



# NTC SMD Thermistors

## NC 12 – NC 20 (PdPtAg Termination)

Chip thermistors are a high quality and low cost device especially developed for surface mounting applications. They are widely used for temperature compensation but can also achieve temperature control of printed circuits. Its silver -

palladium - platinum metallization provides a high degree of resistance to dewetting of the terminations during soldering (typically 260°C / 15 s). Parts are suitable for hybrid assembly process, not suitable for lead free soldering.

| Types                                   | NC 12<br>IEC SIZE : 0805                    | NC 20<br>IEC SIZE : 1206 |
|---|---|--------------------------|
| <b>DIMENSIONS: millimeters (inches)</b> |   |                          |
| Terminations                            | Silver – palladium – platinum metallization |                          |
| Marking                                 | On packaging only                           |                          |
| Climatic category                       | 40/125/56                                   |                          |
| Operating temperature                   | -55°C to +150°C                             |                          |
| Tolerance on Rn (25°C)                  | ±3%*, ±5%, ±10%, ±20%                       |                          |
| Maximum dissipation at 25°C             | 0.12 W                                      | 0.24 W                   |
| Thermal dissipation factor              | 2 mW/°C                                     | 4 mW/°C                  |
| Thermal time constant                   | 5 s   | 7 s                      |

Resistance - Temperature characteristics: pages 29 to 33.

### FEATURES

- Fast thermal response
- Commercial, Industrial and Automotive Applications
- PdPtAg Termination
- Suitable for hybrid assembly
- AEC-Q200 qualified

### APPLICATIONS

- LCD compensation
- Battery packs
- Mobile phones
- CD players
- Heating systems
- Air-conditioning systems
- Refrigeration
- Temperature control of Switch Mode Power Supplies
- Compensation of pressure sensors
- Protection of power transistors in various electronic circuits and more



### HOW TO ORDER

|                            |                            |                                  |   |   |
|----------------------------|----------------------------|----------------------------------|---|---|
| <b>NC 20</b>               | <b>K 0</b>                 | <b>0103</b>                      | <b>M</b>                                    | <b>BA</b>   |
|                            |                            |                                  |   |   |
| <b>Type</b>                | <b>Material Code</b>       | <b>Resistance</b>                | <b>Tolerance</b>                            | <b>Suffix: Packaging</b>  |
| NC12 (0805)<br>NC20 (1206) | K<br>(See tables pages 15) | 10,000 Ω<br>(See tables page 15) | H (±3%)*<br>J (±5%)<br>K (±10%)<br>M (±20%) | --: Bulk (5000 pcs/reel)<br>NC20 BA: Plastic tape (180mm diam. reel, 3000 pcs/reel)<br>BE: Plastic tape (1/2 reel, 1500 pcs/reel)<br>BC: Plastic tape (330mm diam. reel), 10,000 pcs/reel)<br>NC12 BB: Cardboard tape (180mm diam. reel, 4000 pcs/reel)<br>BF: Cardboard tape (1/2 reel, 2000 pcs/reel)<br>BD: Cardboard tape (330mm diam. reel, 10,000 pcs/reel) |

\* Optional tolerance, please contact factory



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## NC 12 – NC 20 (PdPtAg Termination)



