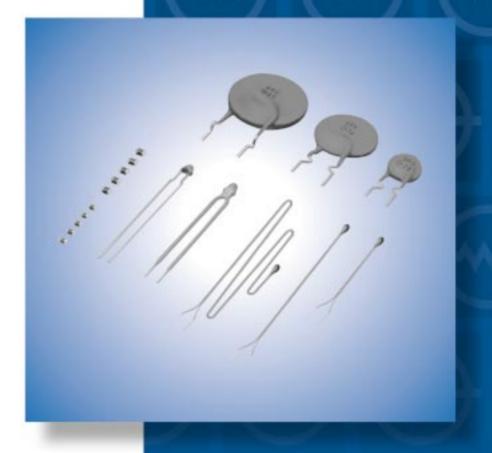
# **NTC Thermistors**



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Innovator in Electronics

Murata Manufacturing Co., Ltd.

### for EU RoHS Compliant

- · All the products in this catalog comply with EU RoHS.
- EU RoHS is "the European Directive 2002/95/EC on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment".
- · For more details, please refer to our website 'Murata's Approach for EU RoHS' (http://www.murata.com/info/rohs.html).



### 10.2.22

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### Part Numbering

NTC Thermistors for Temp. Sensor and Compensation Chip Type

NC P 18 XH 103 J 03 RB (Part Number)

### Product ID

Product ID	
NC	NTC Thermistors Chip Type

### 2 Series

Code	Series
Р	Plated Termination Series

### 3Dimensions (LXW)

Code	Dimensions (LXW)	EIA
03	0.60×0.30mm	0201
15	1.00×0.50mm	0402
18	1.60×0.80mm	0603
21	2.00×1.25mm	0805

### **4**Temperature Characteristics

Code	Temperature Characteristics	
WB	Nominal B-Constant 4050-4099K	
WD	Nominal B-Constant 4150-4199K	
WF	Nominal B-Constant 4250-4299K	
WL	Nominal B-Constant 4450-4499K	
WM	Nominal B-Constant 4500-4549K	
хс	Nominal B-Constant 3100-3149K	
XF	Nominal B-Constant 3250—3299K	
XH	Nominal B-Constant 3350—3399K	
XM	Nominal B-Constant 3500—3549K	
XQ	Nominal B-Constant 3650—3699K	
XV	Nominal B-Constant 3900—3949K	
xw	Nominal B-Constant 3950—3999K	

#### 6 Resistance

Expressed by three-digit alphanumerics. The unit is ohm  $(\Omega)$ . The first and second figures are significant digits, and the third figure expresses the number of zeros which follow the two figures. If there is a decimal point, it is expressed by the capital letter "R". In this case, all figures are significant digits.

Х.	Code	Resistance	
	102	1kΩ	
	103	10kΩ	
	104	100kΩ	

### **6**Resistance Tolerance

Code	Resistance Tolerance	
D	±0.5%	
E	±3%	
F	±1%	
J	±5%	

#### Individual Specifications

Structures and others are expressed by two figures.

Code	Individual Specifications
03	Standard Type

Please contact us for details.

### 8 Packaging

Code	Packaging	
RA	Plastic Taping 4mm Pitch	
RB	Paper Taping 4mm Pitch Paper Taping 2mm Pitch (10000 pcs.)	
RC		
RL	Paper Taping 2mm Pitch (15000 pcs.)	



### NTC Thermistor for Temperature Sensor Thermo String Type

NXF T 15 XH 103 F A 2 B 025 (Part Number)

### Product ID

Product ID	
NXF	NTC Thermistors Sensor Thermo String Type

### 2Individual Specifications

Code	Individual Specifications	
Т	Commercial Type	

### **3**Chip Dimensions

-		
Code	Dimensions (LxT)	EIA
15	1.00 x 0.50mm	0402

#### **4**Temperature Characteristics

Code	Temperature Characteristics	
WB	Nominal B-Constant 4050-4099K	
WF	Nominal B-Constant 4250–4299K	
хн	Nominal B-Constant 3350–3399K	

#### 6 Resistance

Expressed by three figures. The unit is  $(\Omega)$ . The first and second figures are significant digits, and the third figure expresses the number of zeros which follow the two figures.

Ex.	Code	Resistance
	103	10kΩ
	473	47kΩ
	104	100kΩ

#### **6**Resistance Tolerance

Code	Resistance Tolerance	
F	±1%	

### Dead Wire Type

Code	Lead Wire Type	
Α	ø0.3 Copper Lead Wire with Polyurethane Coat	

### Shape of the Lead Wire Kink

Code	Shape of the Lead Wire Kink	
1	The Twist of Lead Wire Type	
2	Standard Type	

### Packaging

Code	Packaging
В	Bulk

#### (Dimensions (Full Length)

Code	Dimensions (Full Length)	
025	25mm	
030	30mm	
040	40mm	
050	50mm	
060	60mm	
070	70mm	
080	80mm	
090	90mm	
100	100mm	
110	110mm	
120	120mm	
130	130mm	
140	140mm	
150	150mm	



### NTC Thermistors for Temperature Sensor Lead Type

NT SA0 XH 103 F E1 B0 (Part Number)

### 1 Product ID

Product ID	
NT	NTC Thermistors

#### 2Series

Code	Series	
SA0	for Temperature Sensors No Lead-coating Type	
SD0	for Temperature Sensors Lead-coating Type (Total Length 30mm max.)	
for Temperature Sensors Lead-coating (Total Length 30 to 50mm)		

#### **3**Temperature Characteristics

Code	Temperature Characteristics	
WB	Nominal B-Constant 4050-4099K	
wc	Nominal B-Constant 4100-4149K	
WD	Nominal B-Constant 4150-4199K	
WF	Nominal B-Constant 4250-4299K	
ХН	Nominal B-Constant 3350-3399K	
XM	Nominal B-Constant 3500-3549K	
XR	Nominal B-Constant 3700-3749K	
XV	Nominal B-Constant 3900—3949K	

### 4 Resistance

Expressed by three-digit alphanumerics. The unit is ohm  $(\Omega)$ . The first and second figures are significant digits, and the third figure expresses the number of zeros which follow the two figures. If there is a decimal point, it is expressed by the capital letter "R". In this case, all figures are significant digits.

E	ΣΧ.	

Code	Resistance	
202	2kΩ	
203	20kΩ	

### **5**Resistance Tolerance

Code	Resistance Tolerance				
E	±3%				
F	±1%				

#### **6**Individual Specifications

A lead structure and other specifications are expressed by two digits.

Code	Individual Specifications			
E1	Standard Bulk (NTSA, NTSD0 Series)			
N6	Standard Ammo Pack Taping (NTSA Series)			
РВ	Standard Bulk (NTSD1 Series)			

#### Packaging (NTSA/NTSD0 Series)

Code	Packaging				
Α0	Ammo Pack Taping				
В0	Bulk				

### Total Length (NTSD1 Series)

Code	Total Length			
30	30mm			
40	40mm			
50	50mm			



### NTC Thermistors for Inrush Current Suppression Lead Type

NT PA7 160 L BM B0 (Part Number)

### Product ID

Product ID	
NT	NTC Thermistors

#### 2Series

Code	Series	Nominal Body Diameter		
PA7		ø7mm		
PA9		ø9mm		
PAA	Inrush Current Suppression	ø10mm		
PAD	Lead Type	ø13mm		
PAJ		ø18mm		
PAN		ø22mm		

### 3Resistance

Expressed by three-digit alphanumerics. The unit is ohm  $(\Omega)$ . The first and second figures are significant digits, and the third figure expresses the number of zeros which follow the two figures. If there is a decimal point, it is expressed by the capital letter "R". In this case, all figures are significant digits.

Ex.	Code	Resistance
	3R0	$3\Omega$
	100	10Ω

### **4** Resistance Tolerance

Code	Resistance Tolerance		
L	±15%		

### **5**Individual Specifications

A lead structure and other specifications are expressed by two capital letters.

Code	Individual Specifications	Body Diameter		
B1	Standard Type (Ammo Pack)	ø7mm, ø9mm		
ВМ	Standard Type (Bulk)	ø7mm, ø9mm		
D6	Standard Type (Ammo Pack)	ø10mm, ø13mm		
DK	Standard (Bulk)	ø18mm, ø22mm		
DN	Standard (Bulk)	ø10mm, ø13mm		

### **6**Packaging

Code	Packaging			
Α0	Ammo Pack Taping			
В0	Bulk			



### **Basic Characteristics**

### ■Basic Characteristics

### 1. Zero-power Resistance of Thermistor: R

R=R<sub>0</sub> expB (1/T-1/T<sub>0</sub>) ······(1)

R: Resistance in ambient temperature T (K)

(K: absolute temperature)

Ro: Resistance in ambient temperature To (K)

**B**: B-Constant of Thermistor

### 2. B-Constant

as (1) formula

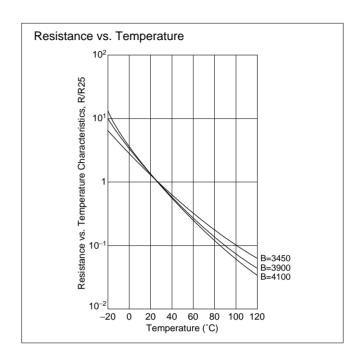
B=  $\ell$  n (R/R<sub>0</sub>) / (1/T-1/T<sub>0</sub>) .....(2)

### 3. Thermal Dissipation Constant

When electric power P (mW) is spent in ambient temperature T<sub>1</sub> and thermistor temperature rises T<sub>2</sub>, there is a formula as follows

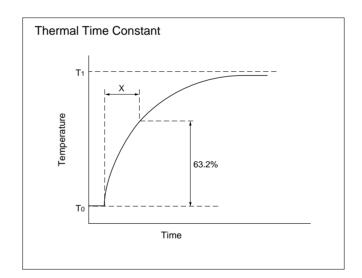
C: Thermal dissipation constant (mW/°C)

Thermal dissipation constant is varied with dimensions, measurement conditions, etc.



#### 4. Thermal Time Constant

Period in which Thermistor's temperature will change 63.2% of its temperature difference from ambient temperature T<sub>0</sub> (°C) to T<sub>1</sub> (°C).



### ■Performance

Item	Condition				
Resistance	Measured by zero-power in specified ambient temperature.				
B-Constant	Calculated between two specified ambient temperatures by next formula. T and To is absolute temperature (K). $B = \frac{\ell \ n \ (R/R_0)}{1/T - 1/T_0}$				
Thermal Dissipation Constant	Shows necessary electric power that Thermistor's temperature rises 1°C by self heating. It is calculated by next formula. (mW/°C) $C = \frac{P}{T - T_0}$				
Rated Electric Power	Shows necessary electric power that Thermistor's temperature rises to a specified temperature by self heating in ambient temperature 25°C.				
Permissive Operating Current	It is possible to keep Thermistor's temperature rising max. 1°C.				

Please inquire about test conditions and ratings.



sales representatives or product engineers before ordering.

• This PDF catalog has only typical specifications because there is no space for detailed specifications. Therefore, please approve our product specifications or transact the approval sheet for product specifications before ordering.

## **NTC Thermistors**



### for Temperature Sensor and Compensation 0201 (0603) Size

0201/0402/0603/0805 sized Chip NTC Thermistors have Ni barrier termination and provide excellent solderability and offer high stability in environment by unique inner construction.



### ■ Features

- 1. Excellent solderability and high stability in environment
- 2. Excellent long time aging stability
- 3. High accuracy in resistance and B-Constant
- 4. Reflow soldering possible
- 5. NCP series are recognized by UL/cUL. (UL1434, File No.E137188)

### ■ Applications

- 1. Temperature compensation for transistor, IC and crystal oscillator in mobile communications
- 2. Temperature sensor for rechargeable batteries
- 3. Temperature compensation of LCD
- 4. Temperature compensation in general use of electric circuits

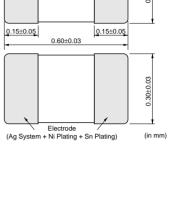
Part Number	Resistance (25°C) (ohm)	B-Constant (25-50°C) (K)	B-Constant (25-80°C) (Reference Value) (K)	B-Constant (25-85°C) (Reference Value) (K)	B-Constant (25-100°C) (Reference Value) (K)	Permissive Operating Current (25°C) (mA)	Rated Electric Power (25°C) (mW)	Typical Dissipation Constant (25°C) (mW/°C)
NCP03YS110J05RL	11 ±5%	2750 ±3%	2758	2758	2758	9.50	100	1
NCP03YS220J05RL	22 ±5%	2750 ±3%	2758	2758	2758	6.70	100	1
NCP03YS330J05RL	33 ±5%	2750 ±3%	2758	2758	2758	5.50	100	1
NCP03YS470J05RL	47 ±5%	2750 ±3%	2758	2758	2758	4.60	100	1
NCP03YS680J05RL	68 ±5%	2750 ±3%	2758	2758	2758	3.80	100	1
NCP03YS101J05RL	100 ±5%	2750 ±3%	2758	2758	2758	3.10	100	1
NCP03XM102□05RL	1.0k	3500 ±1%	3539	3545	3560	1.00	100	1
NCP03XM152□05RL	1.5k	3500 ±1%	3539	3545	3560	0.81	100	1
NCP03XM222□05RL	2.2k	3500 ±1%	3539	3545	3560	0.67	100	1
NCP03XM332□05RL	3.3k	3500 ±1%	3539	3545	3560	0.55	100	1
NCP03XM472□05RL	4.7k	3500 ±1%	3539	3545	3560	0.46	100	1
NCP03XH682□05RL	6.8k	3380 ±1%	3428	3434	3455	0.38	100	1
NCP03XH103F05RL	10k ±1%	3380 ±1%	3428	3434	3455	0.31	100	1
NCP03XH103□05RL	10k	3380 ±1%	3428	3434	3455	0.31	100	1
NCP03XV103□05RL	10k	3900 ±1%	3930	3934	3944	0.31	100	1
NCP03XH153□05RL	15k	3380 ±1%	3428	3434	3455	0.25	100	1
NCP03XH223□05RL	22k	3380 ±1%	3428	3434	3455	0.21	100	1
NCP03WF333□05RL	33k	4250 ±1%	4303	4311	4334	0.17	100	1
NCP03WB473□05RL	47k	4050 ±3%	4101	4108	4131	0.14	100	1
NCP03WL473□05RL	47k	4485 ±1%	4537	4543	4557	0.14	100	1
NCP03WF683□05RL	68k	4250 ±1%	4303	4311	4334	0.12	100	1
NCP03WL683□05RL	68k	4485 ±1%	4537	4543	4557	0.12	100	1
NCP03WF104F05RL	100k ±1%	4250 ±1%	4303	4311	4334	0.10	100	1
NCP03WF104□05RL	100k	4250 ±1%	4303	4311	4334	0.10	100	1
NCP03WL104□05RL	100k	4485 ±1%	4537	4543	4557	0.10	100	1
NCP03WL154□05RL	150k	4485 ±1%	4537	4543	4557	0.08	100	1
NCP03WL224□05RL	220k	4485 ±1%	4537	4543	4557	0.06	100	1

A blank column is filled with resistance tolerance codes (E: ±3%, J: ±5%).

Rated Electric Power is necessary electric power that Thermistor's temperature rises 100°C by self heating at 25°C in still air.

Operating Temperature Range: -40°C to +125°C





## **NTC Thermistors**



### for Temperature Sensor and Compensation 0402 (1005) Size

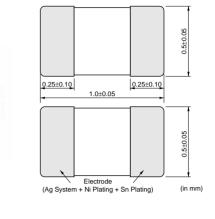
0201/0402/0603/0805 sized Chip NTC Thermistor have Ni barrier termination and provide excellent solderability and offer high stability in environment by unique inner construction.

### ■ Features

- 1. Excellent solderability and high stability in environment
- 2. Excellent long time aging stability
- 3. High accuracy in resistance and B-Constant
- 4. Reflow soldering possible
- 5. Same B-constant in the same resistance in the three sizes (0805 size / 0603 size / 0402 size) Easy to use smaller size in the circuits
- 6. NCP series are recognized by UL/cUL. (UL1434, File No.E137188)

### Applications

- 1. Temperature compensation for transistor, IC and crystal oscillator in mobile communications
- 2. Temperature sensor for rechargeable batteries
- 3. Temperature compensation of LCD
- 4. Temperature compensation in general use of electric circuits



Part Number	Resistance (25°C) (ohm)	B-Constant (25-50°C) (K)	B-Constant (25-80°C) (Reference Value) (K)	B-Constant (25-85°C) (Reference Value) (K)	B-Constant (25-100°C) (Reference Value) (K)	Permissive Operating Current (25°C) (mA)	Rated Electric Power (25°C) (mW)	Typical Dissipation Constant (25°C) (mW/°C)
NCP15XC220□03RC	22	3100 ±3%	3126	3128	3136	6.70	100	1
NCP15XC330□03RC	33	3100 ±3%	3126	3128	3136	5.50	100	1
NCP15XC470□03RC	47	3100 ±3%	3126	3128	3136	4.60	100	1
NCP15XC680□03RC	68	3100 ±3%	3126	3128	3136	3.80	100	1
NCP15XF101□03RC	100	3250 ±3%	3282	3284	3296	3.10	100	1
NCP15XF151□03RC	150	3250 ±3%	3282	3284	3296	2.50	100	1
NCP15XM221□03RC	220	3500 ±3%	3539	3545	3560	2.10	100	1
NCP15XM331□03RC	330	3500 ±3%	3539	3545	3560	1.70	100	1
NCP15XQ471□03RC	470	3650 ±2%	3688	3693	3706	1.40	100	1
NCP15XQ681□03RC	680	3650 ±3%	3688	3693	3706	1.20	100	1
NCP15XQ102□03RC	1.0k	3650 ±2%	3688	3693	3706	1.00	100	1
NCP15XW152□03RC	1.5k	3950 ±3%	3982	3987	3998	0.81	100	1
NCP15XW222□03RC	2.2k	3950 ±3%	3982	3987	3998	0.67	100	1
NCP15XW332□03RC	3.3k	3950 ±3%	3982	3987	3998	0.55	100	1
NCP15XM472□03RC	4.7k	3500 ±2%	3539	3545	3560	0.46	100	1
NCP15XW682□03RC	6.8k	3950 ±3%	3982	3987	3998	0.38	100	1
NCP15XH103D03RC	10k ±0.5%	3380 ±0.7%	3428	3434	3455	0.31	100	1
NCP15XH103F03RC	10k ±1%	3380 ±1%	3428	3434	3455	0.31	100	1
NCP15XH103□03RC	10k	3380 ±1%	3428	3434	3455	0.31	100	1
NCP15XV103□03RC	10k	3900 ±3%	3930	3934	3944	0.31	100	1
NCP15XW153□03RC	15k	3950 ±3%	3982	3987	3998	0.25	100	1
NCP15XW223□03RC	22k	3950 ±3%	3982	3987	3998	0.21	100	1
NCP15WL223□03RC	22k	4485 ±1%	4537	4543	4557	0.21	100	1
NCP15WB333□03RC	33k	4050 ±3%	4101	4108	4131	0.17	100	1
NCP15WL333□03RC	33k	4485 ±1%	4537	4543	4557	0.17	100	1



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Part Number	Resistance (25°C) (ohm)	B-Constant (25-50°C) (K)	B-Constant (25-80°C) (Reference Value) (K)	B-Constant (25-85°C) (Reference Value) (K)	B-Constant (25-100°C) (Reference Value) (K)	Permissive Operating Current (25°C) (mA)	Rated Electric Power (25°C) (mW)	Typical Dissipation Constant (25°C) (mW/°C)
NCP15WB473D03RC	47k ±0.5%	4050 ±0.5%	4101	4108	4131	0.14	100	1
NCP15WB473F03RC	47k ±1%	4050 ±1%	4101	4108	4131	0.14	100	1
NCP15WB473□03RC	47k	4050 ±1%	4101	4108	4131	0.14	100	1
NCP15WL473□03RC	47k	4485 ±1%	4537	4543	4557	0.14	100	1
NCP15WD683□03RC	68k	4150 ±3%	4201	4209	4232	0.12	100	1
NCP15WL683□03RC	68k	4485 ±1%	4537	4543	4557	0.12	100	1
NCP15WF104D03RC	100k ±0.5%	4250 ±0.5%	4303	4311	4334	0.10	100	1
NCP15WF104F03RC	100k ±1%	4250 ±1%	4303	4311	4334	0.10	100	1
NCP15WF104□03RC	100k	4250 ±1%	4303	4311	4334	0.10	100	1
NCP15WL104□03RC	100k	4485 ±1%	4537	4543	4557	0.10	100	1
NCP15WL154□03RC	150k	4485 ±1%	4537	4543	4557	0.08	100	1
NCP15WM154□03RC	150k	4500 ±3%	4571	4582	4614	0.08	100	1

4582

4582

4614

4614

0.06

0.04

100

100

1

470k A blank column is filled with resistance tolerance codes (E:  $\pm 3\%$ , J:  $\pm 5\%$ ).

220k

Rated Electric Power is necessary electric power that Thermistor's temperature rises 100°C by self heating at 25°C in still air.

4571

4571

4500 ±3%

4500 ±3%

Operating Temperature Range: -40°C to +125°C

NCP15WM224□03RC

NCP15WM474□03RC



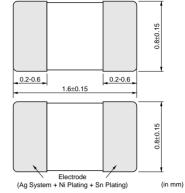
## **NTC Thermistors**



### for Temperature Sensor and Compensation 0603 (1608) Size

0201/0402/0603/0805 sized Chip NTC Thermistors have Ni barrier termination and provide excellent solderability and offer high stability in environment by unique inner construction.





