 30                                     | 0.806            | 8056.0         | 3.11             | - 4.26         | 0.73           | 7805.1         | 8306.8         |
| 35                                     | 0.653            | 6529.7         | 3.22             | - 4.14         | 0.78           | 6319.3         | 6740.2         |
| 40                                     | 0.532            | 5323.9         | 3.33             | - 4.03         | 0.83           | 5146.6         | 5501.1         |
| 45                                     | 0.437            | 4365.3         | 3.43             | - 3.92         | 0.88           | 4215.4         | 4515.1         |
| 50                                     | 0.360            | 3598.7         | 3.53             | - 3.81         | 0.93           | 3471.6         | 3725.8         |
| 55                                     | 0.298            | 2982.3         | 3.63             | - 3.71         | 0.98           | 2874.0         | 3090.5         |
| 60                                     | 0.248            | 2483.8         | 3.72             | - 3.61         | 1.03           | 2391.3         | 2576.3         |
| 65                                     | 0.208            | 2078.7         | 3.81             | - 3.51         | 1.09           | 1999.4         | 2157.9         |
| 70                                     | 0.175            | 1747.7         | 3.90             | - 3.42         | 1.14           | 1679.5         | 1815.9         |
| 75                                     | 0.148            | 1475.9         | 3.99             | - 3.34         | 1.20           | 1417.1         | 1534.8         |
| 80                                     | 0.125            | 1251.8         | 4.07             | - 3.25         | 1.25           | 1200.8         | 1302.8         |
| 85                                     | 0.107            | 1066.1         | 4.15             | - 3.17         | 1.31           | 1021.8         | 1110.4         |
| 90                                     | 0.091            | 911.59         | 4.23             | - 3.09         | 1.37           | 873.01         | 950.16         |
| 95                                     | 0.078            | 782.46         | 4.31             | - 3.02         | 1.43           | 748.75         | 816.17         |
| 100                                    | 0.067            | 674.11         | 4.38             | - 2.94         | 1.49           | 644.56         | 703.66         |
| 105                                    | 0.058            | 582.84         | 4.46             | - 2.87         | 1.55           | 556.87         | 608.82         |
| 110                                    | 0.051            | 505.68         | 4.53             | - 2.81         | 1.61           | 482.79         | 528.57         |
| 115                                    | 0.044            | 440.19         | 4.60             | - 2.74         | 1.68           | 419.96         | 460.42         |
| 120                                    | 0.038            | 384.41         | 4.66             | - 2.68         | 1.74           | 366.49         | 402.34         |
| 125                                    | 0.034            | 336.75         | 4.73             | - 2.62         | 1.81           | 320.83         | 352.67         |

# NTCALUG03 Mini Lug Series



Vishay BCcomponents NTC Thermistors, Mini Lug Sensors

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**TABLE 2**

|                 |  |
|-----------------|--|
| NTCALUG03A103G  | NTC Mini Lug 10K 2 % 3984 K 0.5 %                |
| NTCALUG03A103GC | NTC Mini Lug 10K 2 % 3984 K 0.5 % with connector |