### TABLE OF VALUES

| NC 12<br>IEC SIZE : 0805 |                   |                  |  |                            |
|--------------------------|-------------------|------------------|--|----------------------------|
| Types                    | Rn at 25°C<br>(Ω) | Material<br>Code | B (K)<br>( $\Delta B/B$ <sup>(1)</sup> ± 5%<br>(2) ± 3%) | $\alpha$ at 25°C<br>(%/°C) |
| NC 12 KC 0 180           | 18                | KC               | 3470 ± 5%  | - 3.9                      |
| NC 12 KC 0 220           | 22                |                  |  |                            |
| NC 12 KC 0 270           | 27                |                  |  |                            |
| NC 12 KC 0 330           | 33                |                  |  |                            |
| NC 12 KC 0 390           | 39                |                  |  |                            |
| NC 12 KC 0 470           | 47                |                  |  |                            |
| NC 12 KC 0 560           | 56                |                  |  |                            |
| NC 12 KC 0 680           | 68                |                  |  |                            |
| NC 12 KC 0 820           | 82                |                  |  |                            |
| NC 12 KC 0 101           | 100               |                  |  |                            |
| NC 12 MC 0 121           | 120               | MC               | 3910 ± 3%  | - 4.4                      |
| NC 12 MC 0 151           | 150               |                  |  |                            |
| NC 12 MC 0 181           | 180               |                  |  |                            |
| NC 12 MC 0 221           | 220               |                  |  |                            |
| NC 12 MC 0 271           | 270               |                  |  |                            |
| NC 12 MC 0 331           | 330               |                  |  |                            |
| NC 12 MC 0 391           | 390               |                  |  |                            |
| NC 12 MC 0 471           | 470               |                  |  |                            |
| NC 12 MC 0 561           | 560               |                  |  |                            |
| NC 12 MC 0 681           | 680               |                  |  |                            |
| NC 12 MC 0 821           | 820               |                  |  |                            |
| NC 12 MC 0 102           | 1,000             |                  |  |                            |
| NC 12 MC 0 122           | 1,200             |                  |  |                            |
| NC 12 MC 0 152           | 1,500             |                  |  |                            |
| NC 12 MC 0 182           | 1,800             |                  |  |                            |
| NC 12 MC 0 222           | 2,200             |                  |  |                            |
| NC 12 MC 0 272           | 2,700             |                  |  |                            |
| NC 12 MC 0 332           | 3,300             |                  |  |                            |
| NC 12 J 0 0332           | 3,300             | J                | 3480 ± 3%  | - 3.9                      |
| NC 12 J 0 0392           | 3,900             |                  |  |                            |
| NC 12 J 0 0472           | 4,700             |                  |  |                            |
| NC 12 J 0 0562           | 5,600             |                  |  |                            |
| NC 12 K 0 0682           | 6,800             | K                | 3630 ± 3%  | - 4.0                      |
| NC 12 K 0 0822           | 8,200             |                  |  |                            |
| NC 12 K 0 0103           | 10,000            |                  |  |                            |
| NC 12 K 0 0123           | 12,000            |                  |  |                            |
| NC 12 L 0 0153           | 15,000            | L                | 3790 ± 3%  | - 4.2                      |
| NC 12 L 0 0183           | 18,000            |                  |  |                            |
| NC 12 M 0 0223           | 22,000            | M                | 3950 ± 3%  | - 4.4                      |
| NC 12 M 0 0273           | 27,000            |                  |  |                            |
| NC 12 M 0 0333           | 33,000            |                  |  |                            |
| NC 12 M 0 0393           | 39,000            |                  |  |                            |
| NC 12 N 0 0473           | 47,000            | N                | 4080 ± 3%  | - 4.6                      |
| NC 12 N 0 0563           | 56,000            |                  |  |                            |
| NC 12 L 2 0683           | 68,000            | L2               | 3805 ± 3%  | - 4.1                      |
| NC 12 N 0 0823           | 82,000            | N                | 4080 ± 3%  | - 4.6                      |
| NC 12 P 0 0104           | 100,000           | P                | 4220 ± 3%  | - 4.7                      |
| NC 12 P 0 0124           | 120,000           |                  |  |                            |
| NC 12 P 0 0154           | 150,000           |                  |  |                            |
| NC 12 P 0 0184           | 180,000           |                  |  |                            |
| NC 12 Q 0 0224           | 220,000           | Q                | 4300 ± 3%  | -4.7                       |