#### ■ Features

- 1. Excellent solderability and high stability in environment
- 2. Excellent long time aging stability
- 3. High accuracy in resistance and B-constant
- 4. Flow / Reflow soldering possible
- 5. Same B-Constant in the same resistance in the three sizes (0805 size / 0603 size / 0402 size) Easy to use smaller size in the circuits
- 6. NCP series are recognized by UL/cUL. (UL1434, File No.E137188)

### Applications

- 1. Temperature compensation for transistor, IC and crystal oscillator in mobile communications
- 2. Temperature sensor for rechargeable batteries
- 3. Temperature compensation of LCD
- 4. Temperature compensation in general use of electric circuits

Part Number	Resistance (25°C) (ohm)	B-Constant (25-50°C) (K)	B-Constant (25-80°C) (Reference Value) (K)	B-Constant (25-85°C) (Reference Value) (K)	B-Constant (25-100°C) (Reference Value) (K)	Permissive Operating Current (25°C) (mA)	Rated Electric Power (25°C) (mW)	Typical Dissipation Constant (25°C) (mW/°C)
NCP18XF101□03RB	100	3250 ±3%	3282	3284	3296	3.10	100	1
NCP18XF151□03RB	150	3250 ±3%	3282	3284	3296	2.50	100	1
NCP18XM221□03RB	220	3500 ±3%	3539	3545	3560	2.10	100	1
NCP18XM331□03RB	330	3500 ±3%	3539	3545	3560	1.70	100	1
NCP18XQ471□03RB	470	3650 ±2%	3688	3693	3706	1.40	100	1
NCP18XQ681□03RB	680	3650 ±3%	3688	3693	3706	1.20	100	1
NCP18XQ102□03RB	1.0k	3650 ±2%	3688	3693	3706	1.00	100	1
NCP18XW152□03RB	1.5k	3950 ±3%	3982	3987	3998	0.81	100	1
NCP18XW222□03RB	2.2k	3950 ±3%	3982	3987	3998	0.67	100	1
NCP18XW332□03RB	3.3k	3950 ±3%	3982	3987	3998	0.55	100	1
NCP18XM472□03RB	4.7k	3500 ±2%	3539	3545	3560	0.46	100	1
NCP18XW682□03RB	6.8k	3950 ±3%	3982	3987	3998	0.38	100	1
NCP18XH103D03RB	10k ±0.5%	3380 ±0.7%	3428	3434	3455	0.31	100	1
NCP18XH103F03RB	10k ±1%	3380 ±1%	3428	3434	3455	0.31	100	1
NCP18XH103□03RB	10k	3380 ±1%	3428	3434	3455	0.31	100	1
NCP18XV103□03RB	10k	3900 ±3%	3930	3934	3944	0.31	100	1
NCP18XW153□03RB	15k	3950 ±3%	3982	3987	3998	0.25	100	1
NCP18XW223□03RB	22k	3950 ±3%	3982	3987	3998	0.21	100	1
NCP18WB333□03RB	33k	4050 ±3%	4101	4108	4131	0.17	100	1
NCP18WB473D03RB	47k ±0.5%	4030 ±0.5%	4101	4108	4131	0.14	100	1
NCP18WB473F10RB	47k ±1%	4050 ±1.5%	4101	4108	4131	0.14	100	1
NCP18WB473□03RB	47k	4050 ±2%	4101	4108	4131	0.14	100	1
NCP18WD683□03RB	68k	4150 ±3%	4201	4209	4232	0.12	100	1
NCP18WF104D03RB	100k ±0.5%	4200 ±0.5%	4255	4260	4282	0.10	100	1
NCP18WF104F12RB	100k ±1%	4200 ±1%	4255	4260	4282	0.10	100	1



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Part Number	Resistance (25°C) (ohm)	B-Constant (25-50°C) (K)	B-Constant (25-80°C) (Reference Value) (K)	B-Constant (25-85°C) (Reference Value) (K)	B-Constant (25-100°C) (Reference Value) (K)	Current (25°C)	Rated Electric Power (25°C) (mW)	Typical Dissipation Constant (25°C) (mW/°C)	
NCP18WF104□03RB	100k	4250 ±2%	4255	4260	4282	0.10	100	1	
NCP18WM154□03RB	150k	4500 ±3%	4571	4582	4614	0.08	100	1	
NCP18WM224□03RB	220k	4500 ±3%	4571	4582	4614	0.06	100	1	
NCP18WM474□03RB	470k	4500 ±3%	4571	4582	4614	0.04	100	1	

A blank column is filled with resistance tolerance codes (E:  $\pm 3\%$ , J:  $\pm 5\%$ ).

Rated Electric Power is necessary electric power that Thermistor's temperature rises  $100^{\circ}\text{C}$  by self heating at  $25^{\circ}\text{C}$  in still air.

Operating Temperature Range: -40°C to +125°C





sales representatives or product engineers before ordering.

• This PDF catalog has only typical specifications because there is no space for detailed specifications. Therefore, please approve our product specifications or transact the approval sheet for product specifications before ordering.

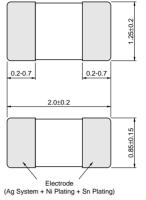
## **NTC Thermistors**



### for Temperature Sensor and Compensation 0805 (2012) Size

0201/0402/0603/0805 sized Chip NTC Thermistors have Ni barrier termination and provide excellent solderability and offer high stability in environment by unique inner construction.





(in mm)

### ■ Features

- Excellent solderability and high stability in environment
- 2. Excellent long time aging stability
- 3. High accuracy in resistance and B-constant
- 4. Flow / Reflow soldering possible
- Same B-Constant in the same resistance in the three sizes (0805 size / 0603 size / 0402 size)
   Easy to use smaller size in the circuits
- NCP series are recognized by UL/cUL. (UL1434, File No.E137188)

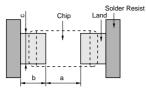
### ■ Applications

- 1. Temperature compensation for transistor, IC and crystal oscillator in mobile communications
- 2. Temperature sensor for rechargeable batteries
- 3. Temperature compensation of LCD
- 4. Temperature compensation in general use of electric circuits

Part Number	Resistance (25°C) (ohm)	B-Constant (25-50°C) (K)	B-Constant (25-80°C) (Reference Value) (K)	B-Constant (25-85°C) (Reference Value) (K)	B-Constant (25-100°C) (Reference Value) (K)	Permissive Operating Current (25°C) (mA)	Rated Electric Power (25°C) (mW)	Typical Dissipation Constant (25°C) (mW/°C)
NCP21XM221J03RA	220 ±5%	3500 ±3%	3539	3545	3560	3.00	200	2
NCP21XQ471J03RA	470 ±5%	3650 ±3%	3688	3693	3706	2.00	200	2
NCP21XQ102J03RA	1.0k ±5%	3650 ±3%	3688	3693	3706	1.40	200	2
NCP21XW222J03RA	2.2k ±5%	3950 ±3%	3982	3987	3998	0.90	200	2
NCP21XM472J03RA	4.7k ±5%	3500 ±3%	3539	3545	3560	0.65	200	2
NCP21XV103J03RA	10k ±5%	3900 ±3%	3930	3934	3944	0.44	200	2
NCP21XW153J03RA	15k ±5%	3950 ±3%	3982	3987	3998	0.36	200	2
NCP21XW223J03RA	22k ±5%	3950 ±3%	3982	3987	3998	0.30	200	2
NCP21WB333J03RA	33k ±5%	4050 ±3%	4101	4108	4131	0.24	200	2
NCP21WB473J03RA	47k ±5%	4050 ±3%	4101	4108	4131	0.20	200	2
NCP21WF104J03RA	100k ±5%	4250 ±3%	4303	4311	4334	0.14	200	2

Rated Electric Power is necessary electric power that Thermistor's temperature rises 100°C by self heating at 25°C in still air. Operating Temperature Range: -40°C to +125°C

### for Temp. Sensor and Compensation Chip Type Standard Land Pattern Dimensions



Part Number	Soldering	Dimensions (mm)					
rait Number	Methods	Chip (LxW)	a	b	С		
NCP03	Reflow Soldering	0.6x0.3	0.25	0.25	0.3		
NCP15	Reflow Soldering	1.0x0.5	0.4	0.4-0.5	0.5		
NCP18	Flow Soldering	1.6x0.8	0.6-1.0	0.8-0.9	0.6-0.8		
NCFIO	Reflow Soldering	1.000.0	0.6-0.8	0.6-0.7	0.6-0.8		
NCP21	Flow Soldering	2.0x1.25	1.0-1.1	0.9-1.0	1.0-1.2		
NCFZI	Reflow Soldering	2.0x1.25	1.0-1.1	0.6-0.7	1.0-1.2		