| <b>RESISTANCE TEMPERATURE CHARACTERISTICS</b> |                  |                |                  |                |                |                |                |
|---|------------------|----------------|------------------|----------------|----------------|----------------|----------------|
| TEMP. (°C)                                    | $R_{(T)}/R_{25}$ | RESISTANCE (Ω) | $\Delta R/R$ (%) | $\alpha$ (%/K) | $\Delta T$ (K) | $R_{MIN.}$ (Ω) | $R_{MAX.}$ (Ω) |
| -40   | 33.427           | 334 274        | 3.90             | - 6.63         | 0.59           | 321 238        | 347 311        |
| -35   | 24.132           | 241 323        | 3.72             | - 6.41         | 0.58           | 232 353        | 250 293        |
| -30   | 17.613           | 176 133        | 3.54             | - 6.19         | 0.57           | 169 895        | 182 370        |
| -25   | 12.990           | 129 900        | 3.37             | - 5.99         | 0.56           | 125 518        | 134 282        |
| -20   | 9.676            | 96 761         | 3.21             | - 5.79         | 0.55           | 93 654         | 99 869         |
| -15   | 7.276            | 72 765         | 3.06             | - 5.61         | 0.54           | 70 541         | 74 988         |
| -10   | 5.522            | 55 218         | 2.91             | - 5.43         | 0.54           | 53 613         | 56 823         |
| -5  | 4.227            | 42 268         | 2.76             | - 5.26         | 0.53           | 41 100         | 43 435         |
| 0   | 3.262            | 32 624         | 2.62             | - 5.10         | 0.51           | 31 768         | 33 480         |
| 5   | 2.538            | 25 381         | 2.49             | - 4.94         | 0.50           | 24 749         | 26 013         |
| 10  | 1.990            | 19 897         | 2.36             | - 4.80         | 0.49           | 19 427         | 20 367         |
| 15  | 1.571            | 15 711         | 2.24             | - 4.65         | 0.48           | 15 360         | 16 063         |
| 20  | 1.249            | 12 493         | 2.12             | - 4.52         | 0.47           | 12 228         | 12 757         |
| 25  | 1.000            | 10 000         | 2.00             | - 4.39         | 0.46           | 9800.0         | 10 200         |
| 30  | 0.806            | 8056.0         | 2.11             | - 4.26         | 0.50           | 7885.8         | 8226.1         |
| 35  | 0.653            | 6529.7         | 2.22             | - 4.14         | 0.54           | 6384.7         | 6674.8         |
| 40  | 0.532            | 5323.9         | 2.33             | - 4.03         | 0.58           | 5200.0         | 5447.7         |
| 45  | 0.437            | 4365.3         | 2.43             | - 3.92         | 0.62           | 4259.3         | 4471.3         |
| 50  | 0.360            | 3598.7         | 2.53             | - 3.81         | 0.66           | 3507.8         | 3689.7         |
| 55  | 0.298            | 2982.3         | 2.62             | - 3.71         | 0.71           | 2904.0         | 3060.5         |
| 60  | 0.248            | 2483.8         | 2.72             | - 3.61         | 0.75           | 2416.4         | 2551.3         |
| 65  | 0.208            | 2078.7         | 2.81             | - 3.51         | 0.80           | 2020.3         | 2137.0         |
| 70  | 0.175            | 1747.7         | 2.89             | - 3.42         | 0.85           | 1697.1         | 1798.2         |
| 75  | 0.148            | 1475.9         | 2.98             | - 3.34         | 0.89           | 1432.0         | 1519.9         |
| 80  | 0.125            | 1251.8         | 3.06             | - 3.25         | 0.94           | 1213.5         | 1290.1         |
| 85  | 0.107            | 1066.1         | 3.14             | - 3.17         | 0.99           | 1032.6         | 1099.6         |
| 90  | 0.091            | 911.59         | 3.22             | - 3.09         | 1.04           | 882.23         | 940.94         |
| 95  | 0.078            | 782.46         | 3.30             | - 3.02         | 1.09           | 756.67         | 808.25         |
| 100   | 0.067            | 674.11         | 3.37             | - 2.94         | 1.14           | 651.40         | 696.83         |
| 105   | 0.058            | 582.84         | 3.44             | - 2.87         | 1.20           | 562.79         | 602.90         |
| 110   | 0.051            | 505.68         | 3.51             | - 2.81         | 1.25           | 487.92         | 523.43         |
| 115   | 0.044            | 440.19         | 3.58             | - 2.74         | 1.31           | 424.43         | 455.95         |
| 120   | 0.038            | 384.41         | 3.65             | - 2.68         | 1.36           | 370.39         | 398.43         |
| 125   | 0.034            | 336.75         | 3.71             | - 2.62         | 1.42           | 324.25         | 349.25         |



# NTCALUG03 Mini Lug Series

NTC Thermistors, Mini Lug Sensors Vishay BCcomponents

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**TABLE 3**

|                 |                                     |
|-----------------|-------------------------------------|
| NTCALUG03A123H  | NTC Mini Lug 12K 3 %                |
| NTCALUG03A123HC | NTC Mini Lug 12K 3 % with connector |