| NC 20<br>IEC SIZE : 1206 |                   |                  |  |                            |   |           |       |
|--------------------------|-------------------|------------------|--|----------------------------|---|-----------|-------|
| Types                    | Rn at 25°C<br>(Ω) | Material<br>Code | B (K)<br>( $\Delta B/B$ <sup>(1)</sup> ± 5%<br>(2) ± 3%) | $\alpha$ at 25°C<br>(%/°C) |   |           |       |
| NC 20 KC 0 100           | 10                | KC               | 3470 ± 5%  | - 3.9                      |   |           |       |
| NC 20 KC 0 120           | 12                |                  |  |                            |   |           |       |
| NC 20 KC 0 150           | 15                |                  |  |                            |   |           |       |
| NC 20 KC 0 180           | 18                |                  |  |                            |   |           |       |
| NC 20 KC 0 220           | 22                |                  |  |                            |   |           |       |
| NC 20 KC 0 270           | 27                |                  |  |                            |   |           |       |
| NC 20 KC 0 330           | 33                |                  |  |                            |   |           |       |
| NC 20 KC 0 390           | 39                |                  |  |                            |   |           |       |
| NC 20 KC 0 470           | 47                |                  |  |                            |   |           |       |
| NC 20 KC 0 560           | 56                |                  |  |                            |   |           |       |
| NC 20 KC 0 680           | 68                |                  |  |                            |   |           |       |
| NC 20 KC 0 820           | 82                |                  |  |                            |   |           |       |
| NC 20 KC 0 101           | 100               |                  |  |                            |   |           |       |
| NC 20 MC 0 121           | 120               | MC               | 3910 ± 3%  | - 4.4                      |   |           |       |
| NC 20 MC 0 151           | 150               |                  |  |                            |   |           |       |
| NC 20 MC 0 181           | 180               |                  |  |                            |   |           |       |
| NC 20 MC 0 221           | 220               |                  |  |                            |   |           |       |
| NC 20 MC 0 271           | 270               |                  |  |                            |   |           |       |
| NC 20 MC 0 331           | 330               |                  |  |                            |   |           |       |
| NC 20 MC 0 391           | 390               |                  |  |                            |   |           |       |
| NC 20 MC 0 471           | 470               |                  |  |                            |   |           |       |
| NC 20 MC 0 561           | 560               |                  |  |                            |   |           |       |
| NC 20 MC 0 681           | 680               |                  |  |                            |   |           |       |
| NC 20 MC 0 821           | 820               |                  |  |                            |   |           |       |
| NC 20 MC 0 102           | 1,000             |                  |  |                            |   |           |       |
| NC 20 MC 0 122           | 1,200             |                  |  |                            |   |           |       |
| NC 20 MC 0 152           | 1,500             |                  |  |                            |   |           |       |
| NC 20 I 0 0182           | 1,800             |                  |  |                            | I | 3250 ± 5% | - 3.7 |
| NC 20 I 0 0222           | 2,200             |                  |  |                            |   |           |       |
| NC 20 I 0 0272           | 2,700             |                  |  |                            |   |           |       |
| NC 20 I 0 0332           | 3,300             |                  |  |                            |   |           |       |
| NC 20 J 0 0392           | 3,900             | J                | 3480 ± 3%  | - 3.9                      |   |           |       |
| NC 20 J 0 0472           | 4,700             |                  |  |                            |   |           |       |
| NC 20 J 0 0562           | 5,600             |                  |  |                            |   |           |       |
| NC 20 J 0 0682           | 6,800             |                  |  |                            |   |           |       |
| NC 20 K 0 0822           | 8,200             | K                | 3630 ± 3%  | - 4.0                      |   |           |       |
| NC 20 K 0 0103           | 10,000            |                  |  |                            |   |           |       |
| NC 20 K 0 0123           | 12,000            |                  |  |                            |   |           |       |
| NC 20 K 0 0153           | 15,000            |                  |  |                            |   |           |       |
| NC 20 L 0 0183           | 18,000            | L                | 3790 ± 3%  | - 4.2                      |   |           |       |
| NC 20 L 0 0223           | 22,000            |                  |  |                            |   |           |       |
| NC 20 M 0 0273           | 27,000            | M                | 3950 ± 3%  | - 4.4                      |   |           |       |
| NC 20 M 0 0333           | 33,000            |                  |  |                            |   |           |       |
| NC 20 M 0 0393           | 39,000            |                  |  |                            |   |           |       |
| NC 20 M 0 0473           | 47,000            |                  |  |                            |   |           |       |
| NC 20 N 0 0563           | 56,000            | N                | 4080 ± 3%  | - 4.6                      |   |           |       |
| NC 20 N 0 0683           | 68,000            |                  |  |                            |   |           |       |
| NC 20 N 0 0823           | 82,000            |                  |  |                            |   |           |       |
| NC 20 N 0 0104           | 100,000           |                  |  |                            |   |           |       |
| NC 20 P 0 0124           | 120,000           | P                | 4220 ± 3%  | - 4.7                      |   |           |       |
| NC 20 P 0 0154           | 150,000           |                  |  |                            |   |           |       |
| NC 20 P 0 0184           | 180,000           |                  |  |                            |   |           |       |
| NC 20 P 0 0224           | 220,000           |                  |  |                            |   |           |       |
| NC 20 Q 0 0274           | 270,000           | Q                | 4300 ± 3%  | - 4.7                      |   |           |       |
| NC 20 Q 0 0334           | 330,000           |                  |  |                            |   |           |       |
| NC 20 Q 0 0394           | 390,000           |                  |  |                            |   |           |       |
| NC 20 Q 0 0474           | 470,000           |                  |  |                            |   |           |       |
| NC 20 R 0 0564           | 560,000           | R                | 4400 ± 3%  | - 4.8                      |   |           |       |
| NC 20 R 0 0684           | 680,000           |                  |  |                            |   |           |       |
| NC 20 R 0 0824           | 820,000           |                  |  |                            |   |           |       |
| NC 20 R 0 0105           | 1,000,000         |                  |  |                            |   |           |       |