Part Number	NCP□□YS110	NCP□□YS220	NCP□□XC220	NCP□□YS330	NCP□□XC330	NCP□□YS470	NCP□□XC470	NCP□□YS680
Resistance	11Ω	22Ω	22Ω	33Ω	33Ω	47Ω	47Ω	68Ω
B-Constant	2750K	2750K	3100K	2750K	3100K	2750K	3100K	2750K
Temp. (°C)	Resistance (Ω)	Resistance (Ω)	Resistance (Ω)	Resistance (Ω)	Resistance (Ω)	Resistance (Ω)	Resistance (Ω)	Resistance (Ω)
-40	127.366	254.732	355.823	382.098	533.734	544.201	760.166	787.354
-35	101.662	203.325	273.975	304.987	410.962	434.376	585.310	628.459
-30	81.726	163.452	213.003	245.178	319.504	349.193	455.051	505.215
-25	66.148	132.296	166.943	198.444	250.415	282.633	356.652	408.915
-20	53.946	107.893	131.997	161.839	197.996	230.498	281.994	333.487
<del>-15</del>	44.273	88.546	105.318	132.819	157.978	189.167	224.998	273.688
-10	36.494	72.987	84.670	109.481	127.005	155.927	180.886	225.597
<del></del> 5	30.262	60.523	68.628	90.785	102.942	129.299	146.614	187.071
0	25.226	50.451	55.981	75.677	83.972	107.782	119.596	155.940
5	21.150	42.300	45.859	63.449	68.789	90.367	97.972	130.744
10	17.828	35.657	37.819	53.485	56.728	76.176	80.794	110.212
15	15.103	30.205	31.396	45.308	47.094	64.529	67.073	93.361
20	12.859	25.719	26.211	38.578	39.317	54.944	55.997	79.494
25	11.000	22.000	22.000	33.000	33.000	47.000	47.000	68.000
30	9.452	18.904	18.560	28.356	27.840	40.386	39.651	58.430
35	8.162	16.323	15.735	24.485	23.603	34.872	33.616	50.454
40	7.077	14.155	13.403	21.232	20.104	30.239	28.633	43.750
45	6.161	12.323	11.462	18.484	17.193	26.326	24.487	38.089
50	5.389	10.778	9.842	16.167	14.763	23.025	21.026	33.313
55	4.731	9.461	8.488	14.192	12.732	20.213	18.133	29.244
60	4.168	8.336	7.348	12.504	11.022	17.809	15.698	25.766
65	3.687	7.374	6.399	11.061	9.598	15.753	13.670	25.766
70	3.273	6.545	5.595	9.817	8.392	13.982	11.952	20.230
75	2.915	5.830	4.896	8.744			10.461	
					7.345	12.454		18.019
<u>80</u> 85	2.605	5.210	4.299	7.814	6.448	11.130	9.184	16.102
	2.335	4.671	3.795	7.006	5.692	9.979	8.107	14.437
90	2.100	4.201	3.360	6.301	5.040	8.974	7.179	12.984
95	1.894	3.789	2.983	5.683	4.474	8.094	6.373	11.710
100	1.713	3.427	2.656	5.140	3.983	7.320	5.673	10.591
105	1.554	3.107	2.367	4.661	3.551	6.638	5.057	9.604
110	1.412	2.825	2.116	4.237	3.173	6.035	4.520	8.731
115	1.287	2.574	1.901	3.862	2.851	5.500	4.060	7.957
120	1.176	2.352	1.712	3.528	2.568	5.024	3.657	7.269
125	1.077	2.153	1.543	3.230	2.314	4.600	3.296	6.655
125	1.077	2.153	1.543	3.230	2.314	4.600	3.296	6.655
125 Part Number	1.077 NCP□□XC680	2.153 NCP□□YS101	1.543 NCP□□XF101	3.230 NCP□□XF151	2.314 NCP□□XM221	4.600 NCP□□XM331	3.296 NCP□□XQ471	6.655 NCP□□XQ681
125 Part Number Resistance	1.077 NCP□□XC680 68Ω	2.153 NCP□□YS101 100Ω	1.543 NCP□□XF101 100Ω	3.230 NCP□□XF151 150Ω	2.314 NCP□□XM221 220Ω	4.600 NCP□□XM331 330Ω	3.296 NCP□□XQ471 470Ω	6.655 NCP□□XQ681 680Ω
Part Number Resistance B-Constant	1.077  NCP□□XC680  68Ω  3100K	2.153  NCP□□YS101  100Ω  2750K	1.543 NCP□□XF101 100Ω 3250K	3.230 NCP□□XF151 150Ω 3250K	2.314  NCP□□XM221  220Ω  3500K	4.600 NCP□□XM331 330Ω 3500K	3.296 NCP□□XQ471 470Ω 3650K	6.655 NCP□□XQ681 680Ω 3650K
Part Number Resistance B-Constant Temp. (°C)	1.077  NCP□□XC680  68Ω  3100K  Resistance (Ω)	2.153  NCP□□YS101  100Ω  2750K  Resistance (Ω)	1.543  NCP□□XF101  100Ω  3250K  Resistance (Ω)	3.230  NCP□□XF151  150Ω  3250K  Resistance (Ω)	2.314  NCP□□XM221  220Ω  3500K  Resistance (Ω)	4.600  NCP□□XM331  330Ω  3500K  Resistance (Ω)	3.296  NCP□□XQ471  470Ω  3650K  Resistance (Ω)	6.655  NCP□□XQ681  680Ω  3650K  Resistance (Ω)
Part Number Resistance B-Constant Temp. (°C)	1.077  NCP□□XC680 68Ω 3100K Resistance (Ω) 1099.815	2.153  NCP□□YS101  100Ω  2750K  Resistance (Ω)  1157.874	1.543  NCP□□XF101  100Ω  3250K  Resistance (Ω)  1824.175	3.230  NCP□□XF151  150Ω  3250K  Resistance (Ω)  2736.262	2.314  NCP□□XM221  220Ω 3500K  Resistance (Ω) 4947.904	4.600  NCP□XM331  330Ω 3500K  Resistance (Ω) 7421.856	3.296  NCP□XQ471  470Ω  3650K  Resistance (Ω)  11822.473	6.655  NCP□□XQ681 680Ω 3650K Resistance (Ω) 17104.854
Part Number Resistance B-Constant Temp. (°C) -40 -35	1.077  NCP□□XC680 68Ω 3100K Resistance (Ω) 1099.815 846.832	2.153  NCP□□YS101  100Ω  2750K  Resistance (Ω)  1157.874  924.204	1.543  NCP□□XF101  100Ω  3250K  Resistance (Ω)  1824.175  1390.685	3.230  NCP□□XF151  150Ω  3250K  Resistance (Ω)  2736.262  2086.028	2.314  NCP□□XM221 220Ω 3500K Resistance (Ω) 4947.904 3703.755	4.600  NCP□□XM331 330Ω 3500K Resistance (Ω) 7421.856 5555.632	3.296  NCP□□XQ471  470Ω  3650K  Resistance (Ω)  11822.473  8767.745	6.655  NCP□□XO681 680Ω 3650K Resistance (Ω) 17104.854 12685.248
Part Number Resistance B-Constant Temp. (°C) -40 -35 -30	1.077  NCP□□XC680 68Ω 3100K Resistance (Ω) 1099.815 846.832 658.372	2.153  NCP□□YS101  100Ω 2750K Resistance (Ω) 1157.874 924.204 742.963	1.543  NCP□□XF101  100Ω  3250K  Resistance (Ω)  1824.175  1390.685  1070.653	3.230  NCP□□XF151  150Ω  3250K  Resistance (Ω)  2736.262  2086.028  1605.979	2.314  NCP□□XM221 220Ω 3500K Resistance (Ω) 4947.904 3703.755 2798.873	4.600  NCP□□XM331 330Ω 3500K Resistance (Ω) 7421.856 5555.632 4198.309	3.296  NCP□□XQ471  470Ω  3650K  Resistance (Ω)  11822.473  8767.745  6570.224	6.655  NCP□□XO681 680Ω 3650K Resistance (Ω) 17104.854 12685.248 9505.855
Part Number Resistance B-Constant Temp. (°C) -40 -35 -30 -25	1.077  NCP□□XC680 68Ω 3100K Resistance (Ω) 1099.815 846.832 658.372 516.007	2.153  NCP□□YS101  100Ω  2750K  Resistance (Ω)  1157.874  924.204  742.963  601.346	1.543  NCP□□XF101  100Ω  3250K  Resistance (Ω)  1824.175  1390.685  1070.653  831.138	3.230  NCP□□XF151  150Ω  3250K  Resistance (Ω)  2736.262  2086.028  1605.979  1246.708	2.314  NCP□□XM221 220Ω 3500K Resistance (Ω) 4947.904 3703.755 2798.873 2135.887	4.600  NCP□□XM331  330Ω  3500K  Resistance (Ω)  7421.856  5555.632  4198.309  3203.831	3.296  NCP□□XQ471  470Ω  3650K  Resistance (Ω)  11822.473  8767.745  6570.224  4971.784	6.655  NCP□□XO681 680Ω 3650K Resistance (Ω) 17104.854 12685.248 9505.855 7193.219
Part Number Resistance B-Constant Temp. (°C) -40 -35 -30 -25 -20	1.077  NCP□□XC680 68Ω 3100K Resistance (Ω) 1099.815 846.832 658.372 516.007 407.991	2.153  NCP□□YS101  100Ω 2750K  Resistance (Ω) 1157.874 924.204 742.963 601.346 490.422	1.543  NCP□□XF101  100Ω  3250K  Resistance (Ω)  1824.175  1390.685  1070.653  831.138  650.960	3.230  NCP□□XF151  150Ω  3250K  Resistance (Ω)  2736.262  2086.028  1605.979  1246.708  976.440	2.314  NCP□□XM221 220Ω 3500K Resistance (Ω) 4947.904 3703.755 2798.873 2135.887 1645.037	4.600  NCP□□XM331 330Ω 3500K Resistance (Ω) 7421.856 5555.632 4198.309 3203.831 2467.555	3.296  NCP□□XO471  470Ω  3650K  Resistance (Ω)  11822.473  8767.745  6570.224  4971.784  3796.933	6.655  NCP□□XQ681 680Ω 3650K Resistance (Ω) 17104.854 12685.248 9505.855 7193.219 5493.436
Part Number Resistance B-Constant Temp. (°C) -40 -35 -30 -25 -20 -15	1.077  NCP□□XC680 68Ω 3100K Resistance (Ω) 1099.815 846.832 658.372 516.007 407.991 325.529	2.153  NCP□□YS101  100Ω  2750K  Resistance (Ω)  1157.874  924.204  742.963  601.346  490.422  402.482	1.543  NCP□□XF101  100Ω  3250K  Resistance (Ω)  1824.175  1390.685  1070.653  831.138  650.960  514.441	3.230  NCP□□XF151  150Ω  3250K  Resistance (Ω)  2736.262  2086.028  1605.979  1246.708  976.440  771.661	2.314  NCP□□XM221 220Ω 3500K Resistance (Ω) 4947.904 3703.755 2798.873 2135.887 1645.037 1278.034	4.600 NCP□□XM331 330Ω 3500K Resistance (Ω) 7421.856 5555.632 4198.309 3203.831 2467.555 1917.051	3.296  NCP□□XQ471  470Ω  3650K  Resistance (Ω)  11822.473  8767.745  6570.224  4971.784  3796.933  2923.400	6.655  NCP□□XQ681 680Ω 3650K Resistance (Ω) 17104.854 12685.248 9505.855 7193.219 5493.436 4229.599
125  Part Number Resistance B-Constant Temp. (°C) -40 -35 -30 -25 -20 -15 -10	1.077  NCP□□XC680 68Ω 3100K Resistance (Ω) 1099.815 846.832 658.372 516.007 407.991 325.529 261.707	2.153  NCP□□YS101  100Ω  2750K  Resistance (Ω)  1157.874  924.204  742.963  601.346  490.422  402.482  331.760	1.543  NCP□□XF101  100Ω  3250K  Resistance (Ω)  1824.175  1390.685  1070.653  831.138  650.960  514.441  409.700	3.230  NCP□□XF151  150Ω  3250K  Resistance (Ω)  2736.262  2086.028  1605.979  1246.708  976.440  771.661  614.550	2.314  NCP□□XM221 220Ω 3500K Resistance (Ω) 4947.904 3703.755 2798.873 2135.887 1645.037 1278.034 1000.620	4.600  NCP□□XM331  330Ω  3500K  Resistance (Ω)  7421.856  5555.632  4198.309  3203.831  2467.555  1917.051  1500.930	3.296  NCP□□XQ471  470Ω  3650K  Resistance (Ω)  11822.473  8767.745  6570.224  4971.784  3796.933  2923.400  2269.599	6.655  NCP□□XO681 680Ω 3650K Resistance (Ω) 17104.854 12685.248 9505.855 7193.219 5493.436 4229.599 3283.675
125 Part Number Resistance B-Constant Temp. (°C) -40 -35 -30 -25 -20 -15 -10 -5	1.077  NCP□□XC680 68Ω 3100K Resistance (Ω) 1099.815 846.832 658.372 516.007 407.991 325.529 261.707 212.123	2.153  NCP□□YS101 100Ω 2750K Resistance (Ω) 1157.874 924.204 742.963 601.346 490.422 402.482 331.760 275.105	1.543  NCP□□XF101  100Ω  3250K  Resistance (Ω)  1824.175  1390.685  1070.653  831.138  650.960  514.441  409.700  328.877	3.230  NCP□□XF151  150Ω  3250K  Resistance (Ω)  2736.262  2086.028  1605.979  1246.708  976.440  771.661  614.550  493.315	2.314  NCP□□XM221 220Ω 3500K  Resistance (Ω) 4947.904 3703.755 2798.873 2135.887 1645.037 1278.034 1000.620 789.612	4.600  NCP□□XM331  330Ω  3500K  Resistance (Ω)  7421.856  5555.632  4198.309  3203.831  2467.555  1917.051  1500.930  1184.418	3.296  NCP□□XQ471  470Ω  3650K  Resistance (Ω)  11822.473  8767.745  6570.224  4971.784  3796.933  2923.400  2269.599  1775.225	6.655  NCP□□XO681 680Ω 3650K Resistance (Ω) 17104.854 12685.248 9505.855 7193.219 5493.436 4229.599 3283.675 2568.411
125 Part Number Resistance B-Constant Temp. (°C) -40 -35 -30 -25 -20 -15 -10 -5 0	1.077  NCP□□XC680 68Ω 3100K Resistance (Ω) 1099.815 846.832 658.372 516.007 407.991 325.529 261.707 212.123 173.033	2.153  NCP□□YS101  100Ω  2750K  Resistance (Ω)  1157.874  924.204  742.963  601.346  490.422  402.482  331.760  275.105  229.324	1.543  NCP□□XF101  100Ω  3250K  Resistance (Ω)  1824.175  1390.685  1070.653  831.138  650.960  514.441  409.700  328.877  265.759	3.230  NCP□□XF151 150Ω 3250K Resistance (Ω) 2736.262 2086.028 1605.979 1246.708 976.440 771.661 614.550 493.315 398.639	2.314  NCP□□XM221 220Ω 3500K Resistance (Ω) 4947.904 3703.755 2798.873 2135.887 1645.037 1278.034 1000.620 789.612 627.752	4.600  NCP□□XM331 330Ω 3500K Resistance (Ω) 7421.856 5555.632 4198.309 3203.831 2467.555 1917.051 1500.930 1184.418 941.628	3.296  NCP□□XQ471  470Ω 3650K  Resistance (Ω) 11822.473 8767.745 6570.224 4971.784 3796.933 2923.400 2269.599 1775.225 1399.050	6.655  NCP□□XO681 680Ω 3650K Resistance (Ω) 17104.854 12685.248 9505.855 7193.219 5493.436 4229.599 3283.675 2568.411 2024.158
Part Number Resistance B-Constant Temp. (°C) -40 -35 -30 -25 -20 -15 -10 -5 0	1.077  NCP□□XC680 68Ω 3100K Resistance (Ω) 1099.815 846.832 658.372 516.007 407.991 325.529 261.707 212.123 173.033 141.747	2.153  NCP□□YS101  100Ω  2750K  Resistance (Ω)  1157.874  924.204  742.963  601.346  490.422  402.482  331.760  275.105  229.324  192.270	1.543  NCP□□XF101  100Ω  3250K  Resistance (Ω)  1824.175  1390.685  1070.653  831.138  650.960  514.441  409.700  328.877  265.759  215.785	3.230  NCP□□XF151 150Ω 3250K Resistance (Ω) 2736.262 2086.028 1605.979 1246.708 976.440 771.661 614.550 493.315 398.639 323.677	2.314  NCP□□XM221 220Ω 3500K Resistance (Ω) 4947.904 3703.755 2798.873 2135.887 1645.037 1278.034 1000.620 789.612 627.752 502.474	4.600  NCP□□XM331 330Ω 3500K Resistance (Ω) 7421.856 5555.632 4198.309 3203.831 2467.555 1917.051 1500.930 1184.418 941.628 753.711	3.296  NCP□□XQ471  470Ω 3650K  Resistance (Ω) 11822.473 8767.745 6570.224 4971.784 3796.933 2923.400 2269.599 1775.225 1399.050 1110.220	6.655  NCP□□XO681 680Ω 3650K Resistance (Ω) 17104.854 12685.248 9505.855 7193.219 5493.436 4229.599 3283.675 2568.411 2024.158 1606.275
Part Number Resistance B-Constant Temp. (°C) -40 -35 -30 -25 -20 -15 -10 -5 0 5	1.077  NCP□□XC680 68Ω 3100K Resistance (Ω) 1099.815 846.832 658.372 516.007 407.991 325.529 261.707 212.123 173.033 141.747 116.894	2.153  NCP□□YS101  100Ω 2750K  Resistance (Ω) 1157.874 924.204 742.963 601.346 490.422 402.482 331.760 275.105 229.324 192.270 162.076	1.543  NCP□□XF101  100Ω 3250K  Resistance (Ω) 1824.175 1390.685 1070.653 831.138 650.960 514.441 409.700 328.877 265.759 215.785 176.395	3.230  NCP□□XF151  150Ω 3250K  Resistance (Ω) 2736.262 2086.028 1605.979 1246.708 976.440 771.661 614.550 493.315 398.639 323.677 264.592	2.314  NCP□□XM221 220Ω 3500K Resistance (Ω) 4947.904 3703.755 2798.873 2135.887 1645.037 1278.034 1000.620 789.612 627.752 502.474 405.010	4.600  NCP□□XM331 330Ω 3500K Resistance (Ω) 7421.856 5555.632 4198.309 3203.831 2467.555 1917.051 1500.930 1184.418 941.628 753.711 607.514	3.296  NCP□□XQ471  470Ω 3650K  Resistance (Ω) 11822.473 8767.745 6570.224 4971.784 3796.933 2923.400 2269.599 1775.225 1399.050 1110.220 887.257	6.655  NCP□□XO681 680Ω 3650K Resistance (Ω) 17104.854 12685.248 9505.855 7193.219 5493.436 4229.599 3283.675 2568.411 2024.158 1606.275 1283.691
Part Number Resistance B-Constant Temp. (°C) -40 -35 -30 -25 -20 -15 -10 0 5 10	1.077  NCP□□XC680 68Ω 3100K Resistance (Ω) 1099.815 846.832 658.372 516.007 407.991 325.529 261.707 212.123 173.033 141.747 116.894 97.042	2.153  NCP□□YS101  100Ω 2750K  Resistance (Ω) 1157.874 924.204 742.963 601.346 490.422 402.482 331.760 275.105 229.324 192.270 162.076 137.296	1.543  NCP□□XF101  100Ω 3250K  Resistance (Ω) 1824.175 1390.685 1070.653 831.138 650.960 514.441 409.700 328.877 265.759 215.785 176.395 145.161	3.230  NCP□□XF151  150Ω 3250K  Resistance (Ω) 2736.262 2086.028 1605.979 1246.708 976.440 771.661 614.550 493.315 398.639 323.677 264.592 217.742	2.314  NCP□□XM221 220Ω 3500K Resistance (Ω) 4947.904 3703.755 2798.873 2135.887 1645.037 1278.034 1000.620 789.612 627.752 502.474 405.010 328.480	4.600  NCP□□XM331 330Ω 3500K  Resistance (Ω) 7421.856 5555.632 4198.309 3203.831 2467.555 1917.051 1500.930 1184.418 941.628 753.711 607.514 492.720	3.296  NCP□□XQ471  470Ω  3650K  Resistance (Ω)  11822.473  8767.745  6570.224  4971.784  3796.933  2923.400  2269.599  1775.225  1399.050  1110.220  887.257  713.463	6.655  NCP□□XO681 680Ω 3650K Resistance (Ω) 17104.854 12685.248 9505.855 7193.219 5493.436 4229.599 3283.675 2568.411 2024.158 1606.275 1283.691 1032.245
Part Number Resistance B-Constant Temp. (°C) -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15	1.077  NCP□□XC680 68Ω 3100K Resistance (Ω) 1099.815 846.832 658.372 516.007 407.991 325.529 261.707 212.123 173.033 141.747 116.894 97.042 81.016	2.153  NCP□□YS101  100Ω 2750K  Resistance (Ω) 1157.874  924.204  742.963 601.346  490.422 402.482 331.760 275.105 229.324 192.270 162.076 137.296 116.902	1.543  NCP□□XF101  100Ω 3250K  Resistance (Ω) 1824.175 1390.685 1070.653 831.138 650.960 514.441 409.700 328.877 265.759 215.785 176.395 145.161 120.152	3.230  NCP□□XF151  150Ω 3250K  Resistance (Ω) 2736.262 2086.028 1605.979 1246.708 976.440 771.661 614.550 493.315 398.639 323.677 264.592 217.742 180.228	2.314  NCP□□XM221 220Ω 3500K Resistance (Ω) 4947.904 3703.755 2798.873 2135.887 1645.037 1278.034 1000.620 789.612 627.752 502.474 405.010 328.480 268.044	4.600  NCP□□XM331 330Ω 3500K Resistance (Ω) 7421.856 5555.632 4198.309 3203.831 2467.555 1917.051 1500.930 1184.418 941.628 753.711 607.514 492.720 402.066	3.296  NCP□□XO471  470Ω  3650K  Resistance (Ω)  11822.473  8767.745  6570.224  4971.784  3796.933  2923.400  2269.599  1775.225  1399.050  1110.220  887.257  713.463  577.375	6.655  NCP□□XO681 680Ω 3650K Resistance (Ω) 17104.854 12685.248 9505.855 7193.219 5493.436 4229.599 3283.675 2568.411 2024.158 1606.275 1283.691 1032.245 835.351
125  Part Number Resistance B-Constant Temp. (°C) -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25	1.077  NCP□□XC680 68Ω 3100K Resistance (Ω) 1099.815 846.832 658.372 516.007 407.991 325.529 261.707 212.123 173.033 141.747 116.894 97.042 81.016 68.000	2.153  NCP□□YS101  100Ω 2750K  Resistance (Ω) 1157.874 924.204 742.963 601.346 490.422 402.482 331.760 275.105 229.324 192.270 162.076 137.296 116.902 100.000	1.543  NCP□□XF101  100Ω 3250K  Resistance (Ω) 1824.175 1390.685 1070.653 831.138 650.960 514.441 409.700 328.877 265.759 215.785 176.395 145.161 120.152 100.000	3.230  NCP□□XF151  150Ω 3250K  Resistance (Ω) 2736.262 2086.028 1605.979 1246.708 976.440 771.661 614.550 493.315 398.639 323.677 264.592 217.742 180.228 150.000	2.314  NCP□□XM221 220Ω 3500K Resistance (Ω) 4947.904 3703.755 2798.873 2135.887 1645.037 1278.034 1000.620 789.612 627.752 502.474 405.010 328.480 268.044 220.000	4.600  NCP□□XM331 330Ω 3500K  Resistance (Ω) 7421.856 5555.632 4198.309 3203.831 2467.555 1917.051 1500.930 1184.418 941.628 753.711 607.514 492.720 402.066 330.000	3.296  NCP□□XO471  470Ω  3650K  Resistance (Ω)  11822.473  8767.745  6570.224  4971.784  3796.933  2923.400  2269.599  1775.225  1399.050  1110.220  887.257  713.463  577.375  470.000	6.655  NCP□□XC681 680Ω 3650K Resistance (Ω) 17104.854 12685.248 9505.855 7193.219 5493.436 4229.599 3283.675 2568.411 2024.158 1606.275 1283.691 1032.245 835.351 680.000
125  Part Number Resistance B-Constant Temp. (°C) -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30	1.077  NCP□□XC680 68Ω 3100K Resistance (Ω) 1099.815 846.832 658.372 516.007 407.991 325.529 261.707 212.123 173.033 141.747 116.894 97.042 81.016 68.000 57.368	2.153  NCP□□YS101 100Ω 2750K Resistance (Ω) 1157.874 924.204 742.963 601.346 490.422 402.482 331.760 275.105 229.324 192.270 162.076 137.296 116.902 100.000 85.927	1.543  NCP□□XF101 100Ω 3250K Resistance (Ω) 1824.175 1390.685 1070.653 831.138 650.960 514.441 409.700 328.877 265.759 215.785 176.395 145.161 120.152 100.000 83.669	3.230  NCP□□XF151 150Ω 3250K Resistance (Ω) 2736.262 2086.028 1605.979 1246.708 976.440 771.661 614.550 493.315 398.639 323.677 264.592 217.742 180.228 150.000 125.503	2.314  NCP□□XM221 220Ω 3500K  Resistance (Ω) 4947.904 3703.755 2798.873 2135.887 1645.037 1278.034 1000.620 789.612 627.752 502.474 405.010 328.480 268.044 220.000 181.576	4.600  NCP□□XM331 330Ω 3500K  Resistance (Ω) 7421.856 5555.632 4198.309 3203.831 2467.555 1917.051 1500.930 1184.418 941.628 753.711 607.514 492.720 402.066 330.000 272.365	3.296  NCP□□XO471  470Ω 3650K  Resistance (Ω) 11822.473 8767.745 6570.224 4971.784 3796.933 2923.400 2269.599 1775.225 1399.050 1110.220 887.257 713.463 577.375 470.000 384.800	6.655  NCP□□XO681 680Ω 3650K Resistance (Ω) 17104.854 12685.248 9505.855 7193.219 5493.436 4229.599 3283.675 2568.411 2024.158 1606.275 1283.691 1032.245 835.351 680.000 556.733
125 Part Number Resistance B-Constant Temp. (°C) -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35	1.077  NCP□□XC680 68Ω 3100K Resistance (Ω) 1099.815 846.832 658.372 516.007 407.991 325.529 261.707 212.123 173.033 141.747 116.894 97.042 81.016 68.000 57.368 48.636	2.153  NCP□□YS101  100Ω 2750K  Resistance (Ω)  1157.874  924.204  742.963  601.346  490.422  402.482  331.760  275.105  229.324  192.270  162.076  137.296  116.902  100.000  85.927  74.197	1.543  NCP□□XF101  100Ω 3250K  Resistance (Ω) 1824.175 1390.685 1070.653 831.138 650.960 514.441 409.700 328.877 265.759 215.785 176.395 145.161 120.152 100.000 83.669 70.361	3.230  NCP□□XF151 150Ω 3250K Resistance (Ω) 2736.262 2086.028 1605.979 1246.708 976.440 771.661 614.550 493.315 398.639 323.677 264.592 217.742 180.228 150.000 125.503 105.541	2.314  NCP□□XM221 220Ω 3500K Resistance (Ω) 4947.904 3703.755 2798.873 2135.887 1645.037 1278.034 1000.620 789.612 627.752 502.474 405.010 328.480 268.044 220.000 181.576 150.668	4.600  NCP□□XM331 330Ω 3500K  Resistance (Ω) 7421.856 5555.632 4198.309 3203.831 2467.555 1917.051 1500.930 1184.418 941.628 753.711 607.514 492.720 402.066 330.000 272.365 226.002	3.296  NCP□□XO471  470Ω 3650K  Resistance (Ω) 11822.473 8767.745 6570.224 4971.784 3796.933 2923.400 2269.599 1775.225 1399.050 1110.220 887.257 713.463 577.375 470.000 384.800 316.757	6.655  NCP□□XO681 680Ω 3650K Resistance (Ω) 17104.854 12685.248 9505.855 7193.219 5493.436 4229.599 3283.675 2568.411 2024.158 1606.275 1283.691 1032.245 835.351 680.000 556.733 458.287
125 Part Number Resistance B-Constant Temp. (°C) -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40	1.077  NCP□□XC680 68Ω 3100K Resistance (Ω) 1099.815 846.832 658.372 516.007 407.991 325.529 261.707 212.123 173.033 141.747 116.894 97.042 81.016 68.000 57.368 48.636 41.426	2.153  NCP□□YS101  100Ω 2750K  Resistance (Ω)  1157.874  924.204  742.963  601.346  490.422  402.482  331.760  275.105  229.324  192.270  162.076  137.296  116.902  100.000  85.927  74.197  64.339	1.543  NCP□□XF101  100Ω 3250K  Resistance (Ω) 1824.175 1390.685 1070.653 831.138 650.960 514.441 409.700 328.877 265.759 215.785 176.395 145.161 120.152 100.000 83.669 70.361 59.456	3.230  NCP□□XF151  150Ω 3250K  Resistance (Ω) 2736.262 2086.028 1605.979 1246.708 976.440 771.661 614.550 493.315 398.639 323.677 264.592 217.742 180.228 150.000 125.503 105.541 89.184	2.314  NCP□□XM221 220Ω 3500K Resistance (Ω) 4947.904 3703.755 2798.873 2135.887 1645.037 1278.034 1000.620 789.612 627.752 502.474 405.010 328.480 268.044 220.000 181.576 150.668 125.681	4.600  NCP□□XM331 330Ω 3500K Resistance (Ω) 7421.856 5555.632 4198.309 3203.831 2467.555 1500.930 1184.418 941.628 753.711 607.514 492.720 402.066 330.000 272.365 226.002 188.521	3.296  NCP□□XQ471  470Ω 3650K  Resistance (Ω) 11822.473 8767.745 6570.224 4971.784 3796.933 2923.400 2269.599 1775.225 1399.050 1110.220 887.257 713.463 577.375 470.000 384.800 316.757 262.177	6.655  NCP□□XO681 680Ω 3650K Resistance (Ω) 17104.854 12685.248 9505.855 7193.219 5493.436 4229.599 3283.675 2568.411 2024.158 1606.275 1283.691 1032.245 835.351 680.000 556.733 458.287 379.320
125 Part Number Resistance B-Constant Temp. (°C) -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40	1.077  NCP□□XC680 68Ω 3100K Resistance (Ω) 1099.815 846.832 658.372 516.007 407.991 325.529 261.707 212.123 173.033 141.747 116.894 97.042 81.016 68.000 57.368 48.636 41.426 35.428	2.153  NCP□□YS101  100Ω 2750K  Resistance (Ω)  1157.874  924.204  742.963  601.346  490.422  402.482  331.760  275.105  229.324  192.270  162.076  137.296  116.902  100.000  85.927  74.197  64.339  56.013	1.543  NCP□□XF101  100Ω 3250K  Resistance (Ω) 1824.175 1390.685 1070.653 831.138 650.960 514.441 409.700 328.877 265.759 215.785 176.395 145.161 120.152 100.000 83.669 70.361 59.456 50.470	3.230  NCP□□XF151  150Ω 3250K  Resistance (Ω) 2736.262 2086.028 1605.979 1246.708 976.440 771.661 614.550 493.315 398.639 323.677 264.592 217.742 180.228 150.000 125.503 105.541 89.184 75.705	2.314  NCP□□XM221 220Ω 3500K Resistance (Ω) 4947.904 3703.755 2798.873 2135.887 1645.037 1278.034 1000.620 789.612 627.752 502.474 405.010 328.480 268.044 220.000 181.576 150.668 125.681 105.336	4.600  NCP□□XM331 330Ω 3500K  Resistance (Ω) 7421.856 5555.632 4198.309 3203.831 2467.555 1917.051 1500.930 1184.418 941.628 753.711 607.514 492.720 402.066 330.000 272.365 226.002 188.521 158.004	3.296  NCP□□XQ471  470Ω 3650K  Resistance (Ω) 11822.473 8767.745 6570.224 4971.784 3796.933 2923.400 2269.599 1775.225 1399.050 1110.220 887.257 713.463 577.375 470.000 384.800 316.757 262.177 218.069	6.655  NCP□□XO681 680Ω 3650K Resistance (Ω) 17104.854 12685.248 9505.855 7193.219 5493.436 4229.599 3283.675 2568.411 2024.158 1606.275 1283.691 1032.245 835.351 680.000 556.733 458.287 379.320 315.504
125 Part Number Resistance B-Constant Temp. (°C) -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40 45 50	1.077  NCP□□XC680 68Ω 3100K Resistance (Ω) 1099.815 846.832 658.372 516.007 407.991 325.529 261.707 212.123 173.033 141.747 116.894 97.042 81.016 68.000 57.368 48.636 41.426 35.428 30.421	2.153  NCP□□YS101  100Ω 2750K  Resistance (Ω) 1157.874 924.204 742.963 601.346 490.422 402.482 331.760 275.105 229.324 192.270 162.076 137.296 116.902 100.000 85.927 74.197 64.339 56.013 48.989	1.543  NCP□□XF101  100Ω 3250K  Resistance (Ω) 1824.175 1390.685 1070.653 831.138 650.960 514.441 409.700 328.877 265.759 215.785 176.395 145.161 120.152 100.000 83.669 70.361 59.456 50.470 43.029	3.230  NCP□□XF151  150Ω 3250K  Resistance (Ω) 2736.262 2086.028 1605.979 1246.708 976.440 771.661 614.550 493.315 398.639 323.677 264.592 217.742 180.228 150.000 125.503 105.541 89.184 75.705 64.543	2.314  NCP□□XM221 220Ω 3500K Resistance (Ω) 4947.904 3703.755 2798.873 2135.887 1645.037 1278.034 1000.620 789.612 627.752 502.474 405.010 328.480 268.044 220.000 181.576 150.668 125.681 105.336 88.717	4.600  NCP□□XM331 330Ω 3500K Resistance (Ω) 7421.856 5555.632 4198.309 3203.831 2467.555 1917.051 1500.930 1184.418 941.628 753.711 607.514 492.720 402.066 330.000 272.365 226.002 188.521 158.004 133.076	3.296  NCP□□XQ471  470Ω 3650K  Resistance (Ω) 11822.473 8767.745 6570.224 4971.784 3796.933 2923.400 2269.599 1775.225 1399.050 1110.220 887.257 713.463 577.375 470.000 384.800 316.757 262.177 218.069 182.297	6.655  NCP□□XO681 680Ω 3650K Resistance (Ω) 17104.854 12685.248 9505.855 7193.219 5493.436 4229.599 3283.675 2568.411 2024.158 1606.275 1283.691 1032.245 835.351 680.000 556.733 458.287 379.320 315.504 263.749
125 Part Number Resistance B-Constant Temp. (°C) -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40 45 50 55	1.077  NCP□□XC680 68Ω 3100K Resistance (Ω) 1099.815 846.832 658.372 516.007 407.991 325.529 261.707 212.123 173.033 141.747 116.894 97.042 81.016 68.000 57.368 48.636 41.426 35.428 30.421 26.235	2.153  NCP□□YS101  100Ω 2750K  Resistance (Ω) 1157.874 924.204 742.963 601.346 490.422 402.482 331.760 275.105 229.324 192.270 162.076 137.296 116.902 100.000 85.927 74.197 64.339 56.013 48.989 43.006	1.543  NCP□□XF101  100Ω 3250K  Resistance (Ω) 1824.175 1390.685 1070.653 831.138 650.960 514.441 409.700 328.877 265.759 215.785 176.395 145.161 120.152 100.000 83.669 70.361 59.456 50.470 43.029 36.830	3.230  NCP□□XF151  150Ω 3250K  Resistance (Ω) 2736.262 2086.028 1605.979 1246.708 976.440 771.661 614.550 493.315 398.639 323.677 264.592 217.742 180.228 150.000 125.503 105.541 89.184 75.705 64.543 55.246	2.314  NCP□□XM221 220Ω 3500K Resistance (Ω) 4947.904 3703.755 2798.873 2135.887 1645.037 1278.034 1000.620 789.612 627.752 502.474 405.010 328.480 268.044 220.000 181.576 150.668 125.681 105.336 88.717 75.059	4.600  NCP□□XM331 330Ω 3500K  Resistance (Ω) 7421.856 5555.632 4198.309 3203.831 2467.555 1917.051 1500.930 1184.418 941.628 753.711 607.514 492.720 402.066 330.000 272.365 226.002 188.521 158.004 133.076 112.588	3.296  NCP□□XQ471  470Ω 3650K  Resistance (Ω) 11822.473 8767.745 6570.224 4971.784 3796.933 2923.400 2269.599 1775.225 1399.050 1110.220 887.257 713.463 577.375 470.000 384.800 316.757 262.177 218.069 182.297	6.655  NCP□□XO681 680Ω 3650K Resistance (Ω) 17104.854 12685.248 9505.855 7193.219 5493.436 4229.599 3283.675 2568.411 2024.158 1606.275 1283.691 1032.245 835.351 680.000 556.733 458.287 379.320 315.504 263.749 221.579