| <b>RESISTANCE TEMPERATURE CHARACTERISTICS</b> |               |                            |                     |                   |                   |                            |                            |
|---|---------------|----------------------------|---------------------|-------------------|-------------------|----------------------------|----------------------------|
| TEMP.<br>(°C)                                 | $R(T)/R_{25}$ | RESISTANCE<br>( $\Omega$ ) | $\Delta R/R$<br>(%) | $\alpha$<br>(%/K) | $\Delta T$<br>(K) | $R_{MIN.}$<br>( $\Omega$ ) | $R_{MAX.}$<br>( $\Omega$ ) |
| - 40  | 25.783        | 309 396                    | 8.40                | - 6.07            | 1.38              | 283 397                    | 335 395                    |
| - 35  | 19.125        | 229 504                    | 7.88                | - 5.88            | 1.34              | 211 413                    | 247 595                    |
| - 30  | 14.320        | 171 840                    | 7.38                | - 5.70            | 1.30              | 159 152                    | 184 528                    |
| - 25  | 10.819        | 129 825                    | 6.90                | - 5.52            | 1.25              | 120 861                    | 138 789                    |
| - 20  | 8.244         | 98 933                     | 6.45                | - 5.35            | 1.20              | 92 556                     | 105 309                    |
| - 15  | 6.335         | 76 019                     | 6.00                | - 5.19            | 1.16              | 71 455                     | 80 582                     |
| - 10  | 4.907         | 58 879                     | 5.58                | - 5.03            | 1.11              | 55 595                     | 62 163                     |
| - 5   | 3.829         | 45 953                     | 5.17                | - 4.88            | 1.06              | 43 578                     | 48 328                     |
| 0   | 3.011         | 36 129                     | 4.77                | - 4.74            | 1.01              | 34 405                     | 37 854                     |
| 5   | 2.384         | 28 607                     | 4.39                | - 4.60            | 0.95              | 27 350                     | 29 864                     |
| 10  | 1.900         | 22 804                     | 4.03                | - 4.47            | 0.90              | 21 886                     | 23 723                     |
| 15  | 1.525         | 18 298                     | 3.67                | - 4.34            | 0.85              | 17 626                     | 18 970                     |
| 20  | 1.231         | 14 773                     | 3.33                | - 4.22            | 0.79              | 14 281                     | 15 265                     |
| 25  | 1.000         | 12 000                     | 3.00                | - 4.10            | 0.73              | 11 640                     | 12 360                     |
| 30  | 0.817         | 9803.7                     | 3.32                | - 3.99            | 0.83              | 9478.2                     | 10 129                     |
| 35  | 0.671         | 8053.9                     | 3.63                | - 3.88            | 0.94              | 7761.7                     | 8346.2                     |
| 40  | 0.554         | 6651.9                     | 3.93                | - 3.77            | 1.04              | 6390.6                     | 6913.2                     |
| 45  | 0.460         | 5522.3                     | 4.22                | - 3.67            | 1.15              | 5289.3                     | 5755.2                     |
| 50  | 0.384         | 4607.2                     | 4.50                | - 3.58            | 1.26              | 4399.9                     | 4814.5                     |
| 55  | 0.322         | 3862.1                     | 4.77                | - 3.48            | 1.37              | 3677.8                     | 4046.4                     |
| 60  | 0.271         | 3252.4                     | 5.04                | - 3.39            | 1.48              | 3088.6                     | 3416.2                     |
| 65  | 0.229         | 2751.1                     | 5.29                | - 3.30            | 1.60              | 2605.5                     | 2896.7                     |
| 70  | 0.195         | 2336.9                     | 5.54                | - 3.22            | 1.72              | 2207.4                     | 2466.4                     |
| 75  | 0.166         | 1993.3                     | 5.78                | - 3.14            | 1.84              | 1878.0                     | 2108.6                     |
| 80  | 0.142         | 1707.0                     | 6.02                | - 3.06            | 1.96              | 1604.2                     | 1809.7                     |
| 85  | 0.122         | 1467.3                     | 6.25                | - 2.99            | 2.09              | 1375.7                     | 1559.0                     |
| 90  | 0.105         | 1266.0                     | 6.47                | - 2.92            | 2.22              | 1184.1                     | 1347.9                     |
| 95  | 0.091         | 1096.2                     | 6.69                | - 2.85            | 2.35              | 1022.9                     | 1169.4                     |
| 100   | 0.079         | 952.38                     | 6.90                | - 2.78            | 2.48              | 886.71                     | 1018.0                     |
| 105   | 0.069         | 830.20                     | 7.10                | - 2.71            | 2.62              | 771.26                     | 889.15                     |
| 110   | 0.061         | 726.02                     | 7.30                | - 2.65            | 2.75              | 673.03                     | 779.02                     |
| 115   | 0.053         | 636.88                     | 7.49                | - 2.59            | 2.89              | 589.16                     | 684.61                     |
| 120   | 0.047         | 560.36                     | 7.68                | - 2.53            | 3.04              | 517.31                     | 603.41                     |
| 125   | 0.041         | 494.46                     | 7.87                | - 2.47            | 3.18              | 455.56                     | 533.37                     |