# Packaging for Automatic Insertion

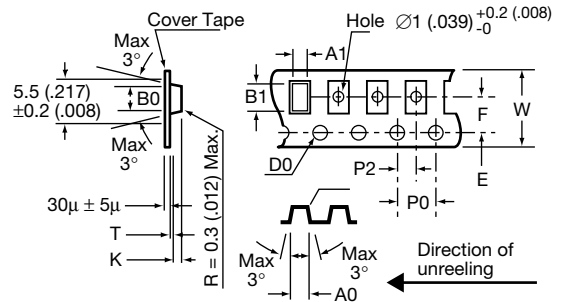
## NTC Chip Thermistors / NC/NB Series



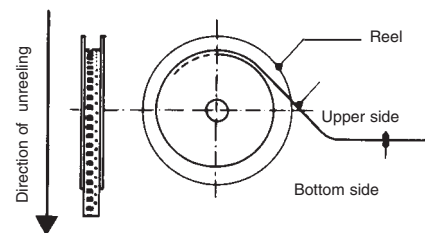
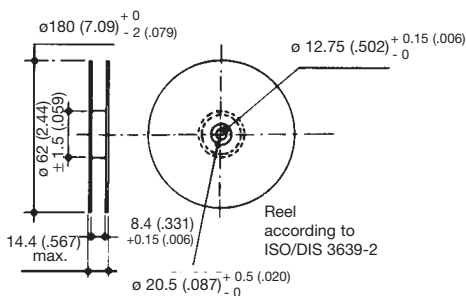
### AUTOMATIC INSERTION

#### Super 8 Plastic Tape Packaging:

The mechanical and dimensional reel characteristics are in accordance with the IEC publication 286-3.



