

NTC SMD Thermistors



NB 21 (Ni Barrier/100% Sn Termination)

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

A nickel barrier metallization provides outstanding qualities of solderability and enables this chip to meet the requirements of the most severe soldering processes including lead free soldering with peak temperatures up to 270°C.

| Types | NB 21 IEC SIZE : 0603 |
|--|--------------------------|
| DIMENSIONS: millimeters (inches) | |
| Terminations | Nickel Barrier/100% Tin |
| Marking | On packaging only |
| Climatic category | 40/125/56 |
| Operating temperature | -55°C to +150°C |
| Tolerance on R _n (25°C) | ±3%*, ±5%, ±10%, ±20% |
| Maximum dissipation at 25°C | 0.07 W |
| Thermal dissipation factor | 1 mW/°C |
| Thermal time constant | 4 s |

Resistance - Temperature characteristics: pages 29 to 33.

FEATURES

- Fast thermal response
- Commercial, Industrial and Automotive Applications
- Ni Barrier/100% Sn Termination
- Suitable for lead free reflow or wave soldering
- AEC-Q200 based qualification

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

| | | | | |
|----------------------------|--|---|---|---|
| NB 21 | K 0 | 0103 | M | BB |
| Type NB21 (0603) | Material Code K (See tables pages 11) | Resistance 10,000 Ω (See tables page 11) | Tolerance H (±3%)* J (±5%) K (±10%) M (±20%) | Suffix: Packaging --: Bulk (5000 pcs/bag) BB: Cardboard tape (180mm diam. reel, 4000 pcs/reel) BF: Cardboard tape (1/2 reel, 2000 pcs/reel) BD: Cardboard tape (330mm diam. reel, 10,000 pcs/reel) |

* Optional tolerance, please contact factory

NTC SMD Thermistors

NB 21 (Ni Barrier/100% Sn Termination)



TABLE OF VALUES

| NB 21 IEC SIZE : 0603 | | | | |
|--------------------------|-------------------|------------------|---|---------------------|
| Types | Rn at 25°C (Ω) | Material Code | B (K) ($\Delta B/B$ ⁽¹⁾ ± 5% ⁽²⁾ ± 3%) | α at 25°C (%/°C) |
| NB 21 KC 0 470 | 47 | KC | 3470 ± 5% | - 3.9 |
| NB 21 KC 0 101 | 100 | | | |
| NB 21 KC 0 471 | 470 | | | |
| NB 21 MC 0 102 | 1,000 | MC | 3910 ± 3% | - 4.4 |
| NB 21 J 0 0472 | 4,700 | J | 3480 ± 3% | - 3.9 |
| NB 21 J 0 0502 | 5,000 | | | |
| NB 21 J 5 0682 | 6,800 | J5 | 3480 ± 3% | - 3.9 |
| NB 21 J 5 0103 | 10,000 | | | |
| NB 21 K 0 0103 | 10,000 | K | 3630 ± 3% | - 4.0 |
| NB 21 K 0 0153 | 15,000 | | | |
| NB 21 L 0 0223 | 22,000 | L | 3790 ± 3% | - 4.2 |
| NB 21 M 0 0333 | 33,000 | M | 3950 ± 3% | - 4.4 |
| NB 21 M 0 0473 | 47,000 | | | |
| NB 21 M4 0 503 | 50,000 | M4 | 4000 ± 3% | - 4.4 |
| NB 21 L 2 0683 | 68,000 | L2 | 3805 ± 3% | - 4.1 |
| NB 21 N 0 0683 | 68,000 | N | 4080 ± 3% | - 4.6 |
| NB 21 N 5 0104 | 100,000 | N5 | 4160 ± 3% | - 4.7 |
| NB 21 P 0 0154 | 150,000 | P | 4220 ± 3% | - 4.7 |
| NB 21 Q 0 0334 | 330,000 | Q | 4300 ± 3% | - 4.7 |
| NB 21 Q 0 0474 | 470,000 | | | |

NTC SMD Thermistors



NB 12 - NB 20 (Ni Barrier/100% Sn Termination)

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

A nickel barrier metallization provides outstanding qualities of solderability and enables this chip to meet the requirements of the most severe soldering processes including lead free soldering with peak temperatures up to 270°C.

| Types | NB 12 IEC SIZE : 0805 | NB 20 IEC SIZE : 1206 |
|--|--------------------------|--------------------------|
| DIMENSIONS: millimeters (inches) | | |
| Terminations | Nickel Barrier/100% Tin | |
| Marking | On packaging only | |
| Climatic category | 40/125/56 | |
| Operating temperature | -55°C to +150°C | |
| Tolerance on R _n (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 | 7s |

Resistance - Temperature characteristics: pages 29 to 33.

FEATURES

- Fast thermal response
- Commercial, Industrial and Automotive Applications
- Ni Barrier/100% Sn Termination
- Suitable for lead free reflow or wave soldering
- AEC-Q200 based qualification

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

NB 20
Type
NB12 (0805)
NB20 (1206)

K 0
Material Code
K
(See tables pages 13)

0103
Resistance
10,000 Ω
(See tables page 13)

M
Tolerance
H (±3%)*
J (±5%)
K (±10%)
M (±20%)

BA
Suffix: Packaging
-- : Bulk (5000 pcs/bag)
NB20 BA: Plastic tape (180mm diam. reel, 3000 pcs/reel)
BE: Plastic tape (1/2 reel, 1500 pcs/reel)
BC: Plastic tape (330mm diam. reel, 10,000 pcs/reel)
NB12 BB: Cardboard tape (180mm diam. reel, 4000 pcs/reel)
BF: Cardboard tape (1/2 reel, 2000 pcs/reel)
BD: Cardboard tape (330mm diam. reel, 10,000 pcs/reel)

* Optional tolerance, please contact factory

NTC SMD Thermistors

NB 12 - NB 20 (Ni Barrier/100% Sn Termination)



TABLE OF VALUES

| NB 12 IEC SIZE : 0805 | | | | |
|--------------------------|----------------|---------------|--|---------------------|
| Types | Rn at 25°C (Ω) | Material Code | B (K) (⁽¹⁾ ±5% (⁽²⁾ ±3%) | α at 25°C (%/°C) |
| NB 12 KC 0 180 | 18 | KC | 3470 ± 5% | - 3.9 |
| NB 12 KC 0 220 | 22 | | | |
| NB 12 KC 0 270 | 27 | | | |
| NB 12 KC 0 330 | 33 | | | |
| NB 12 KC 0 390 | 39 | | | |
| NB 12 KC 0 470 | 47 | | | |
| NB 12 KC 0 560 | 56 | | | |
| NB 12 KC 0 680 | 68 | | | |
| NB 12 KC 0 820 | 82 | | | |
| NB 12 KC 0 101 | 100 | | | |
| NB 12 MC 0 121 | 120 | MC | 3910 ± 3% | - 4.4 |
| NB 12 MC 0 151 | 150 | | | |
| NB 12 MC 0 181 | 180 | | | |
| NB 12 MC 0 221 | 220 | | | |
| NB 12 MC 0 271 | 270 | | | |
| NB 12 MC 0 331 | 330 | | | |
| NB 12 MC 0 391 | 390 | | | |
| NB 12 MC 0 471 | 470 | | | |
| NB 12 MC 0 561 | 560 | | | |
| NB 12 MC 0 681 | 680 | | | |
| NB 12 MC 0 821 | 820 | | | |
| NB 12 MC 0 102 | 1,000 | | | |
| NB 12 MC 0 122 | 1,200 | | | |
| NB 12 MC 0 152 | 1,500 | | | |
| NB 12 MC 0 182 | 1,800 | | | |
| NB 12 MC 0 222 | 2,200 | | | |
| NB 12 MC 0 272 | 2,700 | | | |
| NB 12 MC 0 332 | 3,300 | | | |
| NB 12 J 0 0332 | 3,300 | J | 3480 ± 3% | - 3.9 |
| NB 12 J 0 0392 | 3,900 | | | |
| NB 12 J 0 0472 | 4,700 | | | |
| NB 12 J 0 0502 | 5,000 | | | |
| NB 12 J 0 0562 | 5,600 | | | |
| NB 12 K 0 0682 | 6,800 | K | 3630 ± 3% | - 4.0 |
| NB 12 K 0 0822 | 8,200 | | | |
| NB 12 K 0 0103 | 10,000 | | | |
| NB 12 K 0 0123 | 12,000 | | | |
| NB 12 L 0 0153 | 15,000 | L | 3790 ± 3% | - 4.2 |
| NB 12 L 0 0183 | 18,000 | | | |
| NB 12 M 0 0223 | 22,000 | M | 3950 ± 3% | - 4.4 |
| NB 12 M 0 0273 | 27,000 | | | |
| NB 12 M 0 0333 | 33,000 | | | |
| NB 12 M 0 0393 | 39,000 | | | |
| NB 12 N 0 0473 | 47,000 | N | 4080 ± 3% | - 4.6 |
| NB 12 N 0 0503 | 50,000 | | | |
| NB 12 N 0 0563 | 56,000 | | | |
| NB 12 L 2 0683 | 68,000 | L2 | 3805 ± 3% | - 4.1 |
| NB 12 N 0 0823 | 82,000 | N | 4080 ± 3% | - 4.6 |
| NB 12 P 0 0104 | 100,000 | P | 4220 ± 3% | - 4.7 |
| NB 12 P 0 0124 | 120,000 | | | |
| NB 12 P 0 0154 | 150,000 | | | |
| NB 12 P 0 0184 | 180,000 | | | |
| NB 12 Q 0 0224 | 220,000 | Q | 4300 ± 3% | -4.7 |

| NB 20 IEC SIZE : 1206 | | | | |
|--------------------------|----------------|---------------|--|---------------------|
| Types | Rn at 25°C (Ω) | Material Code | B (K) (⁽¹⁾ ±5% (⁽²⁾ ±3%) | α at 25°C (%/°C) |
| NB 20 MC 0 221 | 220 | MC | 3910 ± 3% | - 4.4 |
| NB 20 MC 0 102 | 1,000 | M C | 3910 ± 3% | - 4.4 |
| NB 20 J 0 0472 | 4,700 | J | 3480 ± 3% | - 3.9 |
| NB 20 J 0 0502 | 5,000 | | | |
| NB 20 J 0 0562 | 5,600 | | | |
| NB 20 J 0 0682 | 6,800 | | | |
| NB 20 J 5 0822 | 8,200 | J5 | 3480 ± 3% | - 3.9 |
| NB 20 K 0 0103 | 10,000 | K | 3630 ± 3% | - 4.0 |
| NB 20 K 0 0123 | 12,000 | | | |
| NB 20 L 0 0153 | 15,000 | L | 3790 ± 3% | - 4.2 |
| NB 20 L 0 0183 | 18,000 | | | |
| NB 20 L 0 0223 | 22,000 | | | |
| NB 20 M 0 0273 | 27,000 | M | 3950 ± 3% | - 4.4 |
| NB 20 M 0 0333 | 33,000 | | | |
| NB 20 M 0 0393 | 39,000 | | | |
| NB 20 M 0 0473 | 47,000 | | | |
| NB 20 M 4 0503 | 50,000 | M4 | 4000 ± 3% | - 4.4 |
| NB 20 N 0 0563 | 56,000 | N | 4080 ± 3% | - 4.6 |
| NB 20 N 0 0683 | 68,000 | | | |
| NB 20 N 0 0823 | 82,000 | | | |
| NB 20 N 5 0104 | 100,000 | N5 | 4160 ± 3% | - 4.7 |
| NB 20 P 0 0124 | 120,000 | P | 4220 ± 3% | - 4.7 |
| NB 20 P 0 0154 | 150,000 | | | |
| NB 20 P 0 0184 | 180,000 | | | |
| NB 20 P 0 0224 | 220,000 | | | |
| NB 20 Q 0 0274 | 270,000 | Q | 4300 ± 3% | - 4.7 |
| NB 20 Q 0 0334 | 330,000 | | | |
| NB 20 Q 0 0394 | 390,000 | | | |
| NB 20 Q 0 0474 | 470,000 | | | |
| NB 20 Q 0 0564 | 560,000 | R | 4400 ± 3% | - 4.8 |
| NB 20 R 0 0684 | 680,000 | | | |
| NB 20 R 0 0824 | 820,000 | | | |
| NB 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 -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 (size is adjustable) (K = t1 +0.2) |
| | NC 20 (1206) | A0 | 1.95 | ±0.1 |
| | | B0 | 3.55 | ±0.1 |
| | | K | 1.5 max. | K ±0.1 (size is adjustable) (K = t1 +0.2) |