125 Part Number Resistance B-Constant Temp. (°C) -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40 45 50 55 60	1.077  NCP□□XC680 68Ω 3100K Resistance (Ω) 1099.815 846.832 658.372 516.007 407.991 325.529 261.707 212.123 173.033 141.747 116.894 97.042 81.016 68.000 57.368 48.636 41.426 35.428 30.421 26.235 22.712	2.153  NCP□□YS101  100Ω 2750K  Resistance (Ω) 1157.874 924.204 742.963 601.346 490.422 402.482 331.760 275.105 229.324 192.270 162.076 137.296 116.902 100.000 85.927 74.197 64.339 56.013 48.989 43.006 37.891	1.543  NCP□□XF101  100Ω 3250K  Resistance (Ω) 1824.175 1390.685 1070.653 831.138 650.960 514.441 409.700 328.877 265.759 215.785 176.395 145.161 120.152 100.000 83.669 70.361 59.456 50.470 43.029 36.830 31.649	3.230  NCP□□XF151  150Ω 3250K  Resistance (Ω) 2736.262 2086.028 1605.979 1246.708 976.440 771.661 614.550 493.315 398.639 323.677 264.592 217.742 180.228 150.000 125.503 105.541 89.184 75.705 64.543 55.246 47.473	2.314  NCP□□XM221 220Ω 3500K Resistance (Ω) 4947.904 3703.755 2798.873 2135.887 1645.037 1278.034 1000.620 789.612 627.752 502.474 405.010 328.480 268.044 220.000 181.576 150.668 125.681 105.336 88.717 75.059 63.777	4.600  NCP□□XM331 330Ω 3500K  Resistance (Ω) 7421.856 5555.632 4198.309 3203.831 2467.555 1917.051 1500.930 1184.418 941.628 753.711 607.514 492.720 402.066 330.000 272.365 226.002 188.521 158.004 133.076 112.588 95.666	3.296  NCP□□XQ471  470Ω  3650K  Resistance (Ω)  11822.473  8767.745  6570.224  4971.784  3796.933  2923.400  2269.599  1775.225  1399.050  1110.220  887.257  713.463  577.375  470.000  384.800  316.757  262.177  218.069  182.297  153.150  129.249	6.655  NCP□□XO681 680Ω 3650K Resistance (Ω) 17104.854 12685.248 9505.855 7193.219 5493.436 4229.599 3283.675 2568.411 2024.158 1606.275 1283.691 1032.245 835.351 680.000 556.733 458.287 379.320 315.504 263.749 221.579 186.998
125 Part Number Resistance B-Constant Temp. (°C) -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 25 30 35 40 45 50 55 60 65	1.077  NCP□□XC680 68Ω 3100K Resistance (Ω) 1099.815 846.832 658.372 516.007 407.991 325.529 261.707 212.123 173.033 141.747 116.894 97.042 81.016 68.000 57.368 48.636 41.426 35.428 30.421 26.235 22.712	2.153  NCP□□YS101 100Ω 2750K Resistance (Ω) 1157.874 924.204 742.963 601.346 490.422 402.482 331.760 275.105 229.324 192.270 162.076 137.296 116.902 100.000 85.927 74.197 64.339 56.013 48.989 43.006 37.891 33.517	1.543  NCP□□XF101  100Ω 3250K  Resistance (Ω) 1824.175 1390.685 1070.653 831.138 650.960 514.441 409.700 328.877 265.759 215.785 176.395 145.161 120.152 100.000 83.669 70.361 59.456 50.470 43.029 36.830 31.649 27.364	3.230  NCP□□XF151  150Ω 3250K  Resistance (Ω) 2736.262 2086.028 1605.979 1246.708 976.440 771.661 614.550 493.315 398.639 323.677 264.592 217.742 180.228 150.000 125.503 105.541 89.184 75.705 64.543 55.246 47.473 41.045	2.314  NCP□□XM221 220Ω 3500K Resistance (Ω) 4947.904 3703.755 2798.873 2135.887 1645.037 1278.034 1000.620 789.612 627.752 502.474 405.010 328.480 268.044 220.000 181.576 150.668 125.681 105.336 88.717 75.059 63.777 54.415	4.600  NCP□□XM331 330Ω 3500K  Resistance (Ω) 7421.856 5555.632 4198.309 3203.831 2467.555 1917.051 1500.930 1184.418 941.628 753.711 607.514 492.720 402.066 330.000 272.365 226.002 188.521 158.004 133.076 112.588 95.666 81.622	3.296  NCP□□XO471  470Ω 3650K  Resistance (Ω) 11822.473 8767.745 6570.224 4971.784 3796.933 2923.400 2269.599 1775.225 1399.050 1110.220 887.257 713.463 577.375 470.000 384.800 316.757 262.177 218.069 182.297 153.150 129.249 109.551	6.655  NCP□□XO681 680Ω 3650K Resistance (Ω) 17104.854 12685.248 9505.855 7193.219 5493.436 4229.599 3283.675 2568.411 2024.158 1606.275 1283.691 1032.245 835.351 680.000 556.733 458.287 379.320 315.504 263.749 221.579 186.998 158.499
125 Part Number Resistance B-Constant Temp. (°C) -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40 45 50 60 65 70	1.077  NCP□□XC680 68Ω 3100K Resistance (Ω) 1099.815 846.832 658.372 516.007 407.991 325.529 261.707 212.123 173.033 141.747 116.894 97.042 81.016 68.000 57.368 48.636 41.426 35.428 30.421 26.235 22.712 19.778 17.293	2.153  NCP□□YS101 100Ω 2750K Resistance (Ω) 1157.874 924.204 742.963 601.346 490.422 402.482 331.760 275.105 229.324 192.270 162.076 137.296 116.902 100.000 85.927 74.197 64.339 56.013 48.989 43.006 37.891 33.517 29.750	1.543  NCP□□XF101  100Ω 3250K  Resistance (Ω) 1824.175 1390.685 1070.653 831.138 650.960 514.441 409.700 328.877 265.759 215.785 176.395 145.161 120.152 100.000 83.669 70.361 59.456 50.470 43.029 36.830 31.649 27.364 23.756	3.230  NCP□□XF151 150Ω 3250K Resistance (Ω) 2736.262 2086.028 1605.979 1246.708 976.440 771.661 614.550 493.315 398.639 323.677 264.592 217.742 180.228 150.000 125.503 105.541 89.184 75.705 64.543 55.246 47.473 41.045 35.634	2.314  NCP□□XM221 220Ω 3500K  Resistance (Ω) 4947.904 3703.755 2798.873 2135.887 1645.037 1278.034 1000.620 789.612 627.752 502.474 405.010 328.480 268.044 220.000 181.576 150.668 125.681 105.336 88.717 75.059 63.777 54.415 46.631	4.600  NCP□□XM331 3500K  Resistance (Ω) 7421.856 5555.632 4198.309 3203.831 2467.555 1917.051 1500.930 1184.418 941.628 753.711 607.514 492.720 402.066 330.000 272.365 226.002 188.521 158.004 133.076 112.588 95.666 81.622 69.946	3.296  NCP□□XO471  470Ω 3650K  Resistance (Ω) 11822.473 8767.745 6570.224 4971.784 3796.933 2923.400 2269.599 1775.225 1399.050 1110.220 887.257 713.463 577.375 470.000 384.800 316.757 262.177 218.069 182.297 153.150 129.249 109.551 93.281	6.655  NCP□□XO681 680Ω 3650K Resistance (Ω) 17104.854 12685.248 9505.855 7193.219 5493.436 4229.599 3283.675 2568.411 2024.158 1606.275 1283.691 1032.245 835.351 680.000 556.733 458.287 379.320 315.504 263.749 221.579 186.998 158.499 134.960
125 Part Number Resistance B-Constant Temp. (°C) -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40 45 50 60 65 70 75	1.077  NCP□□XC680 68Ω 3100K Resistance (Ω) 1099.815 846.832 658.372 516.007 407.991 325.529 261.707 212.123 173.033 141.747 116.894 97.042 81.016 68.000 57.368 48.636 41.426 35.428 30.421 26.235 22.712 19.778 17.293 15.134	2.153  NCP□□YS101  100Ω 2750K  Resistance (Ω)  1157.874  924.204  742.963  601.346  490.422  402.482  331.760  275.105  229.324  192.270  162.076  137.296  116.902  100.000  85.927  74.197  64.339  56.013  48.989  43.006  37.891  33.517  29.750  26.498	1.543  NCP□□XF101  100Ω 3250K  Resistance (Ω) 1824.175 1390.685 1070.653 831.138 650.960 514.441 409.700 328.877 265.759 215.785 176.395 145.161 120.152 100.000 83.669 70.361 59.456 50.470 43.029 36.830 31.649 27.364 23.756 20.651	3.230  NCP□□XF151  150Ω 3250K  Resistance (Ω) 2736.262 2086.028 1605.979 1246.708 976.440 771.661 614.550 493.315 398.639 323.677 264.592 217.742 180.228 150.000 125.503 105.541 89.184 75.705 64.543 55.246 47.473 41.045 35.634 30.976	2.314  NCP□□XM221 220Ω 3500K Resistance (Ω) 4947.904 3703.755 2798.873 2135.887 1645.037 1278.034 1000.620 789.612 627.752 502.474 405.010 328.480 268.044 220.000 181.576 150.668 125.681 105.336 88.717 75.059 63.777 54.415 46.631 40.115	4.600  NCP□□XM331 330Ω 3500K Resistance (Ω) 7421.856 5555.632 4198.309 3203.831 2467.555 1917.051 1500.930 1184.418 941.628 753.711 607.514 492.720 402.066 330.000 272.365 226.002 188.521 158.004 133.076 112.588 95.666 81.622 69.946 60.172	3.296  NCP□□XO471  470Ω 3650K  Resistance (Ω) 11822.473 8767.745 6570.224 4971.784 3796.933 2923.400 2269.599 1775.225 1399.050 1110.220 887.257 713.463 577.375 470.000 384.800 316.757 262.177 218.069 182.297 153.150 129.249 109.551 93.281 79.750	6.655  NCP□□XQ681 680Ω 3650K Resistance (Ω) 17104.854 12685.248 9505.855 7193.219 5493.436 4229.599 3283.675 2568.411 2024.158 1606.275 1283.691 1032.245 835.351 680.000 556.733 458.287 379.320 315.504 263.749 221.579 186.998 158.499 134.960 115.383
125 Part Number Resistance B-Constant Temp. (°C) -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40 45 50 65 70 75 80	1.077  NCP□□XC680 68Ω 3100K Resistance (Ω) 1099.815 846.832 658.372 516.007 407.991 325.529 261.707 212.123 173.033 141.747 116.894 97.042 81.016 68.000 57.368 48.636 41.426 35.428 30.421 26.235 22.712 19.778 17.293 15.134 13.288	2.153  NCP□□YS101  100Ω 2750K  Resistance (Ω) 1157.874 924.204 742.963 601.346 490.422 402.482 331.760 275.105 229.324 192.270 162.076 137.296 116.902 100.000 85.927 74.197 64.339 56.013 48.989 43.006 37.891 33.517 29.750 26.498 23.680	1.543  NCP□□XF101  100Ω 3250K  Resistance (Ω) 1824.175 1390.685 1070.653 831.138 650.960 514.441 409.700 328.877 265.759 215.785 176.395 145.161 120.152 100.000 83.669 70.361 59.456 50.470 43.029 36.830 31.649 27.364 23.756 20.651 18.011	3.230  NCP□□XF151  150Ω 3250K  Resistance (Ω) 2736.262 2086.028 1605.979 1246.708 976.440 771.661 614.550 493.315 398.639 323.677 264.592 217.742 180.228 150.000 125.503 105.541 89.184 75.705 64.543 55.246 47.473 41.045 35.634 30.976 27.016	2.314  NCP□□XM221 220Ω 3500K Resistance (Ω) 4947.904 3703.755 2798.873 2135.887 1645.037 1278.034 1000.620 789.612 627.752 502.474 405.010 328.480 268.044 220.000 181.576 150.668 125.681 105.336 88.717 75.059 63.777 54.415 46.631 40.115 34.637	4.600  NCP□□XM331 330Ω 3500K Resistance (Ω) 7421.856 5555.632 4198.309 3203.831 2467.555 1917.051 1500.930 1184.418 941.628 753.711 607.514 492.720 402.066 330.000 272.365 226.002 188.521 158.004 133.076 112.588 95.666 81.622 69.946 60.172 51.955	3.296  NCP□□XQ471  470Ω 3650K  Resistance (Ω) 11822.473 8767.745 6570.224 4971.784 3796.933 2923.400 2269.599 1775.225 1399.050 1110.220 887.257 713.463 577.375 470.000 384.800 316.757 262.177 218.069 182.297 153.150 129.249 109.551 93.281 79.750 68.446	6.655  NCP□□XQ681 680Ω 3650K Resistance (Ω) 17104.854 12685.248 9505.855 7193.219 5493.436 4229.599 3283.675 2568.411 2024.158 1606.275 1283.691 1032.245 835.351 680.000 556.733 458.287 379.320 315.504 263.749 221.579 186.998 158.499 134.960 115.383 99.029
125 Part Number Resistance B-Constant Temp. (°C) -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40 45 50 65 70 75 80 85	1.077  NCP□□XC680 68Ω 3100K Resistance (Ω) 1099.815 846.832 658.372 516.007 407.991 325.529 261.707 212.123 173.033 141.747 116.894 97.042 81.016 68.000 57.368 48.636 41.426 35.428 30.421 26.235 22.712 19.778 17.293 15.134 13.288 11.729	2.153  NCP□□YS101  100Ω 2750K  Resistance (Ω)  1157.874  924.204  742.963  601.346  490.422  402.482  331.760  275.105  229.324  192.270  162.076  137.296  116.902  100.000  85.927  74.197  64.339  56.013  48.989  43.006  37.891  33.517  29.750  26.498  23.680  21.231	1.543  NCP□□XF101  100Ω 3250K  Resistance (Ω) 1824.175 1390.685 1070.653 831.138 650.960 514.441 409.700 328.877 265.759 215.785 176.395 145.161 120.152 100.000 83.669 70.361 59.456 50.470 43.029 36.830 31.649 27.364 23.756 20.651 18.011 15.800	3.230  NCP□□XF151  150Ω 3250K  Resistance (Ω) 2736.262 2086.028 1605.979 1246.708 976.440 771.661 614.550 493.315 398.639 323.677 264.592 217.742 180.228 150.000 125.503 105.541 89.184 75.705 64.543 55.246 47.473 41.045 35.634 30.976 27.016 23.700	2.314  NCP□□XM221 220Ω 3500K Resistance (Ω) 4947.904 3703.755 2798.873 2135.887 1645.037 1278.034 1000.620 789.612 627.752 502.474 405.010 328.480 268.044 220.000 181.576 150.668 125.681 105.336 88.717 75.059 63.777 54.415 46.631 40.115 34.637 30.013	4.600  NCP□□XM331 330Ω 3500K Resistance (Ω) 7421.856 5555.632 4198.309 3203.831 2467.555 1917.051 1500.930 1184.418 941.628 753.711 607.514 492.720 402.066 330.000 272.365 226.002 188.521 158.004 133.076 112.588 95.666 81.622 69.946 60.172 51.955 45.019	3.296  NCP□□XQ471  470Ω 3650K  Resistance (Ω) 11822.473 8767.745 6570.224 4971.784 3796.933 2923.400 2269.599 1775.225 1399.050 1110.220 887.257 713.463 577.375 470.000 384.800 316.757 262.177 218.069 182.297 153.150 129.249 109.551 93.281 79.750 68.446 58.996	6.655  NCP□□XO681 680Ω 3650K Resistance (Ω) 17104.854 12685.248 9505.855 7193.219 5493.436 4229.599 3283.675 2568.411 2024.158 1606.275 1283.691 1032.245 835.351 680.000 556.733 458.287 379.320 315.504 263.749 221.579 186.998 158.499 134.960 115.383 99.029 85.356
125 Part Number Resistance B-Constant Temp. (°C) -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85	1.077  NCP□□XC680 68Ω 3100K Resistance (Ω) 1099.815 846.832 658.372 516.007 407.991 325.529 261.707 212.123 173.033 141.747 116.894 97.042 81.016 68.000 57.368 48.636 41.426 35.428 30.421 26.235 22.712 19.778 17.293 15.134 13.288 11.729 10.386	2.153  NCP□□YS101  100Ω 2750K  Resistance (Ω)  1157.874  924.204  742.963  601.346  490.422  402.482  331.760  275.105  229.324  192.270  162.076  137.296  116.902  100.000  85.927  74.197  64.339  56.013  48.989  43.006  37.891  33.517  29.750  26.498  23.680  21.231  19.094	1.543  NCP□□XF101  100Ω 3250K  Resistance (Ω) 1824.175 1390.685 1070.653 831.138 650.960 514.441 409.700 328.877 265.759 215.785 176.395 145.161 120.152 100.000 83.669 70.361 59.456 50.470 43.029 36.830 31.649 27.364 23.756 20.651 18.011 15.800 13.908	3.230  NCP□□XF151  150Ω 3250K  Resistance (Ω) 2736.262 2086.028 1605.979 1246.708 976.440 771.661 614.550 493.315 398.639 323.677 264.592 217.742 180.228 150.000 125.503 105.541 89.184 75.705 64.543 55.246 47.473 41.045 35.634 30.976 27.016 23.700 20.862	2.314  NCP□□XM221 220Ω 3500K Resistance (Ω) 4947.904 3703.755 2798.873 2135.887 1645.037 1278.034 1000.620 789.612 627.752 502.474 405.010 328.480 268.044 220.000 181.576 150.668 125.681 105.336 88.717 75.059 63.777 54.415 46.631 40.115 34.637 30.013 26.110	4.600  NCP□□XM331 330Ω 3500K Resistance (Ω) 7421.856 5555.632 4198.309 3203.831 2467.555 1917.051 1500.930 1184.418 941.628 753.711 607.514 492.720 402.066 330.000 272.365 226.002 188.521 158.004 133.076 112.588 95.666 81.622 69.946 60.172 51.955 45.019 39.165	3.296  NCP□□XQ471  470Ω 3650K  Resistance (Ω) 11822.473 8767.745 6570.224 4971.784 3796.933 2923.400 2269.599 1775.225 1399.050 1110.220 887.257 713.463 577.375 470.000 384.800 316.757 262.177 218.069 182.297 153.150 129.249 109.551 93.281 79.750 68.446	6.655  NCP□□XO681 680Ω 3650K Resistance (Ω) 17104.854 12685.248 9505.855 7193.219 5493.436 4229.599 3283.675 2568.411 2024.158 1606.275 1283.691 1032.245 835.351 680.000 556.733 458.287 379.320 315.504 263.749 221.579 186.998 158.499 134.960 115.383 99.029
125 Part Number Resistance B-Constant Temp. (°C) -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40 45 50 65 70 75 80 85	1.077  NCP□□XC680 68Ω 3100K Resistance (Ω) 1099.815 846.832 658.372 516.007 407.991 325.529 261.707 212.123 173.033 141.747 116.894 97.042 81.016 68.000 57.368 48.636 41.426 35.428 30.421 26.235 22.712 19.778 17.293 15.134 13.288 11.729	2.153  NCP□□YS101  100Ω 2750K  Resistance (Ω)  1157.874  924.204  742.963  601.346  490.422  402.482  331.760  275.105  229.324  192.270  162.076  137.296  116.902  100.000  85.927  74.197  64.339  56.013  48.989  43.006  37.891  33.517  29.750  26.498  23.680  21.231	1.543  NCP□□XF101  100Ω 3250K  Resistance (Ω) 1824.175 1390.685 1070.653 831.138 650.960 514.441 409.700 328.877 265.759 215.785 176.395 145.161 120.152 100.000 83.669 70.361 59.456 50.470 43.029 36.830 31.649 27.364 23.756 20.651 18.011 15.800	3.230  NCP□□XF151  150Ω 3250K  Resistance (Ω) 2736.262 2086.028 1605.979 1246.708 976.440 771.661 614.550 493.315 398.639 323.677 264.592 217.742 180.228 150.000 125.503 105.541 89.184 75.705 64.543 55.246 47.473 41.045 35.634 30.976 27.016 23.700	2.314  NCP□□XM221 220Ω 3500K Resistance (Ω) 4947.904 3703.755 2798.873 2135.887 1645.037 1278.034 1000.620 789.612 627.752 502.474 405.010 328.480 268.044 220.000 181.576 150.668 125.681 105.336 88.717 75.059 63.777 54.415 46.631 40.115 34.637 30.013	4.600  NCP□□XM331 330Ω 3500K Resistance (Ω) 7421.856 5555.632 4198.309 3203.831 2467.555 1917.051 1500.930 1184.418 941.628 753.711 607.514 492.720 402.066 330.000 272.365 226.002 188.521 158.004 133.076 112.588 95.666 81.622 69.946 60.172 51.955 45.019	3.296  NCP□□XQ471  470Ω 3650K  Resistance (Ω) 11822.473 8767.745 6570.224 4971.784 3796.933 2923.400 2269.599 1775.225 1399.050 1110.220 887.257 713.463 577.375 470.000 384.800 316.757 262.177 218.069 182.297 153.150 129.249 109.551 93.281 79.750 68.446 58.996	6.655  NCP□□XQ681 680Ω 3650K Resistance (Ω) 17104.854 12685.248 9505.855 7193.219 5493.436 4229.599 3283.675 2568.411 2024.158 1606.275 1283.691 1032.245 835.351 680.000 556.733 458.287 379.320 315.504 263.749 221.579 186.998 158.499 134.960 115.383 99.029 85.356
125 Part Number Resistance B-Constant Temp. (°C) -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85	1.077  NCP□□XC680 68Ω 3100K Resistance (Ω) 1099.815 846.832 658.372 516.007 407.991 325.529 261.707 212.123 173.033 141.747 116.894 97.042 81.016 68.000 57.368 48.636 41.426 35.428 30.421 26.235 22.712 19.778 17.293 15.134 13.288 11.729 10.386	2.153  NCP□□YS101  100Ω 2750K  Resistance (Ω)  1157.874  924.204  742.963  601.346  490.422  402.482  331.760  275.105  229.324  192.270  162.076  137.296  116.902  100.000  85.927  74.197  64.339  56.013  48.989  43.006  37.891  33.517  29.750  26.498  23.680  21.231  19.094	1.543  NCP□□XF101  100Ω 3250K  Resistance (Ω) 1824.175 1390.685 1070.653 831.138 650.960 514.441 409.700 328.877 265.759 215.785 176.395 145.161 120.152 100.000 83.669 70.361 59.456 50.470 43.029 36.830 31.649 27.364 23.756 20.651 18.011 15.800 13.908	3.230  NCP□□XF151  150Ω 3250K  Resistance (Ω) 2736.262 2086.028 1605.979 1246.708 976.440 771.661 614.550 493.315 398.639 323.677 264.592 217.742 180.228 150.000 125.503 105.541 89.184 75.705 64.543 55.246 47.473 41.045 35.634 30.976 27.016 23.700 20.862	2.314  NCP□□XM221 220Ω 3500K Resistance (Ω) 4947.904 3703.755 2798.873 2135.887 1645.037 1278.034 1000.620 789.612 627.752 502.474 405.010 328.480 268.044 220.000 181.576 150.668 125.681 105.336 88.717 75.059 63.777 54.415 46.631 40.115 34.637 30.013 26.110	4.600  NCP□□XM331 330Ω 3500K Resistance (Ω) 7421.856 5555.632 4198.309 3203.831 2467.555 1917.051 1500.930 1184.418 941.628 753.711 607.514 492.720 402.066 330.000 272.365 226.002 188.521 158.004 133.076 112.588 95.666 81.622 69.946 60.172 51.955 45.019 39.165	3.296  NCP□□XQ471  470Ω 3650K  Resistance (Ω) 11822.473 8767.745 6570.224 4971.784 3796.933 2923.400 2269.599 1775.225 1399.050 1110.220 887.257 713.463 577.375 470.000 384.800 316.757 262.177 218.069 182.297 153.150 129.249 109.551 93.281 79.750 68.446 58.996 51.036	6.655  NCP□□XO681 680Ω 3650K Resistance (Ω) 17104.854 12685.248 9505.855 7193.219 5493.436 4229.599 3283.675 2568.411 2024.158 1606.275 1283.691 1032.245 835.351 680.000 556.733 458.287 379.320 315.504 263.749 221.579 186.998 158.499 134.960 115.383 99.029 85.356 73.839
125 Part Number Resistance B-Constant Temp. (°C) -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 70 75 80 85 90	1.077  NCP□□XC680 68Ω 3100K Resistance (Ω) 1099.815 846.832 658.372 516.007 407.991 325.529 261.707 212.123 173.033 141.747 116.894 97.042 81.016 68.000 57.368 48.636 41.426 35.428 30.421 26.235 22.712 19.778 17.293 15.134 13.288 11.729 10.386 9.220	2.153  NCP□□YS101  100Ω 2750K  Resistance (Ω) 1157.874 924.204 742.963 601.346 490.422 402.482 331.760 275.105 229.324 192.270 162.076 137.296 116.902 100.000 85.927 74.197 64.339 56.013 48.989 43.006 37.891 33.517 29.750 26.498 23.680 21.231 19.094 17.221	1.543  NCP□□XF101  100Ω 3250K  Resistance (Ω) 1824.175 1390.685 1070.653 831.138 650.960 514.441 409.700 328.877 265.759 215.785 176.395 145.161 120.152 100.000 83.669 70.361 59.456 50.470 43.029 36.830 31.649 27.364 23.756 20.651 18.011 15.800 13.908 12.263	3.230  NCP□□XF151  150Ω 3250K  Resistance (Ω) 2736.262 2086.028 1605.979 1246.708 976.440 771.661 614.550 493.315 398.639 323.677 264.592 217.742 180.228 150.000 125.503 105.541 89.184 75.705 64.543 55.246 47.473 41.045 35.634 30.976 27.016 23.700 20.862 18.394	2.314  NCP□□XM221 220Ω 3500K Resistance (Ω) 4947.904 3703.755 2798.873 2135.887 1645.037 1278.034 1000.620 789.612 627.752 502.474 405.010 328.480 268.044 220.000 181.576 150.668 125.681 105.336 88.717 75.059 63.777 54.415 46.631 40.115 34.637 30.013 26.110 22.790	4.600  NCP□□XM331 330Ω 3500K Resistance (Ω) 7421.856 5555.632 4198.309 3203.831 2467.555 1917.051 1500.930 1184.418 941.628 753.711 607.514 492.720 402.066 330.000 272.365 226.002 188.521 158.004 133.076 112.588 95.666 81.622 69.946 60.172 51.955 45.019 39.165 34.186	3.296  NCP□□XQ471  470Ω 3650K  Resistance (Ω) 11822.473 8767.745 6570.224 4971.784 3796.933 2923.400 2269.599 1775.225 1399.050 1110.220 887.257 713.463 577.375 470.000 384.800 316.757 262.177 218.069 182.297 153.150 129.249 109.551 93.281 79.750 68.446 58.996 51.036 44.332	6.655  NCP□□XO681 680Ω 3650K Resistance (Ω) 17104.854 12685.248 9505.855 7193.219 5493.436 4229.599 3283.675 2568.411 2024.158 1606.275 1283.691 1032.245 835.351 680.000 556.733 458.287 379.320 315.504 263.749 221.579 186.998 158.499 134.960 115.383 99.029 85.356 73.839 64.140
125 Part Number Resistance B-Constant Temp. (°C) -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100	1.077  NCP□□XC680 68Ω 3100K Resistance (Ω) 1099.815 846.832 658.372 516.007 407.991 325.529 261.707 212.123 173.033 141.747 116.894 97.042 81.016 68.000 57.368 48.636 41.426 35.428 30.421 26.235 22.712 19.778 17.293 15.134 13.288 11.729 10.386 9.220 8.208	2.153  NCP□□YS101 100Ω 2750K Resistance (Ω) 1157.874 924.204 742.963 601.346 490.422 402.482 331.760 275.105 229.324 192.270 162.076 137.296 116.902 100.000 85.927 74.197 64.339 56.013 48.989 43.006 37.891 33.517 29.750 26.498 23.680 21.231 19.094 17.221 15.575	1.543  NCP□□XF101  100Ω 3250K  Resistance (Ω) 1824.175 1390.685 1070.653 831.138 650.960 514.441 409.700 328.877 265.759 215.785 176.395 145.161 120.152 100.000 83.669 70.361 59.456 50.470 43.029 36.830 31.649 27.364 23.756 20.651 18.011 15.800 13.908 12.263 10.844	3.230  NCP□□XF151  150Ω 3250K  Resistance (Ω) 2736.262 2086.028 1605.979 1246.708 976.440 771.661 614.550 493.315 398.639 323.677 264.592 217.742 180.228 150.000 125.503 105.541 89.184 75.705 64.543 55.246 47.473 41.045 35.634 30.976 27.016 23.700 20.862 18.394 16.265	2.314  NCP□□XM221 220Ω 3500K  Resistance (Ω) 4947.904 3703.755 2798.873 2135.887 1645.037 1278.034 1000.620 789.612 627.752 502.474 405.010 328.480 268.044 220.000 181.576 150.668 125.681 105.336 88.717 75.059 63.777 54.415 46.631 40.115 34.637 30.013 26.110 22.790 19.957	4.600  NCP□□XM331 330Ω 3500K  Resistance (Ω) 7421.856 5555.632 4198.309 3203.831 2467.555 1917.051 1500.930 1184.418 941.628 753.711 607.514 492.720 402.066 330.000 272.365 226.002 188.521 158.004 133.076 112.588 95.666 81.622 69.946 60.172 51.955 45.019 39.165 34.186 29.935	3.296  NCP□□XO471  470Ω 3650K  Resistance (Ω) 11822.473 8767.745 6570.224 4971.784 3796.933 2923.400 2269.599 1775.225 1399.050 1110.220 887.257 713.463 577.375 470.000 384.800 316.757 262.177 218.069 182.297 153.150 129.249 109.551 93.281 79.750 68.446 58.996 51.036 44.332 38.640	6.655  NCP□□XO681 680Ω 3650K Resistance (Ω) 17104.854 12685.248 9505.855 7193.219 5493.436 4229.599 3283.675 2568.411 2024.158 1606.275 1283.691 1032.245 835.351 680.000 556.733 458.287 379.320 315.504 263.749 221.579 186.998 158.499 134.960 115.383 99.029 85.356 73.839 64.140 55.905
125 Part Number Resistance B-Constant Temp. (°C) -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105	1.077  NCP□□XC680 68Ω 3100K Resistance (Ω) 1099.815 846.832 658.372 516.007 407.991 325.529 261.707 212.123 173.033 141.747 116.894 97.042 81.016 68.000 57.368 48.636 41.426 35.428 30.421 26.235 22.712 19.778 17.293 15.134 13.288 11.729 10.386 9.220 8.208 7.317	2.153  NCP□□YS101  100Ω 2750K  Resistance (Ω)  1157.874  924.204  742.963  601.346  490.422  402.482  331.760  275.105  229.324  192.270  162.076  137.296  116.902  100.000  85.927  74.197  64.339  56.013  48.989  43.006  37.891  33.517  29.750  26.498  23.680  21.231  19.094  17.221  15.575  14.124	1.543  NCP□□XF101  100Ω 3250K  Resistance (Ω)  1824.175  1390.685  1070.653  831.138  650.960  514.441  409.700  328.877  265.759  215.785  176.395  145.161  120.152  100.000  83.669  70.361  59.456  50.470  43.029  36.830  31.649  27.364  23.756  20.651  18.011  15.800  13.908  12.263  10.844  9.622	3.230  NCP□□XF151  150Ω 3250K  Resistance (Ω) 2736.262 2086.028 1605.979 1246.708 976.440 771.661 614.550 493.315 398.639 323.677 264.592 217.742 180.228 150.000 125.503 105.541 89.184 75.705 64.543 55.246 47.473 41.045 35.634 30.976 27.016 23.700 20.862 18.394 16.265 14.434	2.314  NCP□□XM221 220Ω 3500K  Resistance (Ω) 4947.904 3703.755 2798.873 2135.887 1645.037 1278.034 1000.620 789.612 627.752 502.474 405.010 328.480 268.044 220.000 181.576 150.668 125.681 105.336 88.717 75.059 63.777 54.415 46.631 40.115 34.637 30.013 26.110 22.790 19.957 17.541	4.600  NCP□□XM331 3500K  Resistance (Ω) 7421.856 5555.632 4198.309 3203.831 2467.555 1917.051 1500.930 1184.418 941.628 753.711 607.514 492.720 402.066 330.000 272.365 226.002 188.521 158.004 133.076 112.588 95.666 81.622 69.946 60.172 51.955 45.019 39.165 34.186 29.935 26.312	3.296  NCP□□XO471  470Ω 3650K  Resistance (Ω) 11822.473 8767.745 6570.224 4971.784 3796.933 2923.400 2269.599 1775.225 1399.050 1110.220 887.257 713.463 577.375 470.000 384.800 316.757 262.177 218.069 182.297 153.150 129.249 109.551 93.281 79.750 68.446 58.996 51.036 44.332 38.640 33.790	6.655  NCP□□XO681 680Ω 3650K Resistance (Ω) 17104.854 12685.248 9505.855 7193.219 5493.436 4229.599 3283.675 2568.411 2024.158 1606.275 1283.691 1032.245 835.351 680.000 556.733 458.287 379.320 315.504 263.749 221.579 186.998 158.499 134.960 115.383 99.029 85.356 73.839 64.140 55.905 48.888