| Designation                    | Symbol       | Value     | Tolerance |   |
|--------------------------------|--------------|-----------|-----------|---|
| Tape width                     | W            | 8         | ±0.2      |   |
| Tape thickness                 | T            | 0.4 max.  |           |   |
| Pitch of the sprocket holes    | P0           | 4         | ±0.1      |   |
| Diameter of the sprocket holes | D0           | 1.5<br>-0 | ±0.1      |   |
| Distance                       | E            | 1.75      | ±0.1      |   |
| Distance (center to center)    | F            | 3.5       | ±0.05     |   |
| Distance (center to center)    | P2           | 2         | ±0.1      |   |
| Sizes of the cavities          | NC 12 (0805) | A0        | 1.5       | ±0.1  |
|                                |              | B0        | 2.4       | ±0.1  |
|                                |              | K         | 1.4 max.  | K ±0.1<br>(size is adjustable)<br>(K = t1 +0.2) |
| NC 20 (1206)                   |              | A0        | 1.95      | ±0.1  |
|                                |              | B0        | 3.55      | ±0.1  |
|                                |              | K         | 1.5 max.  | K ±0.1<br>(size is adjustable)<br>(K = t1 +0.2) |



### QUANTITY PER REEL

| Type | Suffix | Description                     | Qty Per Reel |
|------|--------|---------------------------------|--------------|
| NB20 | BA     | Plastic tape (180mm diam. reel) | 3,000 pcs    |
|      | BE     | Plastic tape (1/2 reel)         | 1,500 pcs    |
| NC20 | BC     | Plastic tape (330mm diam. reel) | 10,000 pcs   |

# Packaging for Automatic Insertion

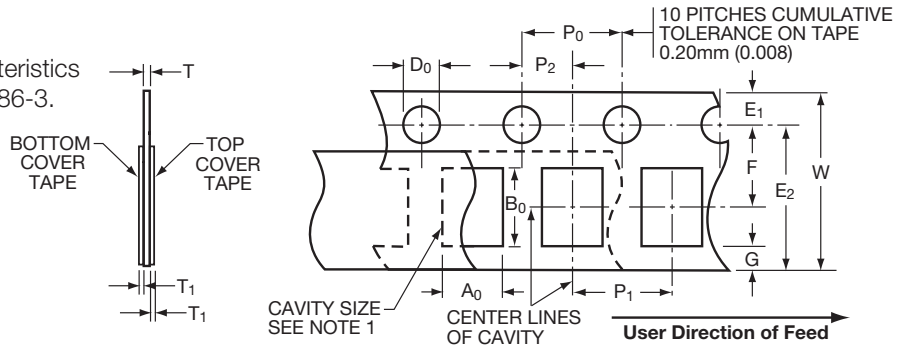
## NTC Chip Thermistors / NC/NB Series



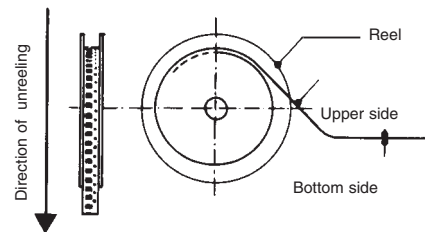
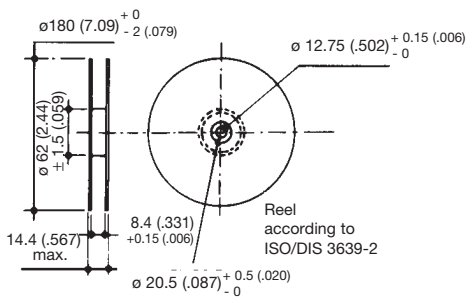
### AUTOMATIC INSERTION

#### 8mm Paper Tape Packaging:

The mechanical and dimensional reel characteristics are in accordance with the IEC publication 286-3.



| Designation                    | Symbol | Value     | Tolerance    |
|--------------------------------|--------|-----------|--------------|
| Tape width                     | W      | 8         | $-.0.1/+0.3$ |
| Tape thickness                 | T      | 1.1 max.  |              |
| Pitch of the sprocket holes    | $P_0$  | 4         | $\pm 0.1$    |
| Diameter of the sprocket holes | $D_0$  | $-0/+0.1$ | $\pm 0.1$    |
| Distance                       | $E_1$  | 1.75      | $\pm 0.1$    |
| Distance (center to center)    | F      | 3.5       | $\pm 0.05$   |
| Distance (center to center)    | $P_2$  | 2         | $\pm 0.05$   |
| Cover tape thickness           | $T_1$  | 0.10 max. |              |
| Distance                       | $E_2$  | 6.25 min. |              |
| Distance                       | G      | 0.75 min. |              |
| Component pitch                | $P_1$  | 0805/0603 | $\pm 0.1$    |
|                                |        | 0402      | $\pm 0.1$    |