QUANTITY PER REEL

| Type | Suffix | Description | Qty Per Reel |
|--------------|--------|---------------------------------|--------------|
| NB20 NC20 | BA | Plastic tape (180mm diam. reel) | 3,000 pcs |
| | BE | Plastic tape (1/2 reel) | 1,500 pcs |
| | 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 | ± 0.1 |
| Diameter of the sprocket holes | D_0 | 1.5 | ± 0.1 |
| Distance | E_1 | 1.75 | ± 0.1 |
| Distance (center to center) | F | 3.5 | ± 0.05 |
| Distance (center to center) | P_2 | 2 | ± 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 | ± 0.1 |
| | | 0402 | ± 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 |
| NC21 | | | |

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 ± 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 ± 5 | 15 max |
| NB | Nickel Barrier | 60/40 | 260 ± 5 | 30 ± 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°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°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)

RECOMMENDED SOLDERING PAD LAYOUT

Dimensions in mm (inches)



REFLOW SOLDERING

| Case Size | P/N | D1 | D2 | D3 | D4 | D5 |
|-----------|------|----------------|----------------|----------------|----------------|----------------|
| 0603 | NB21 | 2.30 (.091) | 0.80 (.031) | 0.70 (.028) | 0.80 (.031) | 0.75 (.030) |
| 0805 | NB12 | 3.00 (.118) | 1.00 (.039) | 1.00 (.039) | 1.00 (.039) | 1.25 (.049) |
| 1206 | NB20 | 4.00 (.157) | 1.00 (.039) | 2.00 (.079) | 1.00 (.039) | 2.50 (.098) |

WAVE SOLDERING

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



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



Tables of Resistance vs Temperature



| T (°C) | Material B(K) | | |
|-----------|---------------|--------|----------|
| | I 3250 | | |
| | R(T) / R25 | TF (%) | α (%/°C) |
| -55 | 42.35 | 21.9 | -5.98 |
| -50 | 31.48 | 20.0 | -5.78 |
| -45 | 23.63 | 18.1 | -5.59 |
| -40 | 17.91 | 16.3 | -5.41 |
| -35 | 13.70 | 14.6 | -5.23 |
| -30 | 10.58 | 13.1 | -5.06 |
| -25 | 8.232 | 11.6 | -4.90 |
| -20 | 6.460 | 10.1 | -4.74 |
| -15 | 5.110 | 8.8 | -4.59 |
| -10 | 4.072 | 7.5 | -4.45 |
| -5 | 3.268 | 6.3 | -4.31 |
| 0 | 2.641 | 5.1 | -4.18 |
| 5 | 2.148 | 4.0 | -4.05 |
| 10 | 1.759 | 2.9 | -3.92 |
| 15 | 1.449 | 1.9 | -3.81 |
| 20 | 1.200 | 0.9 | -3.69 |
| 25 | 1.000 | 0.0 | -3.58 |
| 30 | 0.8377 | 0.9 | -3.48 |
| 35 | 0.7054 | 1.8 | -3.38 |
| 40 | 0.5969 | 2.6 | -3.28 |
| 45 | 0.5076 | 3.5 | -3.19 |
| 50 | 0.4336 | 4.3 | -3.10 |
| 55 | 0.3720 | 5.1 | -3.01 |
| 60 | 0.3206 | 5.9 | -2.93 |
| 65 | 0.2774 | 6.6 | -2.85 |
| 70 | 0.2410 | 7.4 | -2.77 |
| 75 | 0.2102 | 8.1 | -2.70 |
| 80 | 0.1839 | 8.8 | -2.63 |
| 85 | 0.1616 | 9.5 | -2.56 |
| 90 | 0.1424 | 10.2 | -2.49 |
| 95 | 0.1259 | 10.9 | -2.43 |
| 100 | 0.1117 | 11.5 | -2.36 |
| 105 | 0.09938 | 12.2 | -2.30 |
| 110 | 0.08869 | 12.8 | -2.25 |
| 115 | 0.07938 | 13.4 | -2.19 |
| 120 | 0.07124 | 14.0 | -2.14 |
| 125 | 0.06410 | 14.6 | -2.08 |
| 130 | 0.05783 | 15.2 | -2.03 |
| 135 | 0.05230 | 15.7 | -1.98 |
| 140 | 0.04741 | 16.3 | -1.94 |
| 145 | 0.04308 | 16.8 | -1.89 |
| 150 | 0.03924 | 17.4 | -1.85 |

| T (°C) | Material B(K) | | |
|-----------|---------------|--------|----------|
| | J-J5 3480 | | |
| | R(T) / R25 | TF (%) | α (%/°C) |
| -55 | 51.75 | 20.5 | -6.23 |
| -50 | 37.98 | 17.7 | -6.03 |
| -45 | 28.15 | 15.2 | -5.84 |
| -40 | 21.07 | 13.0 | -5.65 |
| -35 | 15.91 | 11.0 | -5.48 |
| -30 | 12.13 | 9.3 | -5.31 |
| -25 | 9.321 | 7.8 | -5.15 |
| -20 | 7.222 | 6.4 | -4.99 |
| -15 | 5.640 | 5.2 | -4.84 |
| -10 | 4.438 | 4.2 | -4.69 |
| -5 | 3.517 | 3.3 | -4.55 |
| 0 | 2.807 | 2.5 | -4.42 |
| 5 | 2.255 | 1.8 | -4.29 |
| 10 | 1.824 | 1.2 | -4.17 |
| 15 | 1.484 | 0.7 | -4.05 |
| 20 | 1.215 | 0.3 | -3.93 |
| 25 | 1.0000 | 0.0 | -3.82 |
| 30 | 0.8278 | 0.3 | -3.71 |
| 35 | 0.6889 | 0.7 | -3.61 |
| 40 | 0.5763 | 1.1 | -3.51 |
| 45 | 0.4845 | 1.5 | -3.41 |
| 50 | 0.4092 | 2.0 | -3.32 |
| 55 | 0.3472 | 2.5 | -3.23 |
| 60 | 0.2960 | 3.0 | -3.15 |
| 65 | 0.2533 | 3.5 | -3.06 |
| 70 | 0.2177 | 4.1 | -2.98 |
| 75 | 0.1879 | 4.7 | -2.90 |
| 80 | 0.1628 | 5.3 | -2.83 |
| 85 | 0.1415 | 5.9 | -2.76 |
| 90 | 0.12349 | 6.5 | -2.69 |
| 95 | 0.10813 | 7.1 | -2.62 |
| 100 | 0.09499 | 7.7 | -2.55 |
| 105 | 0.08372 | 8.4 | -2.49 |
| 110 | 0.07402 | 9.0 | -2.43 |
| 115 | 0.06564 | 9.7 | -2.37 |
| 120 | 0.05837 | 10.3 | -2.31 |
| 125 | 0.05206 | 11.0 | -2.26 |
| 130 | 0.04656 | 11.6 | -2.21 |
| 135 | 0.04175 | 12.3 | -2.15 |
| 140 | 0.03753 | 13.0 | -2.10 |
| 145 | 0.03382 | 13.6 | -2.06 |
| 150 | 0.03055 | 14.3 | -2.01 |

| T (°C) | Material B(K) | | |
|-----------|---------------|--------|----------|
| | K 3630 | | |
| | R(T) / R25 | TF (%) | α (%/°C) |
| -55 | 56.27 | 21.4 | -6.25 |
| -50 | 41.22 | 18.5 | -6.06 |
| -45 | 30.48 | 15.9 | -5.89 |
| -40 | 22.74 | 13.6 | -5.71 |
| -35 | 17.11 | 11.5 | -5.55 |
| -30 | 12.98 | 9.7 | -5.39 |
| -25 | 9.931 | 8.1 | -5.24 |
| -20 | 7.655 | 6.7 | -5.09 |
| -15 | 5.945 | 5.4 | -4.95 |
| -10 | 4.651 | 4.4 | -4.81 |
| -5 | 3.663 | 3.4 | -4.67 |
| 0 | 2.905 | 2.6 | -4.54 |
| 5 | 2.319 | 1.9 | -4.42 |
| 10 | 1.862 | 1.3 | -4.30 |
| 15 | 1.505 | 0.8 | -4.18 |
| 20 | 1.223 | 0.3 | -4.07 |
| 25 | 1.0000 | 0.0 | -3.96 |
| 30 | 0.8219 | 0.3 | -3.85 |
| 35 | 0.6792 | 0.7 | -3.75 |
| 40 | 0.5641 | 1.1 | -3.65 |
| 45 | 0.4708 | 1.6 | -3.55 |
| 50 | 0.3949 | 2.1 | -3.46 |
| 55 | 0.3327 | 2.6 | -3.37 |
| 60 | 0.2816 | 3.1 | -3.28 |
| 65 | 0.2393 | 3.7 | -3.20 |
| 70 | 0.2043 | 4.3 | -3.12 |
| 75 | 0.1751 | 4.9 | -3.04 |
| 80 | 0.1506 | 5.5 | -2.96 |
| 85 | 0.1301 | 6.1 | -2.89 |
| 90 | 0.1128 | 6.8 | -2.82 |
| 95 | 0.09811 | 7.4 | -2.75 |
| 100 | 0.08564 | 8.1 | -2.68 |
| 105 | 0.07501 | 8.7 | -2.61 |
| 110 | 0.06591 | 9.4 | -2.55 |
| 115 | 0.05809 | 10.1 | -2.49 |
| 120 | 0.05136 | 10.8 | -2.43 |
| 125 | 0.04554 | 11.5 | -2.37 |
| 130 | 0.04049 | 12.2 | -2.32 |
| 135 | 0.03611 | 12.8 | -2.26 |
| 140 | 0.03228 | 13.5 | -2.21 |
| 145 | 0.02893 | 14.2 | -2.16 |
| 150 | 0.02600 | 14.9 | -2.11 |