9.787 Detailed Resistance - Temperature Tables are downloadable from the following URL. http://search.murata.co.jp/Ceramy/CatsearchAction.do?sLang=en

10.690

6.850

6.162

5.291

4.768



12.114

10.778

18.171

16.168

10.275

9.243

23.091

20.472

33.409 29.618

120

125

Continued f	from the preceding p	page.						
Part Number	NCP□□XM102	NCP□□XO102	NCP□□XM152	NCP XW152	NCP□□XM222	NCP XW222	NCP□□XM332	NCP□□XW332
Resistance	1kΩ	1kΩ	1.5kΩ	1.5kΩ	2.2kΩ	2.2kΩ	3.3kΩ	3.3kΩ
B-Constant	3500K	3650K	3500K	3950K	3500K	3950K	3500K	3950K
Temp. (°C)	Resistance (kΩ)		Resistance (kΩ)	Resistance (kΩ)		Resistance (kΩ)	Resistance (kΩ)	
<del>-40</del>	21.266	25.154	31.899	51.791	46.786	75.961	70.179	113.941
<del>-35</del>	16.150	18.655	24.225	37.172	35.530	54.520	53.295	81.779
-30	12.347	13.979	18.520	27.005	27.162	39.607	40.743	59.411
<b>-25</b>	9.503	10.578	14.255	19.843	20.907	29.103	31.360	43.654
-20	7.365	8.079	11.047	14.728	16.203	21.601	24.304	32.401
-15	5.747	6.220	8.621	11.044	12.644	16.198	18.966	24.297
<del>-10</del>	4.516	4.829	6.773	8.362	9.934	12.264	14.901	18.396
<u>-5</u>	3.572	3.777	5.358	6.389	7.858	9.370	11.787	14.055
0	2.844	2.977	4.266	4.922	6.257	7.219	9.386	10.829
5	2.280	2.362	3.419	3.825	5.015	5.609	7.523	8.414
10	1.839	1.888	2.758	2.994	4.045	4.391	6.067	6.586
15	1.492	1.518	2.238	2.361	3.283	3.463	4.924	5.195
20	1.218	1.229	1.827	1.876	2.680	2.751	4.019	4.126
25	1.000	1.000	1.500	1.500	2.200	2.200	3.300	3.300
30	0.825	0.819	1.238	1.207	1.816	1.771	2.724	2.656
35	0.685	0.674	1.027	0.978	1.507	1.434	2.260	2.152
40	0.571	0.558	0.857	0.797	1.257	1.169	1.885	1.753
45	0.479	0.464	0.718	0.653	1.053	0.958	1.580	1.437
50	0.403	0.388	0.605	0.538	0.887	0.789	1.331	1.184
55	0.341	0.326	0.512	0.446	0.751	0.654	1.126	0.981
60	0.290	0.275	0.435	0.371	0.638	0.545	0.957	0.817
65	0.247	0.233	0.371	0.311	0.544	0.456	0.816	0.684
70	0.212	0.199	0.318	0.261	0.466	0.383	0.700	0.575
75	0.182	0.170	0.274	0.221	0.401	0.324	0.602	0.486
80	0.157	0.176	0.236	0.187	0.346	0.275	0.520	0.412
85	0.136	0.146	0.205	0.160	0.300		0.450	0.351
						0.234		
90	0.119	0.109	0.178	0.137	0.261	0.200	0.392	0.301
95	0.104	0.094	0.155	0.117	0.228	0.172	0.342	0.258
100	0.091	0.082	0.136	0.101	0.200	0.149	0.299	0.223
105	0.080	0.072	0.120	0.088	0.175	0.129	0.263	0.193
110	0.070	0.063	0.105	0.076	0.155	0.112	0.232	0.168
115	0.062	0.056	0.093	0.067	0.137	0.098	0.205	0.146
120	0.055	0.049	0.083	0.058	0.121	0.085	0.182	0.128
125	0.049	0.044	0.074	0.051	0.108	0.075	0.162	0.113
Dant Niveshau	NCD VA472	NCDUUVII	NCD VW 02	NCD VIIIO	NCD VIII	NCD VIII	NCD VM152	NCDCCVII
		NCP XH682		NCP XH103			NCP XW153	
Resistance	4.7kΩ	6.8kΩ	6.8kΩ	10kΩ	10kΩ	15kΩ	15kΩ	22kΩ
B-Constant	3500K	3380K	3950K	3380K	3900K	3380K	3950K	3380K
Temp. (°C)	Resistance (kΩ)		` '	Resistance (kΩ)		Resistance (kΩ)	Resistance (kΩ)	, ,
-40	105.705	133.043	234.787	195.652	328.996	293.478	517.912	430.434
-35	79.126	100.756	168.515	148.171	237.387	222.256	371.724	325.976
-30	59.794	77.076	122.422	113.347	173.185	170.021	270.048	249.364
-25	45.630	59.540	89.953	87.559	127.773	131.338	198.426	192.629
-20	35.144	46.401	66.766	68.237	95.327	102.355	147.278	150.121
<del>-</del> 15	27.303	36.482	50.066	53.650	71.746	80.474	110.439	118.029
-10	21.377	28.904	37.906	42.506	54.564	63.759	83.617	93.514
<b>-</b> 5	16.869	23.047	28.963	33.892	41.813	50.838	63.888	74.563
0	13.411	18.509	22.313	27.219	32.330	40.828	49.221	59.881
5	10.735	14.974	17.338	22.021	25.194	33.032	38.245	48.446
10	8.653	12.189	13.571	17.926	19.785	26.888	29.936	39.436
15	7.018	9.978	10.705	14.674	15.651	22.010	23.613	32.282
20	5.726	8.215	8.503	12.081	12.468	18.121	18.756	26.577
25	4.700	6.800	6.800	10.000	10.000	15.000	15.000	22.000
30	3.879	5.654	5.474	8.315	8.072	12.472	12.074	18.292
35	3.219	4.725	4.434	6.948	6.556	10.422	9.780	15.285
40	2.685	3.967	3.613	5.834	5.356	8.751	7.969	12.834
45	2.250	3.344	2.961	4.917	4.401	7.375	6.531	10.817
50	1.895	2.829	2.440	4.161	3.635	6.241	5.382	9.154
55	1.604	2.404	2.022	3.535	3.019	5.302	4.459	7.777
60	1.363	2.050	1.683	3.014	2.521	4.521	3.713	6.631