### QUANTITY PER REEL

| Type | Suffix | Description                       | Qty Per Reel |
|------|--------|-----------------------------------|--------------|
| NB12 | BB     | Cardboard tape (180mm diam. reel) | 4,000 pcs    |
| NC12 | BF     | Cardboard tape (1/2 reel)         | 2,000 pcs    |
| NB21 | BD     | Cardboard tape (330mm diam. reel) | 10,000 pcs   |

# Surface Mounting Guide

## Chip Thermistor – Application Notes



### STORAGE

Good solderability is maintained for at least twelve months, provided the components are stored in their “as received” packaging at less than 40°C and 70% RH.

### SOLDERABILITY / LEACHING

Terminations to be well soldered after immersion in a 60/40 tin/lead solder bath at  $235 \pm 5^\circ\text{C}$  for  $2 \pm 1$  seconds.

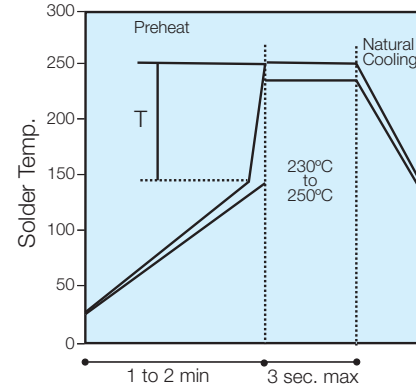
Terminations will resist leaching for at least the immersion times and conditions recommendations shown below.

| P/N | Termination Type | Solder Tin/Lead | Solder Temp °C | Immersion Time Seconds |
|-----|------------------|-----------------|----------------|------------------------|
| NC  | AgPdPt           | 60/40           | $260 \pm 5$    | 15 max                 |
| NB  | Nickel Barrier   | 60/40           | $260 \pm 5$    | $30 \pm 1$             |

NB products are compatible with a wide range of soldering conditions consistent with good manufacturing practice for surface mount components. This includes Pb free reflow processes with peak temperatures up to  $270^\circ\text{C}$ . Recommended profiles for reflow and wave soldering are shown below for reference.

NC products are recommended for lead soldering application or gluing techniques.

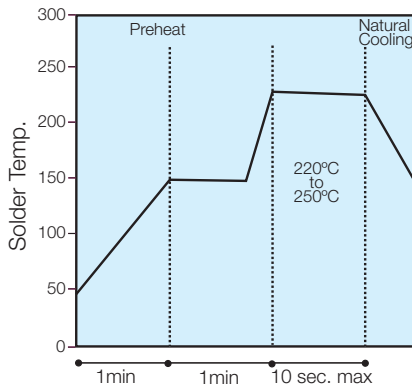
### Wave



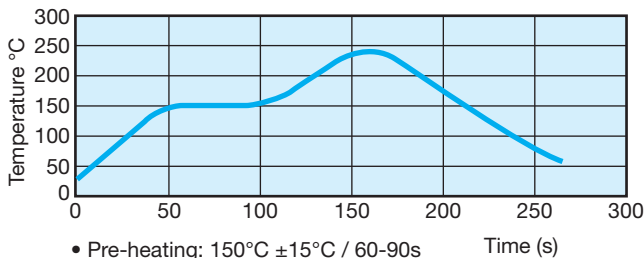
(Preheat chips before soldering)  
T/maximum  $150^\circ\text{C}$

- The visual standards used for evaluation of solder joints will need to be modified as lead free joints are not as bright as with tin-lead pastes and the fillet may not be as large.
- Resin color may darken slightly due to the increase in temperature required for the new pastes.
- Lead-free solder pastes do not allow the same self alignment as lead containing systems. Standard mounting pads are acceptable, but machine set up may need to be modified.