| T (°C) | Material B(K) | | |
|-----------|---------------|--------|----------|
| | KA 3625 | | |
| | R(T) / R25 | TF (%) | α (%/°C) |
| -55 | 61.22 | 7.1 | -6.55 |
| -50 | 44.25 | 6.1 | -6.33 |
| -45 | 32.34 | 5.3 | -6.12 |
| -40 | 23.88 | 4.5 | -5.92 |
| -35 | 17.81 | 3.8 | -5.73 |
| -30 | 13.41 | 3.2 | -5.54 |
| -25 | 10.19 | 2.7 | -5.37 |
| -20 | 7.815 | 2.2 | -5.20 |
| -15 | 6.041 | 1.8 | -5.04 |
| -10 | 4.707 | 1.5 | -4.89 |
| -5 | 3.696 | 1.1 | -4.74 |
| 0 | 2.923 | 0.9 | -4.60 |
| 5 | 2.329 | 0.6 | -4.46 |
| 10 | 1.867 | 0.4 | -4.33 |
| 15 | 1.507 | 0.3 | -4.21 |
| 20 | 1.224 | 0.1 | -4.09 |
| 25 | 1.0000 | 0.0 | -3.97 |
| 30 | 0.8217 | 0.1 | -3.86 |
| 35 | 0.6788 | 0.2 | -3.75 |
| 40 | 0.5638 | 0.4 | -3.65 |
| 45 | 0.4707 | 0.5 | -3.55 |
| 50 | 0.3948 | 0.7 | -3.46 |
| 55 | 0.3328 | 0.9 | -3.37 |
| 60 | 0.2817 | 1.0 | -3.28 |
| 65 | 0.2396 | 1.2 | -3.19 |
| 70 | 0.2046 | 1.4 | -3.11 |
| 75 | 0.1754 | 1.6 | -3.03 |
| 80 | 0.1510 | 1.8 | -2.96 |
| 85 | 0.1305 | 2.0 | -2.88 |
| 90 | 0.1131 | 2.3 | -2.81 |
| 95 | 0.09844 | 2.5 | -2.74 |
| 100 | 0.08596 | 2.7 | -2.68 |
| 105 | 0.07530 | 2.9 | -2.61 |
| 110 | 0.06618 | 3.1 | -2.55 |
| 115 | 0.05833 | 3.4 | -2.49 |
| 120 | 0.05157 | 3.6 | -2.43 |
| 125 | 0.04573 | 3.8 | -2.38 |
| 130 | 0.04065 | 4.0 | -2.32 |
| 135 | 0.03624 | 4.3 | -2.27 |
| 140 | 0.03239 | 4.5 | -2.22 |
| 145 | 0.02902 | 4.7 | -2.17 |
| 150 | 0.02607 | 5.0 | -2.12 |

| T (°C) | Material B(K) | | |
|-----------|---------------|--------|----------|
| | KC 3470 | | |
| | R(T) / R25 | TF (%) | α (%/°C) |
| -55 | 60.08 | 34.0 | -7.00 |
| -50 | 43.19 | 29.4 | -6.71 |
| -45 | 31.42 | 25.3 | -6.44 |
| -40 | 23.13 | 21.6 | -6.18 |
| -35 | 17.22 | 18.4 | -5.94 |
| -30 | 12.95 | 15.5 | -5.71 |
| -25 | 9.842 | 12.9 | -5.49 |
| -20 | 7.550 | 10.7 | -5.29 |
| -15 | 5.845 | 8.7 | -5.10 |
| -10 | 4.564 | 6.9 | -4.91 |
| -5 | 3.594 | 5.4 | -4.74 |
| 0 | 2.853 | 4.1 | -4.58 |
| 5 | 2.281 | 3.0 | -4.42 |
| 10 | 1.838 | 2.0 | -4.27 |
| 15 | 1.491 | 1.2 | -4.13 |
| 20 | 1.217 | 0.5 | -4.00 |
| 25 | 1.0000 | 0.0 | -3.90 |
| 30 | 0.8267 | 0.5 | -3.74 |
| 35 | 0.6873 | 1.1 | -3.63 |
| 40 | 0.5747 | 1.8 | -3.52 |
| 45 | 0.4830 | 2.5 | -3.41 |
| 50 | 0.4081 | 3.3 | -3.31 |
| 55 | 0.3465 | 4.1 | -3.21 |
| 60 | 0.2955 | 5.0 | -3.12 |
| 65 | 0.2532 | 5.9 | -3.03 |
| 70 | 0.2179 | 6.8 | -2.94 |
| 75 | 0.1883 | 7.8 | -2.86 |
| 80 | 0.1634 | 8.7 | -2.78 |
| 85 | 0.1423 | 9.7 | -2.71 |
| 90 | 0.1244 | 10.8 | -2.63 |
| 95 | 0.10915 | 11.8 | -2.56 |
| 100 | 0.09608 | 12.9 | -2.50 |
| 105 | 0.08486 | 13.9 | -2.43 |
| 110 | 0.07519 | 15.0 | -2.37 |
| 115 | 0.06683 | 16.1 | -2.31 |
| 120 | 0.05957 | 17.2 | -2.25 |
| 125 | 0.05325 | 18.3 | -2.20 |
| 130 | 0.04774 | 19.4 | -2.14 |
| 135 | 0.04290 | 20.5 | -2.09 |
| 140 | 0.03866 | 21.6 | -2.04 |
| 145 | 0.03492 | 22.7 | -1.99 |
| 150 | 0.03162 | 23.8 | -1.95 |

| T (°C) | Material B(K) | | |
|-----------|---------------|--------|----------|
| | KC 3470 | | |
| | R(T) / R25 | TF (%) | α (%/°C) |
| -55 | 82.54 | 22.3 | -7.12 |
| -50 | 58.03 | 19.3 | -6.87 |
| -45 | 41.31 | 16.6 | -6.63 |
| -40 | 29.75 | 14.2 | -6.40 |
| -35 | 21.68 | 12.0 | -6.18 |
| -30 | 15.97 | 10.1 | -5.98 |
| -25 | 11.88 | 8.5 | -5.78 |
| -20 | 8.931 | 7.0 | -5.59 |
| -15 | 6.777 | 5.7 | -5.40 |
| -10 | 5.188 | 4.5 | -5.23 |
| -5 | 4.007 | 3.6 | -5.06 |
| 0 | 3.120 | 2.7 | -4.90 |
| 5 | 2.449 | 2.0 | -4.75 |
| 10 | 1.937 | 1.3 | -4.60 |
| 15 | 1.543 | 0.8 | -4.46 |
| 20 | 1.238 | 0.4 | -4.33 |
| 25 | 1.0000 | 0.0 | -4.20 |
| 30 | 0.8128 | 0.3 | -4.07 |
| 35 | 0.6648 | 0.7 | -3.95 |
| 40 | 0.5469 | 1.2 | -3.84 |
| 45 | 0.4525 | 1.6 | -3.73 |
| 50 | 0.3764 | 2.2 | -3.62 |
| 55 | 0.3148 | 2.7 | -3.52 |
| 60 | 0.2646 | 3.3 | -3.42 |
| 65 | 0.2235 | 3.8 | -3.33 |
| 70 | 0.1896 | 4.5 | -3.24 |
| 75 | 0.1616 | 5.1 | -3.15 |
| 80 | 0.1383 | 5.7 | -3.07 |
| 85 | 0.1189 | 6.4 | -2.98 |
| 90 | 0.1026 | 7.1 | -2.91 |
| 95 | 0.08888 | 7.7 | -2.83 |
| 100 | 0.07728 | 8.4 | -2.76 |
| 105 | 0.06744 | 9.1 | -2.69 |
| 110 | 0.05905 | 9.8 | -2.62 |
| 115 | 0.05188 | 10.5 | -2.56 |
| 120 | 0.04572 | 11.3 | -2.49 |
| 125 | 0.04042 | 12.0 | -2.43 |
| 130 | 0.03585 | 12.7 | -2.37 |
| 135 | 0.03188 | 13.4 | -2.32 |
| 140 | 0.02843 | 14.1 | -2.26 |
| 145 | 0.02542 | 14.8 | -2.21 |
| 150 | 0.02279 | 15.6 | -2.16 |

Tables of Resistance vs Temperature



| T (°C) | Material B(K) | | |
|-----------|---------------|--------|----------|
| | L2 3805 | | |
| | R(T) / R25 | TF (%) | α (%/°C) |
| -55 | 62.45 | 22.4 | -6.41 |
| -50 | 45.40 | 19.3 | -6.22 |
| -45 | 33.33 | 16.6 | -6.03 |
| -40 | 24.70 | 14.2 | -5.85 |
| -35 | 18.47 | 12.1 | -5.68 |
| -30 | 13.92 | 10.2 | -5.52 |
| -25 | 10.58 | 8.5 | -5.36 |
| -20 | 8.110 | 7.0 | -5.21 |
| -15 | 6.260 | 5.7 | -5.07 |
| -10 | 4.867 | 4.6 | -4.93 |
| -5 | 3.810 | 3.6 | -4.80 |
| 0 | 3.003 | 2.7 | -4.67 |
| 5 | 2.382 | 2.0 | -4.55 |
| 10 | 1.901 | 1.3 | -4.43 |
| 15 | 1.526 | 0.8 | -4.31 |
| 20 | 1.232 | 0.4 | -4.20 |
| 25 | 1.0000 | 0.0 | -4.10 |
| 30 | 0.8161 | 0.3 | -4.00 |
| 35 | 0.6694 | 0.7 | -3.90 |
| 40 | 0.5518 | 1.2 | -3.80 |
| 45 | 0.4570 | 1.7 | -3.71 |
| 50 | 0.3802 | 2.2 | -3.62 |
| 55 | 0.3178 | 2.7 | -3.53 |
| 60 | 0.2667 | 3.3 | -3.45 |
| 65 | 0.2248 | 3.9 | -3.37 |
| 70 | 0.1902 | 4.5 | -3.29 |
| 75 | 0.1615 | 5.1 | -3.22 |
| 80 | 0.1377 | 5.8 | -3.14 |
| 85 | 0.1179 | 6.4 | -3.07 |
| 90 | 0.1012 | 7.1 | -3.00 |
| 95 | 0.08721 | 7.8 | -2.94 |
| 100 | 0.07539 | 8.5 | -2.87 |
| 105 | 0.06538 | 9.2 | -2.81 |
| 110 | 0.05688 | 9.9 | -2.75 |
| 115 | 0.04963 | 10.6 | -2.69 |
| 120 | 0.04343 | 11.3 | -2.63 |
| 125 | 0.03812 | 12.0 | -2.58 |
| 130 | 0.03354 | 12.7 | -2.53 |
| 135 | 0.02960 | 13.5 | -2.47 |
| 140 | 0.02618 | 14.2 | -2.42 |
| 145 | 0.02322 | 14.9 | -2.37 |
| 150 | 0.02064 | 15.6 | -2.33 |