0.361 Detailed Resistance - Temperature Tables are downloadable from the following URL. http://search.murata.co.jp/Ceramy/CatsearchAction.do?sLang=en

1.759

1.515

1.309

1.135

0.988

0.862

0.755

0.662

0.583

0.515

0.457

0.406

1.409

1.185

1.001

0.849

0.724

0.620

0.532

0.459

0.398

0.346

0.302

0.264

0.232

65

70

75

80

85

90

95

100

105

110

115

120

125

1.163

0.996

0.857

0.740

0.641

0.558

0.487

0.426

0.375

0.330

0.292

0.259

0.230



2.586

2.228

1.925

1.669

1.452

1.268

1.110

0.974

0.858

0.758

0.672

0.596

0.531

2.115

1.781

1.509

1.284

1.097

0.941

0.810

0.701

0.608

0.530

0.463

0.406

0.358

3.879

3.341

2.887

2.503

2.178

1.902

1.664

1.461

1.287

1.137

1.007

0.895

0.797

3.108

2.613

2.208

1.873

1.597

1.367

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1.013

0.878

0.763

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0.582

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4.901

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3.671

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2.790

2.441

2.142

1.888

1.668

1.477

1.312

1.169

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<u></u>	INCOMPOSE AND A	INODE ENGINEER	NODUDINO	NODUDINESSA	NODE THE SEC	NOD	NOD	NODE END (CC
	NCP□□XW223				NCP WL333	NCP□□WB473		NCP WD683
Resistance	22kΩ	22kΩ	33kΩ	33kΩ	33kΩ	47kΩ	47kΩ	68kΩ
B-Constant	3950K	4485K	4050K	4250K	4485K	4050K	4485K	4150K
Temp. (°C)	Resistance (kΩ)	Resistance (kΩ)	· /		Resistance (kΩ)	· · · ·		Resistance (kΩ)
	759.605	1073.436	1227.263	1451.049	1610.154	1747.920	2293.249	2735.359
	545.196	753.900	874.449	1019.238	1130.850	1245.428	1610.605	1937.391
	396.070	535.073	630.851	725.084	802.609	898.485	1143.110	1389.345
<u>-25</u>	291.025	383.590	460.457	522.021	575.385	655.802	819.487	1008.014
-20	216.008	277.643	339.797	379.842	416.464	483.954	593.146	738.978
<del>-15</del>	161.977	202.813	253.363	279.371	304.219	360.850	433.281	547.456
<del>-10</del>	122.638	149.462	190.766	207.566	224.193	271.697	319.305	409.600
-5	93.702	111.082	144.964	155.639	166.623	206.463	237.312	309.217
0	72.191	83.233	111.087	117.814	124.850	158.214	177.816	235.606
5	56.093	62.858	85.842	89.925	94.287	122.259	134.287	180.980
10	43.907	47.831	66.861	69.204	71.747	95.227	102.184	140.139
15	34.633	36.664	52.470	53.675	54.996	74.730	78.327	109.344
20	27.509	28.304	41.471	41.937	42.455	59.065	60.467	85.929
25	22.000	22.000	33.000	33.000	33.000	47.000	47.000	68.000
30	17.709	17.214	26.430	26.143	25.822	37.643	36.776	54.167
35	14.344	13.557	21.298	20.845	20.335	30.334	28.962	43.421
40	11.688	10.744	17.266	16.723	16.115	24.591	22.952	35.016
45	9.578	8.566	14.076	13.498	12.849	20.048	18.301	28.406
50	7.894	6.871	11.538	10.954	10.306	16.433	14.679	23.166
55	6.540	5.543	9.506	8.940	8.314	13.539	11.842	18.997
60	5.446	4.497	7.870	7.334	6.746	11.209	9.607	15.657
65	4.559	3.669	6.549	6.046	5.503	9.328	7.837	12.967
70	3.832	3.009	5.475	5.011	4.513	7.798	6.428	10.794
75	3.239	2.481	4.595	4.170	3.721	6.544	5.300	9.021
80	2.748	2.056	3.874	3.487	3.084	5.518	4.393	7.575
85	2.342	1.713	3.282	2.928	2.569	4.674	3.659	6.387
90	2.004	1.434	2.789	2.469	2.151	3.972	3.063	5.407
95	1.722	1.206	2.379	2.091	1.809	3.388	2.577	4.598
100	1.486	1.019	2.038	1.777	1.529	2.902	2.178	3.922
105	1.287	0.866	1.751	1.516	1.299	2.494	1.849	3.359
110	1.119	0.739	1.509	1.298	1.108	2.150	1.578	2.887
115	0.975	0.633	1.306	1.116	0.949	1.860	1.352	2.489
120	0.854	0.545	1.134	0.962	0.817	1.615	1.164	2.155
125	0.750	0.471	0.987	0.832	0.707	1.406	1.006	1.870
	1	1						·

Part Number	NCP□□WF683	NCP□□WL683	NCP□□WF104	NCP18WF104F	NCP□□WL104	NCP□□WL154	NCP□□WM154	NCP□□WL224
Resistance	68kΩ	68kΩ	100kΩ	100kΩ±1%	100kΩ	150kΩ	150kΩ	220kΩ
B-Constant	4250K	4485K	4250K	4200K	4485K	4485K	4500K	4485K
Temp. (°C)	Resistance (kΩ)							
-40	2990.041	3317.893	4397.119	4205.686	4879.254	7318.881	7899.466	10734.358
-35	2100.247	2330.237	3088.599	2966.436	3426.818	5140.228	5466.118	7539.001
-30	1494.113	1653.862	2197.225	2118.789	2432.149	3648.224	3834.499	5350.729
-25	1075.679	1185.641	1581.881	1531.319	1743.590	2615.385	2720.523	3835.898
-20	782.705	858.168	1151.037	1118.422	1262.012	1893.018	1951.216	2776.427
-15	575.674	626.875	846.579	825.570	921.875	1382.813	1415.565	2028.126
-10	427.712	461.974	628.988	615.526	679.373	1019.059	1036.984	1494.620
<b>-</b> 5	320.710	343.345	471.632	463.104	504.919	757.379	767.079	1110.822
0	242.768	257.266	357.012	351.706	378.333	567.499	572.667	832.332
5	185.300	194.287	272.500	269.305	285.717	428.575	431.264	628.577
10	142.603	147.841	209.710	207.891	217.414	326.121	327.405	478.310
15	110.602	113.325	162.651	161.722	166.654	249.981	250.538	366.639
20	86.415	87.484	127.080	126.723	128.653	192.979	193.166	283.036
25	68.000	68.000	100.000	100.000	100.000	150.000	150.000	220.000
30	53.871	53.208	79.222	79.439	78.247	117.370	117.281	172.143
35	42.954	41.903	63.167	63.509	61.622	92.433	92.293	135.569
40	34.460	33.208	50.677	51.084	48.835	73.252	73.090	107.436
45	27.814	26.477	40.904	41.336	38.937	58.406	58.240	85.662
50	22.572	21.237	33.195	33.628	31.231	46.846	46.665	68.708
55	18.422	17.133	27.091	27.510	25.195	37.793	37.605	55.429
60	15.113	13.900	22.224	22.621	20.441	30.661	30.453	44.970
65	12.459	11.339	18.323	18.692	16.675	25.013	24.804	36.686
70	10.325	9.300	15.184	15.525	13.677	20.516	20.293	30.090
75	8.592	7.668	12.635	12.947	11.277	16.916	16.679	24.810
80	7.185	6.356	10.566	10.849	9.346	14.019	13.776	20.562
85	6.033	5.294	8.873	9.129	7.785	11.678	11.428	17.128
90	5.087	4.432	7.481	7.713	6.517	9.776	9.520	14.338
95	4.309	3.728	6.337	6.546	5.482	8.223	7.966	12.061
100	3.661	3.151	5.384	5.572	4.634	6.951	6.688	10.194
105	3.124	2.676	4.594	4.764	3.935	5.902	5.639	8.657
110	2.675	2.283	3.934	4.087	3.357	5.035	4.772	7.385
115	2.299	1.956	3.380	3.518	2.877	4.315	4.052	6.329
120	1.983	1.684	2.916	3.040	2.476	3.714	3.454	5.448
125	1.715	1.456	2.522	2.634	2.141	3.211	2.955	4.710

Detailed Resistance - Temperature Tables are downloadable from the following URL. http://search.murata.co.jp/Ceramy/CatsearchAction.do?sLang=en

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Part Number         NCP□□WM224         NCP□□WM474           Resistance         220kΩ         470kΩ           B-Constant         4500K         4500K           Temp. (°C)         Resistance (kΩ)         Resistance (kΩ)           −40         11585.884         24751.661           −35         8016.973         17127.169           −30         5623.931         12014.762           −25         3990.100         8524.305           −20         2861.784         6113.811           −15         2076.162         4435.437           −10         1520.909         3249.216           −5         1125.049         2403.515           0         839.912         1794.358           5         632.521         1351.294           10         480.194         1025.870           15         367.455         785.018           20         283.310         605.252           25         220.000         470.000           30         172.012         367.480           35         135.364         289.186           40         107.198         229.014           45         85.419         182.485	Continued from the preceding page.							
B-Constant Temp. (°C)         4500K         4500K           Temp. (°C)         Resistance (kΩ)         Resistance (kΩ)           -40         11585.884         24751.661           -35         8016.973         17127.169           -30         5623.931         12014.762           -25         3990.100         8524.305           -20         2861.784         6113.811           -15         2076.162         4435.437           -10         1520.909         3249.216           -5         1125.049         2403.515           0         839.912         1794.358           5         632.521         1351.294           10         480.194         1025.870           15         367.455         785.018           20         283.310         605.252           25         220.000         470.000           30         172.012         367.480           35         135.364         289.186           40         107.198         229.014           45         85.419         182.485           50         68.441         146.215           55         55.153         117.828	Part Number	NCP□□WM224	NCP□□WM474					
Temp. (°C)         Resistance (kΩ)         Resistance (kΩ)           -40         11585.884         24751.661           -35         8016.973         17127.169           -30         5623.931         12014.762           -25         3990.100         8524.305           -20         2861.784         6113.811           -15         2076.162         4435.437           -10         1520.909         3249.216           -5         1125.049         2403.515           0         839.912         1794.358           5         632.521         1351.294           10         480.194         1025.870           15         367.455         785.018           20         283.310         605.252           25         220.000         470.000           30         172.012         367.480           35         135.364         289.186           40         107.198         229.014           45         85.419         182.485           50         68.441         146.215           55         55.153         117.828           60         44.665         95.420           65         <	Resistance	220kΩ	470kΩ					
-40         11585.884         24751.661           -35         8016.973         17127.169           -30         5623.931         12014.762           -25         3990.100         8524.305           -20         2861.784         6113.811           -15         2076.162         4435.437           -10         1520.909         3249.216           -5         1125.049         2403.515           0         839.912         1794.358           5         632.521         1351.294           10         480.194         1025.870           15         367.455         785.018           20         283.310         605.252           25         220.000         470.000           30         172.012         367.480           35         135.364         289.186           40         107.198         229.014           45         85.419         182.485           50         68.441         146.215           55         55.153         117.828           60         44.665         95.420           65         36.379         77.718           70         29.763	B-Constant	4500K	4500K					
-35         8016.973         17127.169           -30         5623.931         12014.762           -25         3990.100         8524.305           -20         2861.784         6113.811           -15         2076.162         4435.437           -10         1520.909         3249.216           -5         1125.049         2403.515           0         839.912         1794.358           5         632.521         1351.294           10         480.194         1025.870           15         367.455         785.018           20         283.310         605.252           25         220.000         470.000           30         172.012         367.480           35         135.364         289.186           40         107.198         229.014           45         85.419         182.485           50         68.441         146.215           55         55.153         117.828           60         44.665         95.420           65         36.379         77.718           70         29.763         63.584           75         24.462         52.260<	Temp. (°C)	Resistance (kΩ)	Resistance (kΩ)					
-30         5623.931         12014.762           -25         3990.100         8524.305           -20         2861.784         6113.811           -15         2076.162         4435.437           -10         1520.909         3249.216           -5         1125.049         2403.515           0         839.912         1794.358           5         632.521         1351.294           10         480.194         1025.870           15         367.455         785.018           20         283.310         605.252           25         220.000         470.000           30         172.012         367.480           35         135.364         289.186           40         107.198         229.014           45         85.419         182.485           50         68.441         146.215           55         55.153         117.828           60         44.665         95.420           65         36.379         77.718           70         29.763         63.584           75         24.462         52.260           80         20.205         43.166	-40	11585.884						
-25         3990.100         8524.305           -20         2861.784         6113.811           -15         2076.162         4435.437           -10         1520.909         3249.216           -5         1125.049         2403.515           0         839.912         1794.358           5         632.521         1351.294           10         480.194         1025.870           15         367.455         785.018           20         283.310         605.252           25         220.000         470.000           30         172.012         367.480           35         135.364         289.186           40         107.198         229.014           45         85.419         182.485           50         68.441         146.215           55         55.153         117.828           60         44.665         95.420           65         36.379         77.718           70         29.763         63.584           75         24.462         52.260           80         20.205         43.166           85         16.761         35.808 <td>-35</td> <td>8016.973</td> <td>17127.169</td>	-35	8016.973	17127.169					
-20         2861.784         6113.811           -15         2076.162         4435.437           -10         1520.909         3249.216           -5         1125.049         2403.515           0         839.912         1794.358           5         632.521         1351.294           10         480.194         1025.870           15         367.455         785.018           20         283.310         605.252           25         220.000         470.000           30         172.012         367.480           35         135.364         289.186           40         107.198         229.014           45         85.419         182.485           50         68.441         146.215           55         55.153         117.828           60         44.665         95.420           65         36.379         77.718           70         29.763         63.584           75         24.462         52.260           80         20.205         43.166           85         16.761         35.808           90         13.962         29.828	-30	5623.931	12014.762					
-15         2076.162         4435.437           -10         1520.909         3249.216           -5         1125.049         2403.515           0         839.912         1794.358           5         632.521         1351.294           10         480.194         1025.870           15         367.455         785.018           20         283.310         605.252           25         220.000         470.000           30         172.012         367.480           35         135.364         289.186           40         107.198         229.014           45         85.419         182.485           50         68.441         146.215           55         55.153         117.828           60         44.665         95.420           65         36.379         77.718           70         29.763         63.584           75         24.462         52.260           80         20.205         43.166           85         16.761         35.808           90         13.962         29.828           95         11.684         24.961 <tr< td=""><td>-25</td><td>3990.100</td><td>8524.305</td></tr<>	-25	3990.100	8524.305					
-10         1520.909         3249.216           -5         1125.049         2403.515           0         839.912         1794.358           5         632.521         1351.294           10         480.194         1025.870           15         367.455         785.018           20         283.310         605.252           25         220.000         470.000           30         172.012         367.480           35         135.364         289.186           40         107.198         229.014           45         85.419         182.485           50         68.441         146.215           55         55.153         117.828           60         44.665         95.420           65         36.379         77.718           70         29.763         63.584           75         24.462         52.260           80         20.205         43.166           85         16.761         35.808           90         13.962         29.828           95         11.684         24.961           100         9.809         20.955		2861.784						
-5         1125.049         2403.515           0         839.912         1794.358           5         632.521         1351.294           10         480.194         1025.870           15         367.455         785.018           20         283.310         605.252           25         220.000         470.000           30         172.012         367.480           35         135.364         289.186           40         107.198         229.014           45         85.419         182.485           50         68.441         146.215           55         55.153         117.828           60         44.665         95.420           65         36.379         77.718           70         29.763         63.584           75         24.462         52.260           80         20.205         43.166           85         16.761         35.808           90         13.962         29.828           95         11.684         24.961           100         9.809         20.955           105         8.270         17.668	-15	2076.162	4435.437					
0         839.912         1794.358           5         632.521         1351.294           10         480.194         1025.870           15         367.455         785.018           20         283.310         605.252           25         220.000         470.000           30         172.012         367.480           35         135.364         289.186           40         107.198         229.014           45         85.419         182.485           50         68.441         146.215           55         55.153         117.828           60         44.665         95.420           65         36.379         77.718           70         29.763         63.584           75         24.462         52.260           80         20.205         43.166           85         16.761         35.808           90         13.962         29.828           95         11.684         24.961           100         9.809         20.955           105         8.270         17.668           110         6.998         14.951	-10	1520.909	3249.216					
5         632.521         1351.294           10         480.194         1025.870           15         367.455         785.018           20         283.310         605.252           25         220.000         470.000           30         172.012         367.480           35         135.364         289.186           40         107.198         229.014           45         85.419         182.485           50         68.441         146.215           55         55.153         117.828           60         44.665         95.420           65         36.379         77.718           70         29.763         63.584           75         24.462         52.260           80         20.205         43.166           85         16.761         35.808           90         13.962         29.828           95         11.684         24.961           100         9.809         20.955           105         8.270         17.668           110         6.998         14.951           115         5.942         12.695           12	<b>-</b> 5	1125.049	2403.515					
10         480.194         1025.870           15         367.455         785.018           20         283.310         605.252           25         220.000         470.000           30         172.012         367.480           35         135.364         289.186           40         107.198         229.014           45         85.419         182.485           50         68.441         146.215           55         55.153         117.828           60         44.665         95.420           65         36.379         77.718           70         29.763         63.584           75         24.462         52.260           80         20.205         43.166           85         16.761         35.808           90         13.962         29.828           95         11.684         24.961           100         9.809         20.955           105         8.270         17.668           110         6.998         14.951           115         5.942         12.695           120         5.067         10.824	0	839.912	1794.358					
15         367.455         785.018           20         283.310         605.252           25         220.000         470.000           30         172.012         367.480           35         135.364         289.186           40         107.198         229.014           45         85.419         182.485           50         68.441         146.215           55         55.153         117.828           60         44.665         95.420           65         36.379         77.718           70         29.763         63.584           75         24.462         52.260           80         20.205         43.166           85         16.761         35.808           90         13.962         29.828           95         11.684         24.961           100         9.809         20.955           105         8.270         17.668           110         6.998         14.951           115         5.942         12.695           120         5.067         10.824	5	632.521	1351.294					
20         283.310         605.252           25         220.000         470.000           30         172.012         367.480           35         135.364         289.186           40         107.198         229.014           45         85.419         182.485           50         68.441         146.215           55         55.153         117.828           60         44.665         95.420           65         36.379         77.718           70         29.763         63.584           75         24.462         52.260           80         20.205         43.166           85         16.761         35.808           90         13.962         29.828           95         11.684         24.961           100         9.809         20.955           105         8.270         17.668           110         6.998         14.951           115         5.942         12.695           120         5.067         10.824	10	480.194	1025.870					
25         220.000         470.000           30         172.012         367.480           35         135.364         289.186           40         107.198         229.014           45         85.419         182.485           50         68.441         146.215           55         55.153         117.828           60         44.665         95.420           65         36.379         77.718           70         29.763         63.584           75         24.462         52.260           80         20.205         43.166           85         16.761         35.808           90         13.962         29.828           95         11.684         24.961           100         9.809         20.955           105         8.270         17.668           110         6.998         14.951           115         5.942         12.695           120         5.067         10.824	15	367.455	785.018					
30         172.012         367.480           35         135.364         289.186           40         107.198         229.014           45         85.419         182.485           50         68.441         146.215           55         55.153         117.828           60         44.665         95.420           65         36.379         77.718           70         29.763         63.584           75         24.462         52.260           80         20.205         43.166           85         16.761         35.808           90         13.962         29.828           95         11.684         24.961           100         9.809         20.955           105         8.270         17.668           110         6.998         14.951           115         5.942         12.695           120         5.067         10.824	20	283.310	605.252					
35         135.364         289.186           40         107.198         229.014           45         85.419         182.485           50         68.441         146.215           55         55.153         117.828           60         44.665         95.420           65         36.379         77.718           70         29.763         63.584           75         24.462         52.260           80         20.205         43.166           85         16.761         35.808           90         13.962         29.828           95         11.684         24.961           100         9.809         20.955           105         8.270         17.668           110         6.998         14.951           115         5.942         12.695           120         5.067         10.824	25	220.000	470.000					
40         107.198         229.014           45         85.419         182.485           50         68.441         146.215           55         55.153         117.828           60         44.665         95.420           65         36.379         77.718           70         29.763         63.584           75         24.462         52.260           80         20.205         43.166           85         16.761         35.808           90         13.962         29.828           95         11.684         24.961           100         9.809         20.955           105         8.270         17.668           110         6.998         14.951           115         5.942         12.695           120         5.067         10.824	30	172.012	367.480					
45 85.419 182.485 50 68.441 146.215 55 55.153 117.828 60 44.665 95.420 65 36.379 77.718 70 29.763 63.584 75 24.462 52.260 80 20.205 43.166 85 16.761 35.808 90 13.962 29.828 95 11.684 24.961 100 9.809 20.955 105 8.270 17.668 110 6.998 14.951 115 5.942 12.695 120 5.067 10.824	35	135.364	289.186					
50         68.441         146.215           55         55.153         117.828           60         44.665         95.420           65         36.379         77.718           70         29.763         63.584           75         24.462         52.260           80         20.205         43.166           85         16.761         35.808           90         13.962         29.828           95         11.684         24.961           100         9.809         20.955           105         8.270         17.668           110         6.998         14.951           115         5.942         12.695           120         5.067         10.824	40	107.198	229.014					
55         55.153         117.828           60         44.665         95.420           65         36.379         77.718           70         29.763         63.584           75         24.462         52.260           80         20.205         43.166           85         16.761         35.808           90         13.962         29.828           95         11.684         24.961           100         9.809         20.955           105         8.270         17.668           110         6.998         14.951           115         5.942         12.695           120         5.067         10.824	45	85.419	182.485					
60         44.665         95.420           65         36.379         77.718           70         29.763         63.584           75         24.462         52.260           80         20.205         43.166           85         16.761         35.808           90         13.962         29.828           95         11.684         24.961           100         9.809         20.955           105         8.270         17.668           110         6.998         14.951           115         5.942         12.695           120         5.067         10.824	50	68.441	146.215					
65         36.379         77.718           70         29.763         63.584           75         24.462         52.260           80         20.205         43.166           85         16.761         35.808           90         13.962         29.828           95         11.684         24.961           100         9.809         20.955           105         8.270         17.668           110         6.998         14.951           115         5.942         12.695           120         5.067         10.824	55	55.153	117.828					
70         29.763         63.584           75         24.462         52.260           80         20.205         43.166           85         16.761         35.808           90         13.962         29.828           95         11.684         24.961           100         9.809         20.955           105         8.270         17.668           110         6.998         14.951           115         5.942         12.695           120         5.067         10.824	60	44.665	95.420					
75         24.462         52.260           80         20.205         43.166           85         16.761         35.808           90         13.962         29.828           95         11.684         24.961           100         9.809         20.955           105         8.270         17.668           110         6.998         14.951           115         5.942         12.695           120         5.067         10.824	65	36.379	77.718					
80         20.205         43.166           85         16.761         35.808           90         13.962         29.828           95         11.684         24.961           100         9.809         20.955           105         8.270         17.668           110         6.998         14.951           115         5.942         12.695           120         5.067         10.824	70	29.763	63.584					
85         16.761         35.808           90         13.962         29.828           95         11.684         24.961           100         9.809         20.955           105         8.270         17.668           110         6.998         14.951           115         5.942         12.695           120         5.067         10.824	75	24.462	52.260					
90         13.962         29.828           95         11.684         24.961           100         9.809         20.955           105         8.270         17.668           110         6.998         14.951           115         5.942         12.695           120         5.067         10.824	80	20.205	43.166					
95         11.684         24.961           100         9.809         20.955           105         8.270         17.668           110         6.998         14.951           115         5.942         12.695           120         5.067         10.824	85	16.761	35.808					
100         9.809         20.955           105         8.270         17.668           110         6.998         14.951           115         5.942         12.695           120         5.067         10.824	90	13.962	29.828					
105         8.270         17.668           110         6.998         14.951           115         5.942         12.695           120         5.067         10.824	95	11.684	24.961					
110         6.998         14.951           115         5.942         12.695           120         5.067         10.824	100	9.809	20.955					
115         5.942         12.695           120         5.067         10.824	105	8.270	17.668					
120 5.067 10.824	110	6.998	14.951					
	115	5.942	12.695					
	120	5.067	10.824					
125   4.334   9.259	125	4.334	9.259					