### Reflow



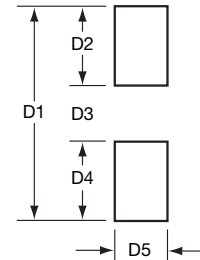
(Minimize soldering time)



- Pre-heating:  $150^\circ\text{C} \pm 15^\circ\text{C}$  / 60-90s
- Max. Peak Gradient:  $2.5^\circ\text{C/s}$
- Peak Temperature:  $245^\circ\text{C} \pm 5^\circ\text{C}$
- Time at  $>230^\circ\text{C}$ : 40s Max.

### RECOMMENDED SOLDERING PAD LAYOUT

Dimensions in mm (inches)



### REFLOW SOLDERING

| Case Size | P/N  | D1             | D2             | D3             | D4             | D5             |
|-----------|------|----------------|----------------|----------------|----------------|----------------|
| 0402      | NB23 | 1.70<br>(.067) | 0.60<br>(.024) | 0.50<br>(.020) | 0.60<br>(.024) | 0.50<br>(.020) |
| 0603      | NB21 | 2.30<br>(.091) | 0.80<br>(.031) | 0.70<br>(.028) | 0.80<br>(.031) | 0.75<br>(.030) |
| 0805      | NB12 | 3.00<br>(.118) | 1.00<br>(.039) | 1.00<br>(.039) | 1.00<br>(.039) | 1.25<br>(.049) |
| 1206      | NB20 | 4.00<br>(.157) | 1.00<br>(.039) | 2.00<br>(.079) | 1.00<br>(.039) | 2.50<br>(.098) |

### WAVE SOLDERING

| Case Size | P/N  | D1             | D2             | D3             | D4             | D5             |
|-----------|------|----------------|----------------|----------------|----------------|----------------|
| 0603      | NB21 | 3.10<br>(.122) | 1.20<br>(.047) | 0.70<br>(.028) | 1.20<br>(.047) | 0.75<br>(.030) |
| 0805      | NB12 | 4.00<br>(.157) | 1.50<br>(.059) | 1.00<br>(.039) | 1.50<br>(.059) | 1.25<br>(.049) |
| 1206      | NB20 | 5.00<br>(.197) | 1.50<br>(.059) | 2.00<br>(.079) | 1.50<br>(.059) | 1.60<br>(.063) |











# Tables of Resistance vs Temperature

| T<br>(°C) | Material B(K) |        |                 |
|-----------|---------------|--------|-----------------|
|           | T 4630        |        |                 |
|           | R(T) / R25    | TF (%) | $\alpha$ (%/°C) |
| -55       | 137.06        | 27.2   | -7.33           |
| -50       | 94.94         | 23.5   | -7.15           |
| -45       | 66.35         | 20.2   | -6.98           |
| -40       | 46.78         | 17.3   | -6.82           |
| -35       | 33.25         | 14.7   | -6.66           |
| -30       | 23.84         | 12.4   | -6.50           |
| -25       | 17.23         | 10.3   | -6.35           |
| -20       | 12.54         | 8.5    | -6.20           |
| -15       | 9.206         | 6.9    | -6.05           |
| -10       | 6.807         | 5.6    | -5.91           |
| -5        | 5.070         | 4.3    | -5.77           |
| 0         | 3.803         | 3.3    | -5.63           |
| 5         | 2.873         | 2.4    | -5.50           |
| 10        | 2.185         | 1.6    | -5.36           |
| 15        | 1.673         | 1.0    | -5.23           |
| 20        | 1.289         | 0.4    | -5.11           |
| 25        | 1.0000        | 0.0    | -4.99           |
| 30        | 0.7805        | 0.4    | -4.86           |
| 35        | 0.6129        | 0.9    | -4.75           |
| 40        | 0.4841        | 1.4    | -4.63           |
| 45        | 0.3847        | 2.0    | -4.52           |
| 50        | 0.3074        | 2.6    | -4.41           |
| 55        | 0.2470        | 3.3    | -4.30           |
| 60        | 0.1996        | 4.0    | -4.19           |
| 65        | 0.1621        | 4.7    | -4.09           |
| 70        | 0.1323        | 5.4    | -3.99           |
| 75        | 0.1086        | 6.2    | -3.89           |
| 80        | 0.08951       | 7.0    | -3.80           |
| 85        | 0.07416       | 7.8    | -3.71           |
| 90        | 0.06172       | 8.6    | -3.62           |
| 95        | 0.05160       | 9.5    | -3.53           |
| 100       | 0.04333       | 10.3   | -3.44           |
| 105       | 0.03655       | 11.2   | -3.36           |
| 110       | 0.03095       | 12.0   | -3.28           |
| 115       | 0.02632       | 12.9   | -3.20           |
| 120       | 0.02246       | 13.7   | -3.12           |
| 125       | 0.01925       | 14.6   | -3.05           |
| 130       | 0.01656       | 15.5   | -2.97           |
| 135       | 0.01429       | 16.4   | -2.90           |
| 140       | 0.01238       | 17.3   | -2.83           |
| 145       | 0.01076       | 18.1   | -2.77           |
| 150       | 0.009383      | 19.0   | -2.70           |