| T (°C) | Material B(K) | | |
|-----------|---------------|--------|----------|
| | M 3950 | | |
| | R(T) / R25 | TF (%) | α (%/°C) |
| -55 | 99.59 | 15.6 | -7.42 |
| -50 | 68.97 | 14.3 | -7.16 |
| -45 | 48.40 | 12.9 | -6.91 |
| -40 | 34.38 | 11.7 | -6.67 |
| -35 | 24.71 | 10.5 | -6.45 |
| -30 | 17.97 | 9.4 | -6.23 |
| -25 | 13.20 | 8.3 | -6.02 |
| -20 | 9.804 | 7.3 | -5.82 |
| -15 | 7.352 | 6.3 | -5.63 |
| -10 | 5.565 | 5.4 | -5.45 |
| -5 | 4.251 | 4.5 | -5.28 |
| 0 | 3.275 | 3.7 | -5.11 |
| 5 | 2.544 | 2.9 | -4.95 |
| 10 | 1.992 | 2.1 | -4.80 |
| 15 | 1.572 | 1.4 | -4.65 |
| 20 | 1.249 | 0.7 | -4.51 |
| 25 | 1.0000 | 0.0 | -4.38 |
| 30 | 0.8057 | 0.7 | -4.25 |
| 35 | 0.6534 | 1.3 | -4.12 |
| 40 | 0.5331 | 1.9 | -4.00 |
| 45 | 0.4376 | 2.5 | -3.89 |
| 50 | 0.3612 | 3.1 | -3.77 |
| 55 | 0.2998 | 3.7 | -3.67 |
| 60 | 0.2501 | 4.3 | -3.57 |
| 65 | 0.2097 | 4.8 | -3.47 |
| 70 | 0.1767 | 5.3 | -3.37 |
| 75 | 0.1496 | 5.9 | -3.28 |
| 80 | 0.1272 | 6.4 | -3.19 |
| 85 | 0.1087 | 6.9 | -3.11 |
| 90 | 0.09320 | 7.4 | -3.03 |
| 95 | 0.08025 | 7.8 | -2.95 |
| 100 | 0.06937 | 8.3 | -2.87 |
| 105 | 0.06019 | 8.8 | -2.80 |
| 110 | 0.05242 | 9.2 | -2.73 |
| 115 | 0.04580 | 9.6 | -2.66 |
| 120 | 0.04016 | 10.1 | -2.60 |
| 125 | 0.03532 | 10.5 | -2.53 |
| 130 | 0.03117 | 10.9 | -2.47 |
| 135 | 0.02758 | 11.3 | -2.41 |
| 140 | 0.02448 | 11.7 | -2.36 |
| 145 | 0.02179 | 12.1 | -2.30 |
| 150 | 0.01945 | 12.4 | -2.25 |

| T (°C) | Material B(K) | | |
|-----------|---------------|--------|----------|
| | MA 3965 | | |
| | R(T) / R25 | TF (%) | α (%/°C) |
| -55 | 101.09 | 2.47 | -7.49 |
| -50 | 69.81 | 2.26 | -7.22 |
| -45 | 48.87 | 2.06 | -6.96 |
| -40 | 34.65 | 1.87 | -6.71 |
| -35 | 24.87 | 1.69 | -6.48 |
| -30 | 18.06 | 1.52 | -6.26 |
| -25 | 13.259 | 1.35 | -6.05 |
| -20 | 9.837 | 1.19 | -5.84 |
| -15 | 7.372 | 1.04 | -5.65 |
| -10 | 5.578 | 0.89 | -5.47 |
| -5 | 4.259 | 0.75 | -5.29 |
| 0 | 3.280 | 0.61 | -5.12 |
| 5 | 2.548 | 0.48 | -4.96 |
| 10 | 1.994 | 0.35 | -4.81 |
| 15 | 1.573 | 0.23 | -4.66 |
| 20 | 1.250 | 0.11 | -4.52 |
| 25 | 1.0000 | 0.00 | -4.38 |
| 30 | 0.8054 | 0.11 | -4.25 |
| 35 | 0.6528 | 0.22 | -4.13 |
| 40 | 0.5324 | 0.32 | -4.01 |
| 45 | 0.4368 | 0.42 | -3.90 |
| 50 | 0.3603 | 0.52 | -3.79 |
| 55 | 0.2989 | 0.61 | -3.68 |
| 60 | 0.2492 | 0.70 | -3.58 |
| 65 | 0.2088 | 0.79 | -3.48 |
| 70 | 0.1758 | 0.88 | -3.39 |
| 75 | 0.1487 | 0.96 | -3.30 |
| 80 | 0.1263 | 1.04 | -3.21 |
| 85 | 0.1078 | 1.12 | -3.13 |
| 90 | 0.0923 | 1.20 | -3.05 |
| 95 | 0.0794 | 1.27 | -2.97 |
| 100 | 0.06857 | 1.35 | -2.90 |
| 105 | 0.05942 | 1.42 | -2.83 |
| 110 | 0.05167 | 1.49 | -2.76 |
| 115 | 0.04509 | 1.55 | -2.69 |
| 120 | 0.03948 | 1.62 | -2.62 |
| 125 | 0.03467 | 1.68 | -2.56 |
| 130 | 0.03055 | 1.75 | -2.50 |
| 135 | 0.02699 | 1.81 | -2.44 |
| 140 | 0.02392 | 1.87 | -2.39 |
| 145 | 0.02125 | 1.93 | -2.33 |
| 150 | 0.01894 | 1.98 | -2.28 |

| T (°C) | Material B(K) | | |
|-----------|---------------|--------|----------|
| | MC 3910 | | |
| | R(T) / R25 | TF (%) | α (%/°C) |
| -55 | 100.6 | 23.0 | -7.56 |
| -50 | 69.29 | 19.9 | -7.27 |
| -45 | 48.40 | 17.1 | -7.00 |
| -40 | 34.27 | 14.6 | -6.75 |
| -35 | 24.57 | 12.4 | -6.50 |
| -30 | 17.83 | 10.5 | -6.27 |
| -25 | 13.09 | 8.7 | -6.05 |
| -20 | 9.71 | 7.2 | -5.84 |
| -15 | 7.282 | 5.9 | -5.64 |
| -10 | 5.514 | 4.7 | -5.45 |
| -5 | 4.215 | 3.7 | -5.27 |
| 0 | 3.250 | 2.8 | -5.10 |
| 5 | 2.528 | 2.0 | -4.93 |
| 10 | 1.982 | 1.4 | -4.77 |
| 15 | 1.567 | 0.8 | -4.62 |
| 20 | 1.247 | 0.4 | -4.48 |
| 25 | 1.0000 | 0.0 | -4.34 |
| 30 | 0.8072 | 0.4 | -4.21 |
| 35 | 0.6559 | 0.8 | -4.08 |
| 40 | 0.5362 | 1.2 | -3.96 |
| 45 | 0.4410 | 1.7 | -3.85 |
| 50 | 0.3647 | 2.2 | -3.74 |
| 55 | 0.3033 | 2.8 | -3.63 |
| 60 | 0.2535 | 3.4 | -3.53 |
| 65 | 0.2130 | 4.0 | -3.43 |
| 70 | 0.1798 | 4.6 | -3.34 |
| 75 | 0.1525 | 5.2 | -3.25 |
| 80 | 0.1300 | 5.9 | -3.16 |
| 85 | 0.1112 | 6.6 | -3.08 |
| 90 | 0.09552 | 7.3 | -2.99 |
| 95 | 0.08239 | 8.0 | -2.92 |
| 100 | 0.07133 | 8.7 | -2.84 |
| 105 | 0.06199 | 9.4 | -2.77 |
| 110 | 0.05406 | 10.1 | -2.70 |
| 115 | 0.04731 | 10.9 | -2.63 |
| 120 | 0.04153 | 11.6 | -2.57 |
| 125 | 0.03658 | 12.3 | -2.51 |
| 130 | 0.03231 | 13.1 | -2.45 |
| 135 | 0.02863 | 13.8 | -2.39 |
| 140 | 0.02544 | 14.6 | -2.33 |
| 145 | 0.02267 | 15.3 | -2.28 |
| 150 | 0.02025 | 16.1 | -2.23 |

| T (°C) | Material B(K) | | |
|-----------|---------------|--------|----------|
| | ME 3975 | | |
| | R(T) / R25 | TF (%) | α (%/°C) |
| -55 | 103.9 | 2.47 | -7.56 |
| -50 | 71.53 | 2.26 | -7.28 |
| -45 | 49.94 | 2.06 | -7.01 |
| -40 | 35.32 | 1.87 | -6.76 |
| -35 | 25.29 | 1.69 | -6.53 |
| -30 | 18.32 | 1.52 | -6.30 |
| -25 | 13.43 | 1.35 | -6.08 |
| -20 | 9.945 | 1.19 | -5.88 |
| -15 | 7.440 | 1.04 | -5.68 |
| -10 | 5.621 | 0.89 | -5.50 |
| -5 | 4.286 | 0.75 | -5.32 |
| 0 | 3.297 | 0.61 | -5.15 |
| 5 | 2.557 | 0.48 | -4.98 |
| 10 | 2.000 | 0.35 | -4.83 |
| 15 | 1.576 | 0.23 | -4.68 |
| 20 | 1.251 | 0.11 | -4.54 |
| 25 | 1.0000 | 0.00 | -4.40 |
| 30 | 0.8048 | 0.11 | -4.27 |
| 35 | 0.6519 | 0.22 | -4.14 |
| 40 | 0.5313 | 0.32 | -4.02 |
| 45 | 0.4356 | 0.42 | -3.91 |
| 50 | 0.3591 | 0.52 | -3.80 |
| 55 | 0.2977 | 0.61 | -3.69 |
| 60 | 0.2481 | 0.70 | -3.59 |
| 65 | 0.2078 | 0.79 | -3.49 |
| 70 | 0.1749 | 0.88 | -3.40 |
| 75 | 0.1479 | 0.96 | -3.31 |
| 80 | 0.1256 | 1.04 | -3.22 |
| 85 | 0.1071 | 1.12 | -3.14 |
| 90 | 0.09175 | 1.20 | -3.06 |
| 95 | 0.07890 | 1.27 | -2.98 |
| 100 | 0.06810 | 1.35 | -2.90 |
| 105 | 0.05900 | 1.42 | -2.83 |
| 110 | 0.05130 | 1.49 | -2.76 |
| 115 | 0.04476 | 1.55 | -2.69 |
| 120 | 0.03918 | 1.62 | -2.63 |
| 125 | 0.03441 | 1.68 | -2.57 |
| 130 | 0.03031 | 1.75 | -2.50 |
| 135 | 0.02678 | 1.81 | -2.45 |
| 140 | 0.02373 | 1.87 | -2.39 |
| 145 | 0.02108 | 1.93 | -2.34 |
| 150 | 0.01878 | 1.98 | -2.28 |