Detailed Resistance - Temperature Tables are downloadable from the following URL.

http://search.murata.co.jp/Ceramy/CatsearchAction.do?sLang=en



### for Temp. Sensor and Compensation Chip Type (1) Caution/Notice

### ■ ① Caution (Storage and Operating Conditions)

This product is designed for application in an ordinary environment (normal room temperature, humidity and atmospheric pressure).

Do not use under the following conditions because all these factors can deteriorate the product characteristics or cause failures and burn-out.

- Corrosive gas or deoxidizing gas
   (Chlorine gas, Hydrogen sulfide gas, Ammonia gas,
   Sulfuric acid gas, Nitric oxide gas, etc.)
- 2. Volatile or flammable gas
- 3. Dusty conditions
- 4. Under vacuum, or under high or low-pressure
- 5. Wet or humid locations
- Places with salt water, oils, chemical liquids or organic solvents
- 7. Strong vibrations
- 8. Other places where similar hazardous conditions

### ■ ①Caution (Others)

Be sure to provide an appropriate fail-safe function on your product to prevent secondary damages that may be caused by the abnormal function or the failure of our product.

### ■ Notice (Storage and Operating Conditions)

To keep solderability of product from declining, the following storage condition is recommended.

1. Storage condition:

Temperature -10 to +40 degrees C Humidity less than 75%RH (not dewing condition)

2. Storage term:

Use this product within 6 months after delivery by first-in and first-out stocking system.

3. Storage place:

Do not store this product in corrosive gas (Sulfuric acid gas, Chlorine gas, etc.) or in direct sunlight.

### ■ Notice (Rating)

Use this product within the specified temperature range.

Higher temperature may cause deterioration of the characteristics or the material quality of this product.

#### ■ Notice (Handling)

The ceramic of this product is fragile, and care must be taken not to load an excessive press - force or not to give a shock at handling. Such forces may cause cracking or chipping.



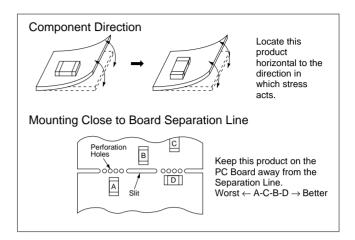
sales representatives or product engineers before ordering.

• This PDF catalog has only typical specifications because there is no space for detailed specifications. Therefore, please approve our product specifications or transact the approval sheet for product specifications before ordering.

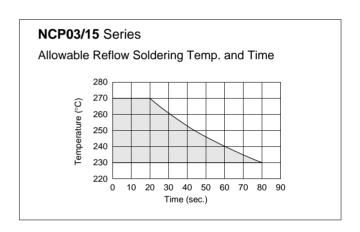
### for Temp. Sensor and Compensation Chip Type \(\textit{\Omega}\) Caution/Notice

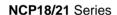
### ■ Notice (Soldering and Mounting)

1. Mounting Position Choose a mounting position that minimizes the stress imposed on the chip during flexing or bending of the board.

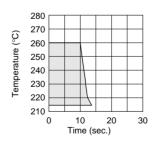


- 2. Allowable Soldering Temperature and Time
- (a) Solder within the temperature and time combinations, indicated by the slanted lines in the fllowing graphs.
- (b) The excessive soldering conditions may cause dissolution of metallization or deterioration of solderwetting on the external electrode.
- (c) In case of repeated soldering, the accumulated soldering time should be within the range shown below figure. (For example, Reflow peak temperature: 260°C, twice -> The total accumulated soldering time at 260°C is within 30 seconds.)

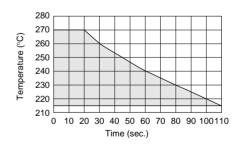




Allowable Flow Soldering Temp. and Time



### Allowable Reflow Soldering Temp. and Time



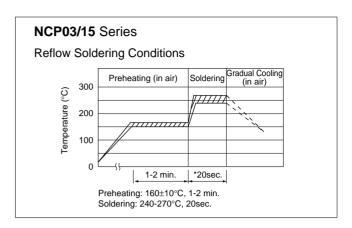


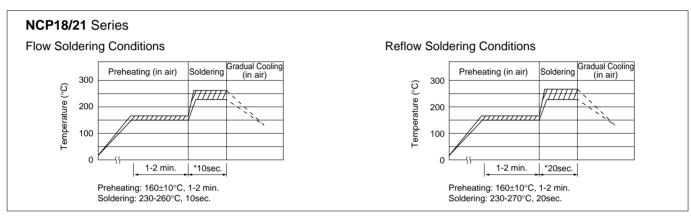


### for Temp. Sensor and Compensation Chip Type (1) Caution/Notice

Continued from the preceding page.

- 3. Recommendable Temperature Profile for Soldering
- (a) Insufficient preheating may cause a crack on ceramic body. The difference between preheating temperature and maximum temperature in the profile shall be 100 °C.
- (b) Rapid cooling by dipping in solvent or by other means is not recommended.
- \* In case of repeated soldering, the accumulated soldering time should be within the range shown above figure 2.





### 4. Solder and Flux

- (1) Solder and Paste
- (a) Reflow Soldering: NCP03/15/18/21 Series

Use RA/RMA type or equivalent type of solder paste. For your reference, we are using the solder paste below for any internal tests of this product.

- •RMA9086 90-4-M20 (Sn:Pb=63wt%:37wt%) (Manufactured by Alpha Metals Japan Ltd.)
- •M705-221BM5-42-11 (Sn:Ag:Cu=96.5wt%:3.0wt%:0.5wt%) (Manufactured by Senju Metal Industry Co., Ltd.)
- (b) Flow Soldering: NCP18/21 Series We are using the solder paste below for any internal tests of this product.

### 5. Cleaning Conditions

For removing the flux after soldering, observe the following points in order to avoid deterioration of the characteristics or any change of the external electrodes' quality.

- Please keep mounted parts and a substrate from an occurance of resonace in ultrasonic cleaning.
- Please do not clean the products in the case of using a non-washed type flux.

- •Sn:Pb=63wt%:37wt%
- •Sn:Ag:Cu=96.5wt%:3.0wt%:0.5wt%

Use rosin type flux in soldering process.

If below flux is used, some problems might be caused in the product characteristics and reliability.

Please do not use below flux.

- · Strong acidic flux (with halide content exceeding 0.1wt%).
- Water-soluble flux (\*Water-soluble flux can be defined as non rosin type flux including wash-type flux and non-wash-type flux.)

	NCP03/15	NCP18/21
Solvent	Isopropyl Alcohol	Isopropyl Alcohol
Dipping Cleaning	Less than 5 minutes at room temp. or less than 2 minutes at 40°C max.	Less than 5 minutes at room temp. or less than 2 minutes at 40°C max.
Ultrasonic Cleaning	Less than 5 minutes and 20W/ $\ell$ Frequency of 28kHz to 40kHz	Less than 1 minute and 20W/ $\ell$ Frequency of several 10kHz to 100kHz

#### Drying

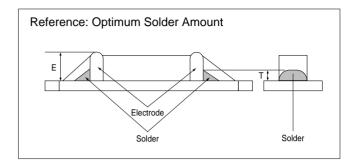
After cleaning, promptly dry this product.



### for Temp. Sensor and Compensation Chip Type (1) Caution/Notice

Continued from the preceding page.

- 7. Printing Conditions of Solder Paste
- The amount of solder is critical. Standard height of fillet is shown in the table below.
- Too much soldering may cause mechanical stress, resulting in cracking, mechanical and/or electronic damage.



Part Number	The Solder Paste Thickness	Т		
NCP03	100µm	1/3E≦T≦E		
NCP15	150µm	1/3E≦T≦E		
NCP18/NCP21	200μm	0.2mm≦T≦E		

- 8. Adhesive Application and Curing
- Thin or insufficient adhesive may result in loose component contact with land during flow soldering.
- Low viscosity adhesive causes chips to slip after mounting.



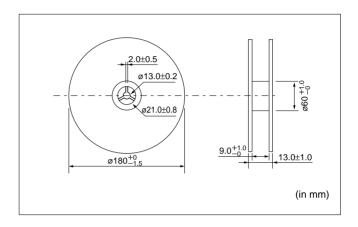
### for Temp. Sensor and Compensation Chip Type Package

### ■ Minimum Quantity Guide

Deat Newsler	Quantity (pcs.)					
Part Number	Paper Tape	Embossed Tape				
NCP03	15000					
NCP15	10000	-				
NCP18	4000					
NCP21	-	4000				

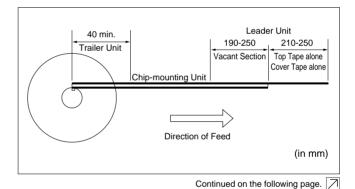
### ■ Tape Carrier Packaging

### 1. Dimensions of Reel



### 2. Taping Method

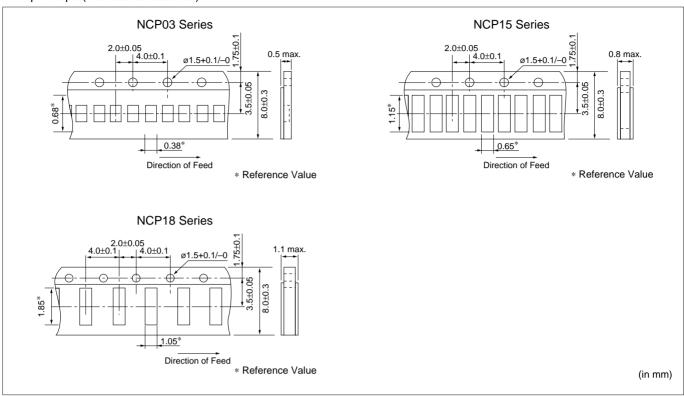
- (1) A tape in a reel contains Leader unit and Trailer unit where products are not packed. (Please refer to the figure right.)
- (2) The top and base tapes or plastic and cover tape are not stuck at the first five pitches minimum.
- (3) A label should be attached on the reel. (MURATA's part number, inspection number and quantity should be marked on the label.)
- (4) Taping reels are packed in a package.



### for Temp. Sensor and Compensation Chip Type Package

Continued from the preceding page.

### 3. Paper Tape (NCP03/15/18 Series)



### (1) Other Conditions

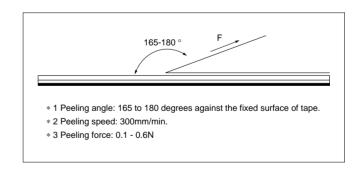
### (a) Packaging

Products are packaged in the cavity of the base tape and sealed by top tape and bottom tape.

### (b) Tape

Top tape and bottom tape have no joints and products are packaged and sealed in the cavity of the base tape, continuously.

### (2) Peeling Force of Top Tape



### (3) Pull Strength

Pull strength of top tape is specified at 10N minimum. Pull strength of bottom tape should be specified 5N minimum.





### for Temp. Sensor and Compensation Chip Type Package

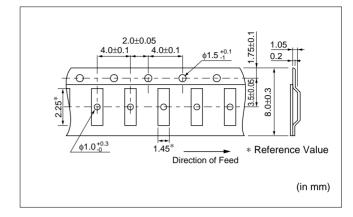
Continued from the preceding page.

- 4. Embossed Tape (NCP21 Series)
- (1) Other Conditions
  - (a) Packaging

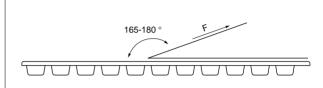
Products are packaged in each cavity of the Embossed tape and sealed by Cover tape.

(b) Tape

Cover tape has no joints.



(2) Peeling Force of Cover Tape



- \* 1 Peeling angle: 165 to 180 degrees against the fixed surface of tape.
- \* 2 Peeling speed: 300mm/min.
- \* 3 Peeling force: 0.1 0.7N

(3) Tape Strength

Pull strength of Embossed tape and Cover tape should be specified 10N minimum.



sales representatives or product engineers before ordering.

• This PDF catalog has only typical specifications because there is no space for detailed specifications. Therefore, please approve our product specifications or transact the approval sheet for product specifications before ordering.

## **NTC Thermistors**



### for Temperature Sensor Thermo String Type

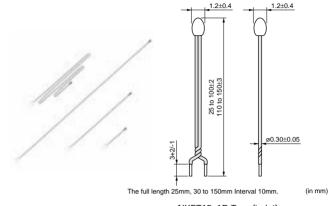
This product is a small flexible lead type NTC Thermistor with the small head and the thin lead wire.

### ■ Features

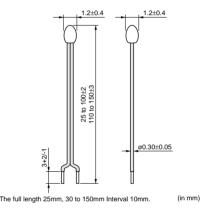
- 1. High accuracy and high sensibility temperature sensing is available by the small size and high accuracy NTC
- 2. Narrow space temperature sensing is available by the small sensing head and the thin lead wire.
- 3. Flexibility and wide variety length (25 mm to 150mm) enables designing flexible temperature sensing architectures.
- 4. This product is compatible with our 0402 (EIA) size chip Thermistor.
- 5. Excellent long time aging stability
- 6. This is halogen free product. \*
  - \* Cl= max.900ppm, Br=max.900ppm and CI+Br=max.1500ppm
- 7. NXFT series are recognized by UL/cUL. (UL1434, File No.E137188).

#### ■ Applications

- 1. Temperature compensation for transistor, IC and crystal oscillator in mobile communications
- 2. Temperature sensor for rechargeable batteries
- 3. Temperature compensation of LCD
- 4. Temperature compensation in general use of electric circuits



NXFT15\_1B Type(twist)



NXFT15\_2B Type(without twist)

Part Number	Resistance (25°C) (ohm)	B-Constant (25-50°C) (K)	B-Constant (25-80°C) (Reference Value) (K)	B-Constant (25-85°C) (Reference Value) (K)	B-Constant (25-100°C) (Reference Value) (K)	Operating Current for Sensor (25°C) (mA)	Rated Electric Power (25°C) (mW)	Typical Dissipation Constant (25°C) (mW/°C)	Thermal Time Constant (s)
NXFT15XH103FA□B□□□	10k	3380 ±1%	3423	3431	3452	0.12	7.5	1.5	4
NXFT15WB473FA B	47k	4050 ±1%	4091	4097	4114	0.06	7.5	1.5	4
NXFT15WF104FA□B□□□	100k	4250 ±1%	4303	4311	4334	0.04	7.5	1.5	4

☐ is the fulled with lead shape (1:twist, 2:without twist).

□□□ is the fulled with Total-length codes. (25mm, 30 to 150mm interval 10mm, ex. 050=50mm)

Operating Current for Sensor rises Thermistor's temperature by 0.1.°C

Rated Electric Power is necessary electric power that Thermistor's temperature rises 5°C by self heating at 25°C in still air.

Operating Temperature Range: -40°C to +125°C

# Note • This PDF catalog is downloaded from the website of Murata Manufacturing co., ltd. Therefore, it's specifications are subject to change or our products in it may be discontinued without advance notice. Please check with our sales representatives or product engineers before ordering. • This PDF catalog has only typical specifications because there is no space for detailed specifications. Therefore, please approve our product specifications or transact the approval sheet for product specifications before ordering.

### for Temperature Sensor Thermo String Type Specifications and Test Methods

No.	Item	Specifications	Test Methods
1	High Temperature Storage Test	Resistance (R25°C) fluctuation rate: less than ±1%.	125±2°C in air, for 1000 +48/-0 hours without loading.
2	Low Temperature Storage Test	· B-Constant (B25/50°C) fluctuation rate: less than ±1%.	-40 +0/-3°C in air, for 1000 +48/-0 hours without loading.
3	Humidity Storage Test		60±2°C, 90 to 95%RH in air, for 1000 +48/-0 hours without loading.
4	Temperature Cycle	Resistance (R25°C) fluctuation rate: less than ±2%. B-Constant (B25/50°C) fluctuation rate: less than ±1%.	-40 +0/-3°C, 30 minutes in air +25±2°C, 10 to 15 minutes in air +125±2°C, 30 minutes in air + 25 +2/-0°C, 10 to 15 minutes in air (1 cycle) Continuous 100 cycles, without loading.
5	High Temperature Load		85±2°C in air, with 'Operating Current for Sensor' for 1000 +48/-0 hrs.
6	Insulation Break - down Voltage	· No damage electrical characteristics on DC100 V, 1 min.	2mm length of coating resin from the top of Thermistor is to be dipped into beads of lead (Pb), and DC100V 1 minute is applied to circuit between beads of lead (Pb) and lead wire.
7	Resistance to Soldering Heat	Resistance (R25°C) fluctuation rate: less than ±1%. B-Constant (B25/50°C) fluctuation rate: less than ±1%.	Both lead wires are dipped into 350±10°C solder for 3.5±0.5 seconds, or 260±5°C solder for 10±1 seconds according to Fig-1. (solder <jis 3282="" h60a="" z="">)</jis>
8	Solderability	More than 90% of lead wire surface shall be covered by solder.	Both lead wires are dipped into flux (25wt% colophony <jis 5902="" k=""> isopropyl alcohol <jis 8839="" k="">) for 5 to 10 seconds. Then both lead wires are dipped into 235±5°C solder <jis 3282="" h60a="" z=""> for 2±0.5 seconds according to Fig-1.</jis></jis></jis>
9	Lead Wire Pull Strength	Resistance (R25°C) fluctuation rate: less than ±1%.     B-Constant (B25/50°C) fluctuation rate: less than ±1%.	The lead wire shall be inserted in a ø1.0mm hole until resin part contacts with a substrate as shown in fig2. And 1N force for 10 seconds shall be applied to the lead wire.  1N (10 sec.)  Fig-2
10	Lead Wire Bending Strength	· Lead wire does not break.	Hold the lead wires like Fig-3. Bend by 90 degrees and again bend back to the initial position. Then bend to the other side by 90 degrees and again bend back to the initial position. After bending process, 10N force for 3 seconds shall be applied to the lead wire.  Fig-3

- \*  $\cdot$  R25 is zero-power resistance at 25°C.
  - B25/50 is calculated by zero-power resistance of Thermistor in 25°C -50°C.
  - · After each test, NTC Thermistor should be kept for 1 hour at room temperature (normal humidity and normal atmospheric pressure).