| T<br>(°C) | Material B(K) |        |                 |
|-----------|---------------|--------|-----------------|
|           | U 4840        |        |                 |
|           | R(T) / R25    | TF (%) | $\alpha$ (%/°C) |
| -55       | 173.74        | 28.5   | -7.69           |
| -50       | 118.20        | 24.6   | -7.50           |
| -45       | 81.18         | 21.2   | -7.32           |
| -40       | 56.26         | 18.1   | -7.15           |
| -35       | 39.34         | 15.4   | -6.98           |
| -30       | 27.75         | 12.9   | -6.82           |
| -25       | 19.74         | 10.8   | -6.66           |
| -20       | 14.15         | 8.9    | -6.50           |
| -15       | 10.23         | 7.3    | -6.34           |
| -10       | 7.457         | 5.8    | -6.19           |
| -5        | 5.476         | 4.5    | -6.04           |
| 0         | 4.051         | 3.4    | -5.90           |
| 5         | 3.020         | 2.5    | -5.76           |
| 10        | 2.267         | 1.7    | -5.62           |
| 15        | 1.714         | 1.0    | -5.48           |
| 20        | 1.305         | 0.5    | -5.35           |
| 25        | 1.0000        | 0.0    | -5.22           |
| 30        | 0.7715        | 0.4    | -5.09           |
| 35        | 0.5991        | 0.9    | -4.97           |
| 40        | 0.4681        | 1.5    | -4.84           |
| 45        | 0.3680        | 2.1    | -4.72           |
| 50        | 0.2911        | 2.8    | -4.61           |
| 55        | 0.2316        | 3.4    | -4.49           |
| 60        | 0.1853        | 4.2    | -4.38           |
| 65        | 0.1491        | 4.9    | -4.28           |
| 70        | 0.1206        | 5.7    | -4.17           |
| 75        | 0.09812       | 6.5    | -4.07           |
| 80        | 0.08022       | 7.3    | -3.97           |
| 85        | 0.06591       | 8.2    | -3.87           |
| 90        | 0.05442       | 9.0    | -3.77           |
| 95        | 0.04515       | 9.9    | -3.68           |
| 100       | 0.03763       | 10.8   | -3.59           |
| 105       | 0.03150       | 11.7   | -3.50           |
| 110       | 0.02649       | 12.6   | -3.42           |
| 115       | 0.02237       | 13.5   | -3.33           |
| 120       | 0.01897       | 14.4   | -3.25           |
| 125       | 0.01615       | 15.3   | -3.17           |
| 130       | 0.01380       | 16.2   | -3.10           |
| 135       | 0.01184       | 17.1   | -3.02           |
| 140       | 0.01020       | 18.0   | -2.95           |
| 145       | 0.008814      | 19.0   | -2.88           |
| 150       | 0.007643      | 19.9   | -2.81           |