| T (°C) | Material B(K) | | |
|-----------|---------------|--------|----------|
| | M4 4400 | | |
| | R(T) / R25 | TF (%) | α (%/°C) |
| -55 | 98.22 | 23.5 | -7.38 |
| -50 | 68.17 | 20.3 | -7.12 |
| -45 | 47.92 | 17.5 | -6.88 |
| -40 | 34.11 | 14.9 | -6.64 |
| -35 | 24.57 | 12.7 | -6.42 |
| -30 | 17.89 | 10.7 | -6.20 |
| -25 | 13.17 | 8.9 | -6.00 |
| -20 | 9.790 | 7.4 | -5.80 |
| -15 | 7.349 | 6.0 | -5.62 |
| -10 | 5.568 | 4.8 | -5.44 |
| -5 | 4.256 | 3.8 | -5.27 |
| 0 | 3.280 | 2.8 | -5.11 |
| 5 | 2.549 | 2.1 | -4.95 |
| 10 | 1.996 | 1.4 | -4.80 |
| 15 | 1.574 | 0.8 | -4.66 |
| 20 | 1.250 | 0.4 | -4.52 |
| 25 | 1.0000 | 0.0 | -4.39 |
| 30 | 0.8049 | 0.4 | -4.27 |
| 35 | 0.6519 | 0.8 | -4.15 |
| 40 | 0.5311 | 1.2 | -4.03 |
| 45 | 0.4352 | 1.7 | -3.92 |
| 50 | 0.3586 | 2.3 | -3.81 |
| 55 | 0.2970 | 2.8 | -3.71 |
| 60 | 0.2472 | 3.4 | -3.61 |
| 65 | 0.2068 | 4.1 | -3.52 |
| 70 | 0.1738 | 4.7 | -3.42 |
| 75 | 0.1468 | 5.4 | -3.34 |
| 80 | 0.1245 | 6.0 | -3.25 |
| 85 | 0.1060 | 6.7 | -3.17 |
| 90 | 0.09060 | 7.4 | -3.09 |
| 95 | 0.07776 | 8.2 | -3.01 |
| 100 | 0.06700 | 8.9 | -2.94 |
| 105 | 0.05793 | 9.6 | -2.87 |
| 110 | 0.05026 | 10.4 | -2.80 |
| 115 | 0.04376 | 11.1 | -2.74 |
| 120 | 0.03822 | 11.9 | -2.67 |
| 125 | 0.03349 | 12.6 | -2.61 |
| 130 | 0.02944 | 13.4 | -2.55 |
| 135 | 0.02595 | 14.1 | -2.49 |
| 140 | 0.02294 | 14.9 | -2.44 |
| 145 | 0.02033 | 15.6 | -2.38 |
| 150 | 0.01807 | 16.4 | -2.33 |

Tables of Resistance vs Temperature



| T (°C) | Material B(K) | | |
|-----------|---------------|--------|----------|
| | MN 4077 | | |
| | R(T) / R25 | TF (%) | α (%/°C) |
| -55 | 103.56 | 2.54 | -7.39 |
| -50 | 71.79 | 2.32 | -7.14 |
| -45 | 50.39 | 2.12 | -6.90 |
| -40 | 35.79 | 1.92 | -6.68 |
| -35 | 25.71 | 1.74 | -6.46 |
| -30 | 18.67 | 1.56 | -6.25 |
| -25 | 13.70 | 1.39 | -6.06 |
| -20 | 10.15 | 1.22 | -5.87 |
| -15 | 7.59 | 1.06 | -5.68 |
| -10 | 5.73 | 0.91 | -5.51 |
| -5 | 4.36 | 0.77 | -5.34 |
| 0 | 3.35 | 0.63 | -5.18 |
| 5 | 2.59 | 0.49 | -5.03 |
| 10 | 2.02 | 0.36 | -4.88 |
| 15 | 1.59 | 0.24 | -4.74 |
| 20 | 1.26 | 0.12 | -4.60 |
| 25 | 1.00 | 0.00 | -4.47 |
| 30 | 0.80 | 0.11 | -4.35 |
| 35 | 0.65 | 0.22 | -4.23 |
| 40 | 0.52 | 0.33 | -4.11 |
| 45 | 0.43 | 0.43 | -4.00 |
| 50 | 0.35 | 0.53 | -3.89 |
| 55 | 0.29 | 0.63 | -3.79 |
| 60 | 0.24 | 0.72 | -3.69 |
| 65 | 0.20 | 0.81 | -3.59 |
| 70 | 0.17 | 0.90 | -3.50 |
| 75 | 0.14 | 0.99 | -3.41 |
| 80 | 0.12 | 1.07 | -3.32 |
| 85 | 0.10 | 1.15 | -3.24 |
| 90 | 0.09 | 1.23 | -3.16 |
| 95 | 0.07 | 1.31 | -3.08 |
| 100 | 0.06 | 1.38 | -3.00 |
| 105 | 0.05 | 1.46 | -2.93 |
| 110 | 0.05 | 1.53 | -2.86 |
| 115 | 0.04 | 1.60 | -2.79 |
| 120 | 0.04 | 1.67 | -2.73 |
| 125 | 0.03 | 1.73 | -2.66 |
| 130 | 0.03 | 1.80 | -2.60 |
| 135 | 0.02 | 1.86 | -2.54 |
| 140 | 0.02 | 1.92 | -2.49 |
| 145 | 0.02 | 1.98 | -2.43 |
| 150 | 0.02 | 2.04 | -2.38 |

| T (°C) | Material B(K) | | |
|-----------|---------------|--------|----------|
| | N 4080 | | |
| | R(T) / R25 | TF (%) | α (%/°C) |
| -55 | 110.1 | 24.0 | -7.50 |
| -50 | 75.89 | 20.7 | -7.25 |
| -45 | 52.97 | 17.8 | -7.01 |
| -40 | 37.42 | 15.2 | -6.78 |
| -35 | 26.75 | 12.9 | -6.56 |
| -30 | 19.33 | 10.9 | -6.35 |
| -25 | 14.11 | 9.1 | -6.14 |
| -20 | 10.41 | 7.5 | -5.95 |
| -15 | 7.758 | 6.1 | -5.76 |
| -10 | 5.834 | 4.9 | -5.58 |
| -5 | 4.426 | 3.8 | -5.41 |
| 0 | 3.387 | 2.9 | -5.24 |
| 5 | 2.614 | 2.1 | -5.08 |
| 10 | 2.033 | 1.4 | -4.93 |
| 15 | 1.593 | 0.9 | -4.78 |
| 20 | 1.258 | 0.4 | -4.64 |
| 25 | 1.0000 | 0.0 | -4.51 |
| 30 | 0.8004 | 0.4 | -4.37 |
| 35 | 0.6449 | 0.8 | -4.25 |
| 40 | 0.5228 | 1.3 | -4.13 |
| 45 | 0.4264 | 1.8 | -4.01 |
| 50 | 0.3497 | 2.3 | -3.90 |
| 55 | 0.2885 | 2.9 | -3.79 |
| 60 | 0.2392 | 3.5 | -3.68 |
| 65 | 0.1994 | 4.1 | -3.58 |
| 70 | 0.1671 | 4.8 | -3.49 |
| 75 | 0.1406 | 5.5 | -3.39 |
| 80 | 0.1189 | 6.2 | -3.30 |
| 85 | 0.1010 | 6.9 | -3.22 |
| 90 | 0.08616 | 7.6 | -3.13 |
| 95 | 0.07381 | 8.3 | -3.05 |
| 100 | 0.06347 | 9.1 | -2.97 |
| 105 | 0.05480 | 9.8 | -2.90 |
| 110 | 0.04748 | 10.6 | -2.83 |
| 115 | 0.04129 | 11.3 | -2.76 |
| 120 | 0.03603 | 12.1 | -2.69 |
| 125 | 0.03155 | 12.9 | -2.62 |
| 130 | 0.02771 | 13.7 | -2.56 |
| 135 | 0.02442 | 14.4 | -2.50 |
| 140 | 0.02158 | 15.2 | -2.44 |
| 145 | 0.01913 | 16.0 | -2.38 |
| 150 | 0.01700 | 16.8 | -2.33 |

| T (°C) | Material B(K) | | |
|-----------|---------------|--------|----------|
| | NA 4100 | | |
| | R(T) / R25 | TF (%) | α (%/°C) |
| -55 | 109.5 | 8.0 | -7.53 |
| -50 | 75.44 | 6.9 | -7.27 |
| -45 | 52.64 | 6.0 | -7.02 |
| -40 | 37.19 | 5.1 | -6.78 |
| -35 | 26.59 | 4.3 | -6.56 |
| -30 | 19.22 | 3.7 | -6.34 |
| -25 | 14.05 | 3.1 | -6.14 |
| -20 | 10.37 | 2.5 | -5.94 |
| -15 | 7.730 | 2.1 | -5.75 |
| -10 | 5.817 | 1.6 | -5.57 |
| -5 | 4.417 | 1.3 | -5.40 |
| 0 | 3.382 | 1.0 | -5.23 |
| 5 | 2.611 | 0.7 | -5.08 |
| 10 | 2.032 | 0.5 | -4.92 |
| 15 | 1.593 | 0.3 | -4.78 |
| 20 | 1.258 | 0.1 | -4.64 |
| 25 | 1.0000 | 0.0 | -4.51 |
| 30 | 0.8003 | 0.1 | -4.38 |
| 35 | 0.6446 | 0.3 | -4.25 |
| 40 | 0.5224 | 0.4 | -4.14 |
| 45 | 0.4258 | 0.6 | -4.02 |
| 50 | 0.3490 | 0.8 | -3.91 |
| 55 | 0.2877 | 1.0 | -3.81 |
| 60 | 0.2383 | 1.2 | -3.71 |
| 65 | 0.1984 | 1.4 | -3.61 |
| 70 | 0.1660 | 1.6 | -3.51 |
| 75 | 0.1395 | 1.8 | -3.42 |
| 80 | 0.1178 | 2.1 | -3.34 |
| 85 | 0.09989 | 2.3 | -3.25 |
| 90 | 0.08506 | 2.5 | -3.17 |
| 95 | 0.07271 | 2.8 | -3.09 |
| 100 | 0.06240 | 3.0 | -3.02 |
| 105 | 0.05375 | 3.3 | -2.94 |
| 110 | 0.04647 | 3.5 | -2.87 |
| 115 | 0.04032 | 3.8 | -2.81 |
| 120 | 0.03509 | 4.1 | -2.74 |
| 125 | 0.03065 | 4.3 | -2.68 |
| 130 | 0.02685 | 4.6 | -2.61 |
| 135 | 0.02359 | 4.8 | -2.55 |
| 140 | 0.02079 | 5.1 | -2.50 |
| 145 | 0.01837 | 5.4 | -2.44 |
| 150 | 0.01628 | 5.6 | -2.39 |