# NTCALUG03 Mini Lug Series



Vishay BCcomponents NTC Thermistors, Mini Lug Sensors

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**TABLE 4**

|                 |                                     |
|-----------------|-------------------------------------|
| NTCALUG03A473H  | NTC Mini Lug 47K 3 %                |
| NTCALUG03A473HC | NTC Mini Lug 47K 3 % with connector |

| <b>RESISTANCE TEMPERATURE CHARACTERISTICS</b> |                  |                |                  |                |                |                |                |
|---|------------------|----------------|------------------|----------------|----------------|----------------|----------------|
| TEMP. (°C)                                    | $R_{(T)}/R_{25}$ | RESISTANCE (Ω) | $\Delta R/R$ (%) | $\alpha$ (%/K) | $\Delta T$ (K) | $R_{MIN.}$ (Ω) | $R_{MAX.}$ (Ω) |
| -40   | 25.783           | 1 211 802      | 8.40             | - 6.07         | 1.38           | 1 109 973      | 1 313 631      |
| -35   | 19.125           | 898 891        | 7.88             | - 5.88         | 1.34           | 828 034        | 969 749        |
| -30   | 14.320           | 673 040        | 7.38             | - 5.70         | 1.30           | 623 344        | 722 736        |
| -25   | 10.819           | 508 481        | 6.90             | - 5.52         | 1.25           | 473 370        | 543 592        |
| -20   | 8.244            | 387 486        | 6.45             | - 5.35         | 1.20           | 362 512        | 412 460        |
| -15   | 6.335            | 297 740        | 6.00             | - 5.19         | 1.16           | 279 866        | 315 613        |
| -10   | 4.907            | 230 608        | 5.58             | - 5.03         | 1.11           | 217 745        | 243 471        |
| -5  | 3.829            | 179 983        | 5.17             | - 4.88         | 1.06           | 170 681        | 189 285        |
| 0   | 3.011            | 141 507        | 4.77             | - 4.74         | 1.01           | 134 752        | 148 262        |
| 5   | 2.384            | 112 043        | 4.39             | - 4.60         | 0.95           | 107 121        | 116 966        |
| 10  | 1.900            | 89 317         | 4.03             | - 4.47         | 0.90           | 85 721         | 92 914         |
| 15  | 1.525            | 71 665         | 3.67             | - 4.34         | 0.85           | 69 033         | 74 297         |
| 20  | 1.231            | 57 863         | 3.33             | - 4.22         | 0.79           | 55 936         | 59 790         |
| 25  | 1.000            | 47 000         | 3.00             | - 4.10         | 0.73           | 45 590         | 48 410         |
| 30  | 0.817            | 38 398         | 3.32             | - 3.99         | 0.83           | 37 123         | 39 672         |
| 35  | 0.671            | 31 545         | 3.63             | - 3.88         | 0.94           | 30 400         | 32 689         |
| 40  | 0.554            | 26 053         | 3.93             | - 3.77         | 1.04           | 25 030         | 27 077         |
| 45  | 0.460            | 21 629         | 4.22             | - 3.67         | 1.15           | 20 717         | 22 541         |
| 50  | 0.384            | 18 045         | 4.50             | - 3.58         | 1.26           | 17 233         | 18 857         |
| 55  | 0.322            | 15 127         | 4.77             | - 3.48         | 1.37           | 14 405         | 15 848         |
| 60  | 0.271            | 12 739         | 5.04             | - 3.39         | 1.48           | 12 097         | 13 380         |
| 65  | 0.229            | 10 775         | 5.29             | - 3.30         | 1.60           | 10 205         | 11 345         |
| 70  | 0.195            | 9153.0         | 5.54             | - 3.22         | 1.72           | 8645.8         | 9660.2         |
| 75  | 0.166            | 7807.1         | 5.78             | - 3.14         | 1.84           | 7355.6         | 8258.7         |
| 80  | 0.142            | 6685.6         | 6.02             | - 3.06         | 1.96           | 6283.2         | 7087.9         |
| 85  | 0.122            | 5747.0         | 6.25             | - 2.99         | 2.09           | 5388.0         | 6106.0         |
| 90  | 0.105            | 4958.4         | 6.47             | - 2.92         | 2.22           | 4637.7         | 5279.2         |
| 95  | 0.091            | 4293.3         | 6.69             | - 2.85         | 2.35           | 4006.3         | 4580.3         |
| 100   | 0.079            | 3730.1         | 6.90             | - 2.78         | 2.48           | 3472.9         | 3987.3         |
| 105   | 0.069            | 3251.6         | 7.10             | - 2.71         | 2.62           | 3020.8         | 3482.5         |
| 110   | 0.061            | 2843.6         | 7.30             | - 2.65         | 2.75           | 2636.0         | 3051.2         |
| 115   | 0.053            | 2494.5         | 7.49             | - 2.59         | 2.89           | 2307.5         | 2681.4         |
| 120   | 0.047            | 2194.7         | 7.68             | - 2.53         | 3.04           | 2026.1         | 2363.4         |
| 125   | 0.041            | 1936.6         | 7.87             | - 2.47         | 3.18           | 1784.3         | 2089.0         |



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