| T (°C) | Material B(K) | | |
|-----------|---------------|--------|----------|
| | NC 4080 | | |
| | R(T) / R25 | TF (%) | α (%/°C) |
| -55 | 105.4 | 24.0 | -7.45 |
| -50 | 72.89 | 20.7 | -7.20 |
| -45 | 51.04 | 17.8 | -6.95 |
| -40 | 36.18 | 15.2 | -6.72 |
| -35 | 25.94 | 12.9 | -6.50 |
| -30 | 18.81 | 10.9 | -6.29 |
| -25 | 13.78 | 9.1 | -6.08 |
| -20 | 10.20 | 7.5 | -5.89 |
| -15 | 7.621 | 6.1 | -5.71 |
| -10 | 5.748 | 4.9 | -5.53 |
| -5 | 4.373 | 3.8 | -5.36 |
| 0 | 3.355 | 2.9 | -5.20 |
| 5 | 2.595 | 2.1 | -5.04 |
| 10 | 2.023 | 1.4 | -4.89 |
| 15 | 1.588 | 0.9 | -4.75 |
| 20 | 1.256 | 0.4 | -4.61 |
| 25 | 1.0000 | 0.0 | -4.48 |
| 30 | 0.8014 | 0.4 | -4.35 |
| 35 | 0.6463 | 0.8 | -4.23 |
| 40 | 0.5243 | 1.3 | -4.11 |
| 45 | 0.4278 | 1.8 | -4.00 |
| 50 | 0.3510 | 2.3 | -3.89 |
| 55 | 0.2896 | 2.9 | -3.79 |
| 60 | 0.2401 | 3.5 | -3.69 |
| 65 | 0.2001 | 4.1 | -3.59 |
| 70 | 0.1675 | 4.8 | -3.50 |
| 75 | 0.1409 | 5.5 | -3.41 |
| 80 | 0.1190 | 6.2 | -3.32 |
| 85 | 0.1010 | 6.9 | -3.24 |
| 90 | 0.08605 | 7.6 | -3.16 |
| 95 | 0.07360 | 8.3 | -3.08 |
| 100 | 0.06319 | 9.1 | -3.01 |
| 105 | 0.05446 | 9.8 | -2.94 |
| 110 | 0.04710 | 10.6 | -2.87 |
| 115 | 0.04087 | 11.3 | -2.80 |
| 120 | 0.03559 | 12.1 | -2.73 |
| 125 | 0.03109 | 12.9 | -2.67 |
| 130 | 0.02724 | 13.7 | -2.61 |
| 135 | 0.02394 | 14.4 | -2.55 |
| 140 | 0.02111 | 15.2 | -2.49 |
| 145 | 0.01866 | 16.0 | -2.44 |
| 150 | 0.01654 | 16.8 | -2.38 |

| T (°C) | Material B(K) | | |
|-----------|---------------|--------|----------|
| | NE 4100 | | |
| | R(T) / R25 | TF (%) | α (%/°C) |
| -55 | 97.27 | 24.1 | -7.2 |
| -50 | 67.99 | 20.8 | -7.0 |
| -45 | 48.08 | 17.9 | -6.8 |
| -40 | 34.39 | 15.3 | -6.5 |
| -35 | 24.85 | 13.0 | -6.3 |
| -30 | 18.15 | 11.0 | -6.1 |
| -25 | 13.38 | 9.2 | -6.0 |
| -20 | 9.960 | 7.6 | -5.8 |
| -15 | 7.479 | 6.2 | -5.6 |
| -10 | 5.664 | 4.9 | -5.4 |
| -5 | 4.325 | 3.8 | -5.3 |
| 0 | 3.328 | 2.9 | -5.1 |
| 5 | 2.581 | 2.1 | -5.0 |
| 10 | 2.016 | 1.4 | -4.9 |
| 15 | 1.585 | 0.9 | -4.7 |
| 20 | 1.255 | 0.4 | -4.6 |
| 25 | 1.0000 | 0.0 | -4.5 |
| 30 | 0.8017 | 0.4 | -4.3 |
| 35 | 0.6466 | 0.8 | -4.2 |
| 40 | 0.5245 | 1.3 | -4.1 |
| 45 | 0.4278 | 1.8 | -4.0 |
| 50 | 0.3508 | 2.3 | -3.9 |
| 55 | 0.2891 | 2.9 | -3.8 |
| 60 | 0.2394 | 3.5 | -3.7 |
| 65 | 0.1992 | 4.2 | -3.6 |
| 70 | 0.1666 | 4.8 | -3.5 |
| 75 | 0.1399 | 5.5 | -3.4 |
| 80 | 0.11794 | 6.2 | -3.4 |
| 85 | 0.09987 | 6.9 | -3.3 |
| 90 | 0.08491 | 7.6 | -3.2 |
| 95 | 0.07246 | 8.4 | -3.1 |
| 100 | 0.06207 | 9.1 | -3.1 |
| 105 | 0.05336 | 9.9 | -3.0 |
| 110 | 0.04604 | 10.6 | -2.9 |
| 115 | 0.03985 | 11.4 | -2.8 |
| 120 | 0.03461 | 12.2 | -2.8 |
| 125 | 0.03015 | 12.9 | -2.7 |
| 130 | 0.02635 | 13.7 | -2.7 |
| 135 | 0.02309 | 14.5 | -2.6 |
| 140 | 0.0203 | 15.3 | -2.5 |
| 145 | 0.01789 | 16.1 | -2.5 |
| 150 | 0.01581 | 16.8 | -2.4 |

| T (°C) | Material B(K) | | |
|-----------|---------------|--------|----------|
| | N5 4160 | | |
| | R(T) / R25 | TF (%) | α (%/°C) |
| -55 | 115.8 | 16.3 | -7.52 |
| -50 | 79.72 | 14.1 | -7.28 |
| -45 | 55.54 | 12.1 | -7.04 |
| -40 | 39.15 | 10.4 | -6.82 |
| -35 | 27.91 | 8.8 | -6.61 |
| -30 | 20.11 | 7.4 | -6.40 |
| -25 | 14.64 | 6.2 | -6.20 |
| -20 | 10.77 | 5.1 | -6.01 |
| -15 | 7.996 | 4.2 | -5.83 |
| -10 | 5.991 | 3.3 | -5.65 |
| -5 | 4.529 | 2.6 | -5.48 |
| 0 | 3.454 | 2.0 | -5.31 |
| 5 | 2.655 | 1.4 | -5.16 |
| 10 | 2.057 | 1.0 | -5.00 |
| 15 | 1.606 | 0.6 | -4.86 |
| 20 | 1.263 | 0.3 | -4.72 |
| 25 | 1.0000 | 0.0 | -4.58 |
| 30 | 0.7973 | 0.3 | -4.45 |
| 35 | 0.6398 | 0.5 | -4.32 |
| 40 | 0.5167 | 0.9 | -4.20 |
| 45 | 0.4198 | 1.2 | -4.09 |
| 50 | 0.3430 | 1.6 | -3.97 |
| 55 | 0.2819 | 2.0 | -3.86 |
| 60 | 0.2329 | 2.4 | -3.76 |
| 65 | 0.1934 | 2.8 | -3.66 |
| 70 | 0.1614 | 3.3 | -3.56 |
| 75 | 0.1354 | 3.7 | -3.46 |
| 80 | 0.1141 | 4.2 | -3.37 |
| 85 | 0.09658 | 4.7 | -3.29 |
| 90 | 0.08211 | 5.2 | -3.20 |
| 95 | 0.07010 | 5.7 | -3.12 |
| 100 | 0.06009 | 6.2 | -3.04 |
| 105 | 0.05171 | 6.7 | -2.96 |
| 110 | 0.04467 | 7.2 | -2.89 |
| 115 | 0.03872 | 7.7 | -2.82 |
| 120 | 0.03369 | 8.2 | -2.75 |
| 125 | 0.02941 | 8.8 | -2.68 |
| 130 | 0.02576 | 9.3 | -2.62 |
| 135 | 0.02263 | 9.8 | -2.55 |
| 140 | 0.01995 | 10.3 | -2.49 |
| 145 | 0.01763 | 10.9 | -2.44 |
| 150 | 0.01563 | 11.4 | -2.38 |

Tables of Resistance vs Temperature



| T (°C) | Material B(K) | | |
|-----------|---------------|--------|----------|
| | P 4220 | | |
| | R(T) / R25 | TF (%) | α (%/°C) |
| -55 | 121.4 | 24.8 | -7.56 |
| -50 | 83.35 | 21.5 | -7.32 |
| -45 | 57.92 | 18.4 | -7.09 |
| -40 | 40.72 | 15.8 | -6.87 |
| -35 | 28.95 | 13.4 | -6.66 |
| -30 | 20.80 | 11.3 | -6.45 |
| -25 | 15.10 | 9.4 | -6.26 |
| -20 | 11.07 | 7.8 | -6.07 |
| -15 | 8.197 | 6.3 | -5.89 |
| -10 | 6.123 | 5.1 | -5.71 |
| -5 | 4.615 | 4.0 | -5.54 |
| 0 | 3.508 | 3.0 | -5.38 |
| 5 | 2.688 | 2.2 | -5.22 |
| 10 | 2.076 | 1.5 | -5.07 |
| 15 | 1.616 | 0.9 | -4.92 |
| 20 | 1.267 | 0.4 | -4.78 |
| 25 | 1.0000 | 0.0 | -4.64 |
| 30 | 0.7949 | 0.4 | -4.51 |
| 35 | 0.6359 | 0.8 | -4.38 |
| 40 | 0.5120 | 1.3 | -4.26 |
| 45 | 0.4148 | 1.8 | -4.14 |
| 50 | 0.3379 | 2.4 | -4.03 |
| 55 | 0.2769 | 3.0 | -3.92 |
| 60 | 0.2281 | 3.6 | -3.81 |
| 65 | 0.1890 | 4.3 | -3.71 |
| 70 | 0.1573 | 5.0 | -3.61 |
| 75 | 0.1316 | 5.7 | -3.52 |
| 80 | 0.1106 | 6.4 | -3.42 |
| 85 | 0.09337 | 7.1 | -3.34 |
| 90 | 0.07918 | 7.9 | -3.25 |
| 95 | 0.06743 | 8.6 | -3.17 |
| 100 | 0.05766 | 9.4 | -3.09 |
| 105 | 0.04950 | 10.2 | -3.01 |
| 110 | 0.04266 | 10.9 | -2.93 |
| 115 | 0.03691 | 11.7 | -2.86 |
| 120 | 0.03204 | 12.5 | -2.79 |
| 125 | 0.02791 | 13.3 | -2.72 |
| 130 | 0.02439 | 14.1 | -2.66 |
| 135 | 0.02139 | 14.9 | -2.59 |
| 140 | 0.01881 | 15.7 | -2.53 |
| 145 | 0.01660 | 16.5 | -2.47 |
| 150 | 0.01469 | 17.3 | -2.42 |

| T (°C) | Material B(K) | | |
|-----------|---------------|--------|----------|
| | PA 4235 | | |
| | R(T) / R25 | TF (%) | α (%/°C) |
| -55 | 123.40 | 8.3 | -7.68 |
| -50 | 84.33 | 7.2 | -7.42 |
| -45 | 58.39 | 6.2 | -7.17 |
| -40 | 40.93 | 5.3 | -6.93 |
| -35 | 29.04 | 4.5 | -6.71 |
| -30 | 20.83 | 3.8 | -6.49 |
| -25 | 15.11 | 3.2 | -6.29 |
| -20 | 11.07 | 2.6 | -6.09 |
| -15 | 8.190 | 2.1 | -5.90 |
| -10 | 6.117 | 1.7 | -5.72 |
| -5 | 4.610 | 1.3 | -5.54 |
| 0 | 3.505 | 1.0 | -5.38 |
| 5 | 2.686 | 0.7 | -5.22 |
| 10 | 2.075 | 0.5 | -5.07 |
| 15 | 1.615 | 0.3 | -4.92 |
| 20 | 1.267 | 0.1 | -4.78 |
| 25 | 1.0000 | 0.0 | -4.64 |
| 30 | 0.7949 | 0.1 | -4.51 |
| 35 | 0.6359 | 0.3 | -4.39 |
| 40 | 0.5119 | 0.4 | -4.27 |
| 45 | 0.4145 | 0.6 | -4.15 |
| 50 | 0.3376 | 2.4 | -4.04 |
| 55 | 0.2764 | 1.0 | -3.93 |
| 60 | 0.2276 | 1.2 | -3.83 |
| 65 | 0.1883 | 1.4 | -3.73 |
| 70 | 0.1566 | 1.7 | -3.63 |
| 75 | 0.1308 | 1.9 | -3.54 |
| 80 | 0.1098 | 2.1 | -3.45 |
| 85 | 0.09257 | 2.4 | -3.37 |
| 90 | 0.07836 | 2.6 | -3.28 |
| 95 | 0.06661 | 2.9 | -3.20 |
| 100 | 0.05685 | 3.1 | -3.13 |
| 105 | 0.04870 | 3.4 | -3.05 |
| 110 | 0.04188 | 3.7 | -2.98 |
| 115 | 0.03614 | 3.9 | -2.91 |
| 120 | 0.03129 | 4.2 | -2.84 |
| 125 | 0.02719 | 4.5 | -2.78 |
| 130 | 0.02370 | 4.7 | -2.71 |
| 135 | 0.02072 | 5.0 | -2.65 |
| 140 | 0.01817 | 5.3 | -2.59 |
| 145 | 0.01598 | 5.5 | -2.54 |
| 150 | 0.01409 | 5.8 | -2.48 |

| T (°C) | Material B(K) | | |
|-----------|---------------|--------|----------|
| | Q 4300 | | |
| | R(T) / R25 | TF (%) | α (%/°C) |
| -55 | 98.04 | 25.3 | -6.87 |
| -50 | 69.53 | 21.9 | -6.70 |
| -45 | 49.73 | 18.8 | -6.53 |
| -40 | 35.87 | 16.1 | -6.37 |
| -35 | 26.08 | 13.6 | -6.22 |
| -30 | 19.12 | 11.5 | -6.07 |
| -25 | 14.12 | 9.6 | -5.92 |
| -20 | 10.51 | 7.9 | -5.78 |
| -15 | 7.877 | 6.5 | -5.64 |
| -10 | 5.947 | 5.2 | -5.50 |
| -5 | 4.521 | 4.0 | -5.37 |
| 0 | 3.460 | 3.1 | -5.24 |
| 5 | 2.666 | 2.2 | -5.11 |
| 10 | 2.067 | 1.5 | -4.99 |
| 15 | 1.613 | 0.9 | -4.87 |
| 20 | 1.266 | 0.4 | -4.75 |
| 25 | 1.0000 | 0.0 | -4.63 |
| 30 | 0.7944 | 0.4 | -4.52 |
| 35 | 0.6347 | 0.8 | -4.41 |
| 40 | 0.5099 | 1.3 | -4.30 |
| 45 | 0.4119 | 1.9 | -4.20 |
| 50 | 0.3344 | 2.4 | -4.09 |
| 55 | 0.2730 | 3.1 | -3.99 |
| 60 | 0.2239 | 3.7 | -3.90 |
| 65 | 0.1846 | 4.4 | -3.80 |
| 70 | 0.1529 | 5.1 | -3.71 |
| 75 | 0.1272 | 5.8 | -3.62 |
| 80 | 0.1063 | 6.5 | -3.53 |
| 85 | 0.08927 | 7.2 | -3.44 |
| 90 | 0.07526 | 8.0 | -3.36 |
| 95 | 0.06372 | 8.8 | -3.28 |
| 100 | 0.05417 | 9.6 | -3.20 |
| 105 | 0.04622 | 10.4 | -3.13 |
| 110 | 0.03960 | 11.2 | -3.05 |
| 115 | 0.03405 | 12.0 | -2.98 |
| 120 | 0.02938 | 12.8 | -2.91 |
| 125 | 0.02545 | 13.6 | -2.84 |
| 130 | 0.02211 | 14.4 | -2.77 |
| 135 | 0.01928 | 15.2 | -2.71 |
| 140 | 0.01686 | 16.0 | -2.64 |
| 145 | 0.01479 | 16.8 | -2.58 |
| 150 | 0.01302 | 17.7 | -2.52 |

| T (°C) | Material B(K) | | |
|-----------|---------------|--------|----------|
| | QA 4250 | | |
| | R(T) / R25 | TF (%) | α (%/°C) |
| -55 | 99.06 | 8.3 | -7.09 |
| -50 | 69.60 | 7.2 | -6.88 |
| -45 | 49.42 | 6.2 | -6.68 |
| -40 | 35.45 | 5.3 | -6.49 |
| -35 | 25.67 | 4.5 | -6.30 |
| -30 | 18.77 | 3.8 | -6.13 |
| -25 | 13.84 | 3.2 | -5.96 |
| -20 | 10.29 | 2.6 | -5.79 |
| -15 | 7.719 | 2.1 | -5.64 |
| -10 | 5.834 | 1.7 | -5.49 |
| -5 | 4.442 | 1.3 | -5.34 |
| 0 | 3.407 | 1.0 | -5.20 |
| 5 | 2.632 | 0.7 | -5.07 |
| 10 | 2.047 | 0.5 | -4.94 |
| 15 | 1.602 | 0.3 | -4.81 |
| 20 | 1.262 | 0.1 | -4.69 |
| 25 | 1.0000 | 0.0 | -4.57 |
| 30 | 0.7971 | 0.1 | -4.46 |
| 35 | 0.6389 | 0.3 | -4.35 |
| 40 | 0.5149 | 0.4 | -4.24 |
| 45 | 0.4172 | 0.6 | -4.14 |
| 50 | 0.3397 | 0.8 | -4.04 |
| 55 | 0.2780 | 1.0 | -3.95 |
| 60 | 0.2286 | 1.2 | -3.85 |
| 65 | 0.1888 | 1.4 | -3.76 |
| 70 | 0.1567 | 1.7 | -3.68 |
| 75 | 0.1306 | 1.9 | -3.59 |
| 80 | 0.1093 | 2.1 | -3.51 |
| 85 | 0.09179 | 2.4 | -3.43 |
| 90 | 0.07743 | 2.6 | -3.36 |
| 95 | 0.06556 | 2.9 | -3.28 |
| 100 | 0.05571 | 3.2 | -3.21 |
| 105 | 0.04752 | 3.4 | -3.14 |
| 110 | 0.04067 | 3.7 | -3.07 |
| 115 | 0.03492 | 3.9 | -3.01 |
| 120 | 0.03008 | 4.2 | -2.94 |
| 125 | 0.02600 | 4.5 | -2.88 |
| 130 | 0.02254 | 4.7 | -2.82 |
| 135 | 0.01960 | 5.0 | -2.76 |
| 140 | 0.01709 | 5.3 | -2.71 |
| 145 | 0.01495 | 5.5 | -2.65 |
| 150 | 0.01311 | 5.8 | -2.60 |

| T (°C) | Material B(K) | | |
|-----------|---------------|--------|----------|
| | R 4400 | | |
| | R(T) / R25 | TF (%) | α (%/°C) |
| -55 | 113.90 | 25.9 | -7.13 |
| -50 | 79.71 | 22.4 | -6.95 |
| -45 | 56.30 | 19.2 | -6.77 |
| -40 | 40.13 | 16.4 | -6.60 |
| -35 | 28.85 | 14.0 | -6.44 |
| -30 | 20.92 | 11.8 | -6.28 |
| -25 | 15.29 | 9.8 | -6.12 |
| -20 | 11.27 | 8.1 | -5.97 |
| -15 | 8.368 | 6.6 | -5.82 |
| -10 | 6.261 | 5.3 | -5.68 |
| -5 | 4.719 | 4.1 | -5.53 |
| 0 | 3.583 | 3.1 | -5.40 |
| 5 | 2.739 | 2.3 | -5.26 |
| 10 | 2.108 | 1.5 | -5.13 |
| 15 | 1.634 | 0.9 | -5.00 |
| 20 | 1.274 | 0.4 | -4.88 |
| 25 | 1.0000 | 0.0 | -4.75 |
| 30 | 0.7897 | 0.4 | -4.64 |
| 35 | 0.6273 | 0.9 | -4.52 |
| 40 | 0.5012 | 1.4 | -4.41 |
| 45 | 0.4028 | 1.9 | -4.30 |
| 50 | 0.3255 | 2.5 | -4.19 |
| 55 | 0.2644 | 3.1 | -4.09 |
| 60 | 0.2159 | 3.8 | -3.98 |
| 65 | 0.1772 | 4.5 | -3.89 |
| 70 | 0.1462 | 5.2 | -3.79 |
| 75 | 0.1212 | 5.9 | -3.70 |
| 80 | 0.1009 | 6.7 | -3.60 |
| 85 | 0.08440 | 7.4 | -3.52 |
| 90 | 0.07092 | 8.2 | -3.43 |
| 95 | 0.05984 | 9.0 | -3.35 |
| 100 | 0.05071 | 9.8 | -3.26 |
| 105 | 0.04314 | 10.6 | -3.19 |
| 110 | 0.03685 | 11.4 | -3.11 |
| 115 | 0.03160 | 12.2 | -3.03 |
| 120 | 0.02719 | 13.1 | -2.96 |
| 125 | 0.02349 | 13.9 | -2.89 |
| 130 | 0.02036 | 14.7 | -2.82 |
| 135 | 0.01770 | 15.6 | -2.76 |
| 140 | 0.01545 | 16.4 | -2.69 |
| 145 | 0.01352 | 17.2 | -2.63 |
| 150 | 0.01187 | 18.1 | -2.57 |

| T (°C) | Material B(K) | | |
|-----------|---------------|--------|----------|
| | RA 4380 | | |
| | R(T) / R25 | TF (%) | α (%/°C) |
| -55 | 110.80 | 8.6 | -7.24 |
| -50 | 77.24 | 7.4 | -7.03 |
| -45 | 54.44 | 6.4 | -6.83 |
| -40 | 38.76 | 5.5 | -6.63 |
| -35 | 27.87 | 4.6 | -6.45 |
| -30 | 20.22 | 3.9 | -6.27 |
| -25 | 14.81 | 3.3 | -6.10 |
| -20 | 10.94 | 2.7 | -5.93 |
| -15 | 8.144 | 2.2 | -5.78 |
| -10 | 6.112 | 1.8 | -5.62 |
| -5 | 4.623 | 1.4 | -5.48 |
| 0 | 3.522 | 1.0 | -5.34 |
| 5 | 2.702 | 0.8 | -5.20 |
| 10 | 2.087 | 0.5 | -5.07 |
| 15 | 1.623 | 0.3 | -4.94 |
| 20 | 1.270 | 0.1 | -4.82 |
| 25 | 1.0000 | 0.0 | -4.70 |
| 30 | 0.7920 | 0.1 | -4.59 |
| 35 | 0.6308 | 0.3 | -4.47 |
| 40 | 0.5052 | 0.5 | -4.37 |
| 45 | 0.4068 | 0.6 | -4.26 |
| 50 | 0.3292 | 0.8 | -4.16 |
| 55 | 0.2678 | 1.0 | -4.07 |
| 60 | 0.2189 | 1.3 | -3.97 |
| 65 | 0.1797 | 1.5 | -3.88 |
| 70 | 0.1482 | 1.7 | -3.79 |
| 75 | 0.1228 | 2.0 | -3.71 |
| 80 | 0.1022 | 2.2 | -3.63 |
| 85 | 0.08536 | 2.5 | -3.55 |
| 90 | 0.07159 | 2.7 | -3.47 |
| 95 | 0.06028 | 3.0 | -3.39 |
| 100 | 0.05095 | 3.2 | -3.32 |
| 105 | 0.04322 | 3.5 | -3.25 |
| 110 | 0.03679 | 3.8 | -3.18 |
| 115 | 0.03142 | 4.1 | -3.11 |
| 120 | 0.02693 | 4.3 | -3.05 |
| 125 | 0.02315 | 4.6 | -2.98 |
| 130 | 0.01997 | 4.9 | -2.92 |
| 135 | 0.01728 | 5.2 | -2.86 |
| 140 | 0.01499 | 5.4 | -2.80 |
| 145 | 0.01304 | 5.7 | -2.75 |
| 150 | 0.01138 | 6.0 | -2.69 |

Tables of Resistance vs Temperature



| T (°C) | Material B(K) | | |
|-----------|---------------|--------|----------|
| | RC 4340 | | |
| | R(T) / R25 | TF (%) | α (%/°C) |
| -55 | 105.70 | 25.5 | -7.15 |
| -50 | 74.01 | 22.1 | -6.95 |
| -45 | 52.37 | 19.0 | -6.75 |
| -40 | 37.43 | 16.2 | -6.56 |
| -35 | 27.01 | 13.8 | -6.38 |
| -30 | 19.66 | 11.6 | -6.20 |
| -25 | 14.44 | 9.7 | -6.04 |
| -20 | 10.70 | 8.0 | -5.87 |
| -15 | 7.990 | 6.5 | -5.72 |
| -10 | 6.013 | 5.2 | -5.57 |
| -5 | 4.559 | 4.1 | -5.42 |
| 0 | 3.482 | 3.1 | -5.29 |
| 5 | 2.678 | 2.2 | -5.15 |
| 10 | 2.074 | 1.5 | -5.02 |
| 15 | 1.616 | 0.9 | -4.90 |
| 20 | 1.267 | 0.4 | -4.77 |
| 25 | 1.0000 | 0.0 | -4.66 |
| 30 | 0.7936 | 0.4 | -4.54 |
| 35 | 0.6334 | 0.8 | -4.43 |
| 40 | 0.5083 | 1.3 | -4.33 |
| 45 | 0.4100 | 1.9 | -4.23 |
| 50 | 0.3325 | 2.5 | -4.13 |
| 55 | 0.2709 | 3.1 | -4.03 |
| 60 | 0.2218 | 3.7 | -3.94 |
| 65 | 0.1825 | 4.4 | -3.85 |
| 70 | 0.1508 | 5.1 | -3.76 |
| 75 | 0.1251 | 5.8 | -3.67 |
| 80 | 0.1043 | 6.6 | -3.59 |
| 85 | 0.08727 | 7.3 | -3.51 |
| 90 | 0.07332 | 8.1 | -3.43 |
| 95 | 0.06184 | 8.9 | -3.36 |
| 100 | 0.05235 | 9.7 | -3.29 |
| 105 | 0.04448 | 10.5 | -3.22 |
| 110 | 0.03793 | 11.3 | -3.15 |
| 115 | 0.03245 | 12.1 | -3.08 |
| 120 | 0.02785 | 12.9 | -3.01 |
| 125 | 0.02399 | 13.7 | -2.95 |
| 130 | 0.02072 | 14.5 | -2.89 |
| 135 | 0.01796 | 15.4 | -2.83 |
| 140 | 0.01561 | 16.2 | -2.77 |
| 145 | 0.01360 | 17.0 | -2.72 |
| 150 | 0.01189 | 17.8 | -2.66 |

| T (°C) | Material B(K) | | |
|-----------|---------------|--------|----------|
| | T 4630 | | |
| | R(T) / R25 | TF (%) | α (%/°C) |
| -55 | 137.10 | 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 (°C) | Material B(K) | | |
|-----------|---------------|--------|----------|
| | U 4840 | | |
| | R(T) / R25 | TF (%) | α (%/°C) |
| -55 | 173.70 | 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 |

| T (°C) | Material B(K) | | |
|-----------|---------------|--------|----------|
| | S 4520 | | |
| | R(T) / R25 | TF (%) | α (%/°C) |
| -55 | 126.10 | 26.6 | -7.25 |
| -50 | 87.75 | 23.0 | -7.07 |
| -45 | 61.60 | 19.8 | -6.90 |
| -40 | 43.63 | 16.9 | -6.73 |
| -35 | 31.17 | 14.3 | -6.56 |
| -30 | 22.46 | 12.1 | -6.40 |
| -25 | 16.31 | 10.1 | -6.25 |
| -20 | 11.94 | 8.3 | -6.10 |
| -15 | 8.809 | 6.8 | -5.95 |
| -10 | 6.549 | 5.4 | -5.80 |
| -5 | 4.904 | 4.2 | -5.66 |
| 0 | 3.699 | 3.2 | -5.52 |
| 5 | 2.810 | 2.3 | -5.39 |
| 10 | 2.149 | 1.6 | -5.26 |
| 15 | 1.654 | 1.0 | -5.13 |
| 20 | 1.282 | 0.4 | -5.00 |
| 25 | 1.0000 | 0.0 | -4.88 |
| 30 | 0.7848 | 0.4 | -4.76 |
| 35 | 0.6196 | 0.9 | -4.64 |
| 40 | 0.4921 | 1.4 | -4.52 |
| 45 | 0.3931 | 2.0 | -4.41 |
| 50 | 0.3158 | 2.6 | -4.30 |
| 55 | 0.2551 | 3.2 | -4.20 |
| 60 | 0.2072 | 3.9 | -4.09 |
| 65 | 0.1691 | 4.6 | -3.99 |
| 70 | 0.1387 | 5.3 | -3.89 |
| 75 | 0.1144 | 6.1 | -3.80 |
| 80 | 0.0948 | 6.8 | -3.71 |
| 85 | 0.0789 | 7.6 | -3.61 |
| 90 | 0.06594 | 8.4 | -3.53 |
| 95 | 0.05538 | 9.2 | -3.44 |
| 100 | 0.04671 | 10.1 | -3.36 |
| 105 | 0.03956 | 10.9 | -3.28 |
| 110 | 0.03364 | 11.7 | -3.20 |
| 115 | 0.02872 | 12.6 | -3.12 |
| 120 | 0.02461 | 13.4 | -3.04 |
| 125 | 0.02117 | 14.3 | -2.97 |
| 130 | 0.01827 | 15.1 | -2.90 |
| 135 | 0.01583 | 16.0 | -2.83 |
| 140 | 0.01376 | 16.8 | -2.77 |
| 145 | 0.01200 | 17.7 | -2.70 |
| 150 | 0.01050 | 18.6 | -2.64 |

| T (°C) | Material B(K) | | |
|-----------|---------------|--------|----------|
| | SC 4500 | | |
| | R(T) / R25 | TF (%) | α (%/°C) |
| -55 | 129.80 | 26.5 | -7.51 |
| -50 | 89.31 | 22.9 | -7.29 |
| -45 | 62.15 | 19.7 | -7.07 |
| -40 | 43.72 | 16.8 | -6.87 |
| -35 | 31.07 | 14.3 | -6.68 |
| -30 | 22.29 | 12.0 | -6.49 |
| -25 | 16.15 | 10.0 | -6.31 |
| -20 | 11.80 | 8.3 | -6.14 |
| -15 | 8.703 | 6.8 | -5.97 |
| -10 | 6.470 | 5.4 | -5.81 |
| -5 | 4.849 | 4.2 | -5.66 |
| 0 | 3.662 | 3.2 | -5.51 |
| 5 | 2.786 | 2.3 | -5.36 |
| 10 | 2.135 | 1.6 | -5.23 |
| 15 | 1.647 | 0.9 | -5.09 |
| 20 | 1.279 | 0.4 | -4.96 |
| 25 | 1.0000 | 0.0 | -4.84 |
| 30 | 0.7865 | 0.4 | -4.72 |
| 35 | 0.6223 | 0.9 | -4.60 |
| 40 | 0.4953 | 1.4 | -4.49 |
| 45 | 0.3963 | 2.0 | -4.38 |
| 50 | 0.3189 | 2.6 | -4.28 |
| 55 | 0.2579 | 3.2 | -4.18 |
| 60 | 0.2096 | 3.9 | -4.08 |
| 65 | 0.1712 | 4.6 | -3.99 |
| 70 | 0.1405 | 5.3 | -3.89 |
| 75 | 0.1159 | 6.0 | -3.80 |
| 80 | 0.09595 | 6.8 | -3.72 |
| 85 | 0.07980 | 7.6 | -3.63 |
| 90 | 0.06664 | 8.4 | -3.55 |
| 95 | 0.05588 | 9.2 | -3.47 |
| 100 | 0.04704 | 10.0 | -3.40 |
| 105 | 0.03975 | 10.8 | -3.32 |
| 110 | 0.03371 | 11.7 | -3.25 |
| 115 | 0.02869 | 12.5 | -3.18 |
| 120 | 0.02450 | 13.4 | -3.12 |
| 125 | 0.02100 | 14.2 | -3.05 |
| 130 | 0.01805 | 15.1 | -2.99 |
| 135 | 0.01557 | 15.9 | -2.92 |
| 140 | 0.01347 | 16.8 | -2.86 |
| 145 | 0.01169 | 17.6 | -2.80 |
| 150 | 0.01017 | 18.5 | -2.75 |



Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

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