### for Temperature Sensor Thermo String Type Specifications and Test Methods

No.	Item	Specifications	Test Methods
11	Free Fall		NTC Thermistor shall be dropped without any force onto concrete floor from 1 meter height one time.
12	Vibration	$\cdot$ Resistance (R25°C) fluctuation rate: less than $\pm 1\%$ . B-Constant (B25/50°C) fluctuation rate: less than $\pm 1\%$ . No visible damage at resin part.	NTC Thermistor shall be fixed to the vibration test equipment. Vibration of total 1.5 mm amplitude, Frequency sequence of 10Hz - 55Hz - 10Hz in 1 minute, shall be applied for right angled 3 directions for each 2 hours duration.    Mount

- · R25 is zero-power resistance at 25°C.
- $\cdot$  B25/50 is calculated by zero-power resistance of Thermistor in 25°C -50°C.
- · After each test, NTC Thermistor should be kept for 1 hour at room temperature (normal humidity and normal atmospheric pressure).

## **NTC Thermistors**

### for Temperature Sensor Lead Type

This product is a sensor type NTC Thermistor to be useful in the normal temperature range developed by the unique ceramic technology and the automatic assembly.

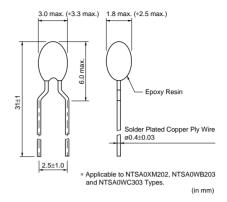
### ■ Features

- 1. High-accuracy of B-Constant tolerance +/-0.5% +/-1% of resistance and +/-0.5% of B-Constant is realized due to technical advantages of the material and manufacturing process.
- 2. Quick response This product provides faster response time due to its smaller size.
- 3. Taping type is available.
- 4. Strong lead strength Original lead-wiring technique assures reliable connection. It can be formed and bent flexibly according to the mounting conditions.

### ■ Applications

- 1. Rechargeable batteries
- 2. Battery charging circuits
- 3. Head of printers
- 4. DC fan motors
- 5. Home appliance equipments





Part Number	Resistance (25°C) (ohm)	B-Constant (25-50°C) (K)	B-Constant (25-80°C) (Reference Value) (K)	B-Constant (25-85°C) (Reference Value) (K)	B-Constant (25-100°C) (Reference Value) (K)	Permissive Operating Current (25°C) (mA)	Rated Electric Power (25°C) (mW)	Typical Dissipation Constant (25°C) (mW/°C)	Thermal Time Constant (s)
NTSA0XM202□E1B0	2.0k	3500 ±0.5%	3523	3526	3543	1.05	21	2.1	7
NTSA0XR502□E1B0	5.0k	3700 ±1%	3727	3738	3760	0.68	15	1.5	7
NTSA0XH103□E1B0	10k	3380 ±0.5%	3428	3434	3455	0.38	15	1.5	7
NTSA0XV103□E1B0	10k	3900 ±0.5%	3930	3934	3944	0.46	15	1.5	7
NTSA0WB203□E1B0	20k	4050 ±1%	4078	4080	4096	0.31	21	2.1	7
NTSA0WC303□E1B0	30k	4100 ±1%	4128	4130	4147	0.26	21	2.1	7
NTSA0WD503□E1B0	50k	4150 ±1%	4205	4213	4234	0.20	15	1.5	7
NTSA0WF104□E1B0	100k	4250 ±1%	4303	4311	4334	0.14	15	1.5	7

A blank column is filled with resistance tolerance codes (F:  $\pm 1\%$ , E:  $\pm 3\%$ ).

Rated Electric Power is necessary electric power that Thermistor's temperature rises 10°C by self heating at 25°C in still air.

Operating Temperature Range: -40°C to +125°C

Taping type of part numbers with "N6A0" is available (Lead spacing=5mm).

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### 7

## **NTC Thermistors**



### for Temperature Sensor Lead Insulation Type

This product is a sensor type NTC Thermistor to be useful in the normal temperature range developed by the unique ceramic technology and the automatic assembly.

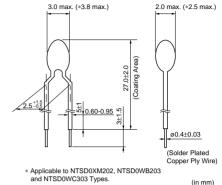
#### ■ Features

- 1. Electric insulation on lead wire
- 2. Excellent bending resistance due to suitable hardness of surface coating
- Easy handling due to most suitable hardness of surface of coating
- 4. High-accuracy of B-Constant tolerance +/-0.5% +/-1% of resistance and +/-0.5% of B-Constant is realized due to technical advantages of the material and manufacturing process.

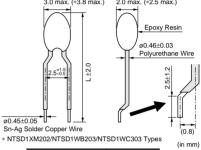
### ■ Applications

- 1. Rechargeable batteries
- 2. Battery charging circuits
- 3. Head of printers
- 4. DC fan motors
- 5. Home appliance equipments









 Type
 L (mm)

 NTSD1\_FPB30
 30

 NTSD1\_FPB40
 40

 NTSD1\_FPB50
 50

### **NTSD0 Series**

Part Number	Resistance (25°C) (ohm)	B-Constant (25-50°C) (K)	B-Constant (25-80°C) (Reference Value) (K)	B-Constant (25-85°C) (Reference Value) (K)	B-Constant (25-100°C) (Reference Value) (K)	Current (25°C)	Rated Electric Power (25°C) (mW)	Typical Dissipation Constant (25°C) (mW/°C)	Thermal Time Constant (s)
NTSD0XM202□E1B0	2.0k	3500 ±0.5%	3523	3526	3543	1.05	21	2.1	7
NTSD0XR502□E1B0	5.0k	3700 ±1%	3727	3738	3760	0.68	15	1.5	7
NTSD0XH103□E1B0	10k	3380 ±0.5%	3428	3434	3455	0.38	15	1.5	7
NTSD0XV103□E1B0	10k	3900 ±0.5%	3930	3934	3944	0.46	15	1.5	7
NTSD0WB203□E1B0	20k	4050 ±1%	4078	4080	4096	0.31	21	2.1	7
NTSD0WC303□E1B0	30k	4100 ±1%	4128	4130	4147	0.26	21	2.1	7
NTSD0WD503□E1B0	50k	4150 ±1%	4205	4213	4234	0.20	15	1.5	7
NTSD0WF104□E1B0	100k	4250 ±1%	4303	4311	4334	0.14	15	1.5	7

A blank column is filled with resistance tolerance codes (F:  $\pm 1\%$ , E:  $\pm 3\%$ ).

Rated Electric Power is necessary electric power that Thermistor's temperature rises 10°C by self heating at 25°C in still air.

Operating Temperature Range: -40°C to +125°C

### **NTSD1 Series**

Part Number	Resistance (25°C) (ohm)	B-Constant (25-50°C) (K)	B-Constant (25-80°C) (Reference Value) (K)	B-Constant (25-85°C) (Reference Value) (K)	B-Constant (25-100°C) (Reference Value) (K)	Permissive Operating Current (25°C) (mA)	Rated Electric Power (25°C) (mW)	Typical Dissipation Constant (25°C) (mW/°C)	Thermal Time Constant (s)
NTSD1XM202FPB□□	2.0k ±1%	3500 ±0.5%	3523	3526	3543	1.05	21	2.1	7
NTSD1XR502FPB□□	5.0k ±1%	3700 ±1%	3727	3738	3760	0.68	15	1.5	7
NTSD1XH103FPB□□	10k ±1%	3380 ±0.5%	3428	3434	3455	0.38	15	1.5	7
NTSD1XV103FPB□□	10k ±1%	3900 ±0.5%	3930	3934	3944	0.46	15	1.5	7
NTSD1WB203FPB□□	20k ±1%	4050 ±1%	4078	4080	4096	0.31	21	2.1	7
NTSD1WC303FPB□□	30k ±1%	4100 ±1%	4128	4130	4147	0.26	21	2.1	7

<u> </u>	1 3								
Part Number	Resistance (25°C) (ohm)	B-Constant (25-50°C) (K)	B-Constant (25-80°C) (Reference Value) (K)	B-Constant (25-85°C) (Reference Value) (K)	B-Constant (25-100°C) (Reference Value) (K)	Permissive Operating Current (25°C) (mA)	Rated Electric Power (25°C) (mW)	Typical Dissipation Constant (25°C) (mW/°C)	Thermal Time Constant (s)
NTSD1WD503FPB□□	50k ±1%	4150 ±1%	4205	4213	4234	0.20	15	1.5	7
NTSD1WF104FPB□□	100k ±1%	4250 ±1%	4303	4311	4334	0.14	15	1.5	7

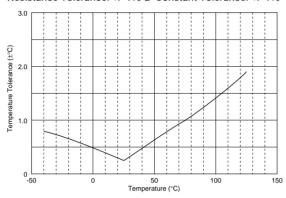
A blank column is filled with Total-length codes. (30, 40, 50)

Rated Electric Power is necessary electric power that Thermistor's temperature rises 10°C by self heating at 25°C in still air.

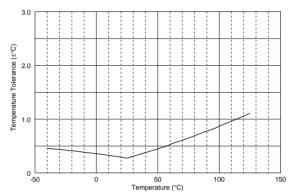
Operating Temperature Range: -40°C to +125°C

### **■** Temperature Tolerance - Temperature Characteristics

Resistance Tolerance: +/-1% B-Constant Tolerance: +/-1%



Resistance Tolerance: +/-1% B-Constant Tolerance: +/-0.5%



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### for Temperature Sensor Temperature Characteristics (Center Value)

Part Number         NXF□XH103         NXF□WB473         NXF□WF104           Resistance         10kΩ         47kΩ         100kΩ           B-Constant         3380K         4050K         4250K           Temp. (°C)         Resistance (kΩ)         Resistance (kΩ)         Resistance (kΩ)           −40         197.388         1690.590         4221.280           −35         149.395         1215.320         2995.040           −30         114.345         882.908         2147.000           −25         88.381         647.911         1554.600           −20         68.915         480.069         1136.690           −15         54.166         359.009         839.019           −10         42.889         270.868         624.987           −5         34.196         206.113         469.678           0         27.445         158.126         355.975           5         22.165         122.267         272.011           10         18.010         95.256         209.489           15         14.720         74.754         162.559           20         12.099         59.075         127.057           25         10.000				
B-Constant         3380K         4050K         4250K           Temp. (°C)         Resistance (kΩ)         Resistance (kΩ)         Resistance (kΩ)           -40         197.388         1690.590         4221.280           -35         149.395         1215.320         2995.040           -30         114.345         882.908         2147.000           -25         88.381         647.911         1554.600           -20         68.915         480.069         1136.690           -15         54.166         359.009         839.019           -10         42.889         270.868         624.987           -5         34.196         206.113         469.678           0         27.445         158.126         355.975           5         22.165         122.267         272.011           10         18.010         95.256         209.489           15         14.720         74.754         162.559           20         12.099         59.075         127.057           25         10.000         47.000         100.000           30         8.309         37.636         79.222           35         6.939         30.326	Part Number	NXF□XH103	NXF□WB473	NXF□WF104
Temp. (°C)         Resistance (κΩ)         Resistance (κΩ)         Resistance (κΩ)           -40         197.388         1690.590         4221.280           -35         149.395         1215.320         2995.040           -30         114.345         882.908         2147.000           -25         88.381         647.911         1554.600           -20         68.915         480.069         1136.690           -15         54.166         359.009         839.019           -10         42.889         270.868         624.987           -5         34.196         206.113         469.678           0         27.445         158.126         355.975           5         22.165         122.267         272.011           10         18.010         95.256         209.489           15         14.720         74.754         162.559           20         12.099         59.075         127.057           25         10.000         47.000         100.000           30         8.309         37.636         79.222           35         6.939         30.326         63.167           40         5.824         24.583	Resistance	10kΩ	47kΩ	100kΩ
-40         197.388         1690.590         4221.280           -35         149.395         1215.320         2995.040           -30         114.345         882.908         2147.000           -25         88.381         647.911         1554.600           -20         68.915         480.069         1136.690           -15         54.166         359.009         839.019           -10         42.889         270.868         624.987           -5         34.196         206.113         469.678           0         27.445         158.126         355.975           5         22.165         122.267         272.011           10         18.010         95.256         209.489           15         14.720         74.754         162.559           20         12.099         59.075         127.057           25         10.000         47.000         100.000           30         8.309         37.636         79.222           35         6.939         30.326         63.167           40         5.824         24.583         50.677           45         4.911         20.043         40.904	B-Constant	3380K	4050K	4250K
-35         149.395         1215.320         2995.040           -30         114.345         882.908         2147.000           -25         88.381         647.911         1554.600           -20         68.915         480.069         1136.690           -15         54.166         359.009         839.019           -10         42.889         270.868         624.987           -5         34.196         206.113         469.678           0         27.445         158.126         355.975           5         22.165         122.267         272.011           10         18.010         95.256         209.489           15         14.720         74.754         162.559           20         12.099         59.075         127.057           25         10.000         47.000         100.000           30         8.309         37.636         79.222           35         6.939         30.326         63.167           40         5.824         24.583         50.677           45         4.911         20.043         40.904           50         4.160         16.433         33.195           <	Temp. (°C)	Resistance ( $k\Omega$ )	Resistance (kΩ)	Resistance (kΩ)
-30         114.345         882.908         2147.000           -25         88.381         647.911         1554.600           -20         68.915         480.069         1136.690           -15         54.166         359.009         839.019           -10         42.889         270.868         624.987           -5         34.196         206.113         469.678           0         27.445         158.126         355.975           5         22.165         122.267         272.011           10         18.010         95.256         209.489           15         14.720         74.754         162.559           20         12.099         59.075         127.057           25         10.000         47.000         100.000           30         8.309         37.636         79.222           35         6.939         30.326         63.167           40         5.824         24.583         50.677           45         4.911         20.043         40.904           50         4.160         16.433         33.195           55         3.539         13.545         27.091           60 </td <td>-40</td> <td>197.388</td> <td>1690.590</td> <td>4221.280</td>	-40	197.388	1690.590	4221.280
-25         88.381         647.911         1554.600           -20         68.915         480.069         1136.690           -15         54.166         359.009         839.019           -10         42.889         270.868         624.987           -5         34.196         206.113         469.678           0         27.445         158.126         355.975           5         22.165         122.267         272.011           10         18.010         95.256         209.489           15         14.720         74.754         162.559           20         12.099         59.075         127.057           25         10.000         47.000         100.000           30         8.309         37.636         79.222           35         6.939         30.326         63.167           40         5.824         24.583         50.677           45         4.911         20.043         40.904           50         4.160         16.433         33.195           55         3.539         13.545         27.091           60         3.024         11.223         22.224           65	-35	149.395	1215.320	2995.040
-20         68.915         480.069         1136.690           -15         54.166         359.009         839.019           -10         42.889         270.868         624.987           -5         34.196         206.113         469.678           0         27.445         158.126         355.975           5         22.165         122.267         272.011           10         18.010         95.256         209.489           15         14.720         74.754         162.559           20         12.099         59.075         127.057           25         10.000         47.000         100.000           30         8.309         37.636         79.222           35         6.939         30.326         63.167           40         5.824         24.583         50.677           45         4.911         20.043         40.904           50         4.160         16.433         33.195           55         3.539         13.545         27.091           60         3.024         11.223         22.224           65         2.593         9.345         18.323           70	-30	114.345	882.908	2147.000
-15         54.166         359.009         839.019           -10         42.889         270.868         624.987           -5         34.196         206.113         469.678           0         27.445         158.126         355.975           5         22.165         122.267         272.011           10         18.010         95.256         209.489           15         14.720         74.754         162.559           20         12.099         59.075         127.057           25         10.000         47.000         100.000           30         8.309         37.636         79.222           35         6.939         30.326         63.167           40         5.824         24.583         50.677           45         4.911         20.043         40.904           50         4.160         16.433         33.195           55         3.539         13.545         27.091           60         3.024         11.223         22.224           65         2.593         9.345         18.323           70         2.233         7.818         15.184           75         1.		88.381	647.911	1554.600
-10         42.889         270.868         624.987           -5         34.196         206.113         469.678           0         27.445         158.126         355.975           5         22.165         122.267         272.011           10         18.010         95.256         209.489           15         14.720         74.754         162.559           20         12.099         59.075         127.057           25         10.000         47.000         100.000           30         8.309         37.636         79.222           35         6.939         30.326         63.167           40         5.824         24.583         50.677           45         4.911         20.043         40.904           50         4.160         16.433         33.195           55         3.539         13.545         27.091           60         3.024         11.223         22.224           65         2.593         9.345         18.323           70         2.233         7.818         15.184           75         1.929         6.571         12.635           80         1.673 </td <td></td> <td>68.915</td> <td>480.069</td> <td>1136.690</td>		68.915	480.069	1136.690
-5         34.196         206.113         469.678           0         27.445         158.126         355.975           5         22.165         122.267         272.011           10         18.010         95.256         209.489           15         14.720         74.754         162.559           20         12.099         59.075         127.057           25         10.000         47.000         100.000           30         8.309         37.636         79.222           35         6.939         30.326         63.167           40         5.824         24.583         50.677           45         4.911         20.043         40.904           50         4.160         16.433         33.195           55         3.539         13.545         27.091           60         3.024         11.223         22.224           65         2.593         9.345         18.323           70         2.233         7.818         15.184           75         1.929         6.571         12.635           80         1.673         5.548         10.566           85         1.455	<del>-</del> 15	54.166	359.009	839.019
0         27.445         158.126         355.975           5         22.165         122.267         272.011           10         18.010         95.256         209.489           15         14.720         74.754         162.559           20         12.099         59.075         127.057           25         10.000         47.000         100.000           30         8.309         37.636         79.222           35         6.939         30.326         63.167           40         5.824         24.583         50.677           45         4.911         20.043         40.904           50         4.160         16.433         33.195           55         3.539         13.545         27.091           60         3.024         11.223         22.224           65         2.593         9.345         18.323           70         2.233         7.818         15.184           75         1.929         6.571         12.635           80         1.673         5.548         10.566           85         1.455         4.704         8.873           90         1.270	-10	42.889	270.868	624.987
5         22.165         122.267         272.011           10         18.010         95.256         209.489           15         14.720         74.754         162.559           20         12.099         59.075         127.057           25         10.000         47.000         100.000           30         8.309         37.636         79.222           35         6.939         30.326         63.167           40         5.824         24.583         50.677           45         4.911         20.043         40.904           50         4.160         16.433         33.195           55         3.539         13.545         27.091           60         3.024         11.223         22.224           65         2.593         9.345         18.323           70         2.233         7.818         15.184           75         1.929         6.571         12.635           80         1.673         5.548         10.566           85         1.455         4.704         8.873           90         1.270         4.004         7.481           95         1.112 <t< td=""><td>-5</td><td>34.196</td><td>206.113</td><td>469.678</td></t<>	-5	34.196	206.113	469.678
10         18.010         95.256         209.489           15         14.720         74.754         162.559           20         12.099         59.075         127.057           25         10.000         47.000         100.000           30         8.309         37.636         79.222           35         6.939         30.326         63.167           40         5.824         24.583         50.677           45         4.911         20.043         40.904           50         4.160         16.433         33.195           55         3.539         13.545         27.091           60         3.024         11.223         22.224           65         2.593         9.345         18.323           70         2.233         7.818         15.184           75         1.929         6.571         12.635           80         1.673         5.548         10.566           85         1.455         4.704         8.873           90         1.270         4.004         7.481           95         1.112         3.422         6.337           105         0.860         2		27.445	158.126	355.975
15         14.720         74.754         162.559           20         12.099         59.075         127.057           25         10.000         47.000         100.000           30         8.309         37.636         79.222           35         6.939         30.326         63.167           40         5.824         24.583         50.677           45         4.911         20.043         40.904           50         4.160         16.433         33.195           55         3.539         13.545         27.091           60         3.024         11.223         22.224           65         2.593         9.345         18.323           70         2.233         7.818         15.184           75         1.929         6.571         12.635           80         1.673         5.548         10.566           85         1.455         4.704         8.873           90         1.270         4.004         7.481           95         1.112         3.422         6.337           100         0.976         2.936         5.384           105         0.860         2.52	5	22.165	122.267	272.011
20         12.099         59.075         127.057           25         10.000         47.000         100.000           30         8.309         37.636         79.222           35         6.939         30.326         63.167           40         5.824         24.583         50.677           45         4.911         20.043         40.904           50         4.160         16.433         33.195           55         3.539         13.545         27.091           60         3.024         11.223         22.224           65         2.593         9.345         18.323           70         2.233         7.818         15.184           75         1.929         6.571         12.635           80         1.673         5.548         10.566           85         1.455         4.704         8.873           90         1.270         4.004         7.481           95         1.112         3.422         6.337           100         0.976         2.936         5.384           105         0.860         2.528         4.594           110         0.759         2.184 </td <td>10</td> <td>18.010</td> <td>95.256</td> <td>209.489</td>	10	18.010	95.256	209.489
25         10.000         47.000         100.000           30         8.309         37.636         79.222           35         6.939         30.326         63.167           40         5.824         24.583         50.677           45         4.911         20.043         40.904           50         4.160         16.433         33.195           55         3.539         13.545         27.091           60         3.024         11.223         22.224           65         2.593         9.345         18.323           70         2.233         7.818         15.184           75         1.929         6.571         12.635           80         1.673         5.548         10.566           85         1.455         4.704         8.873           90         1.270         4.004         7.481           95         1.112         3.422         6.337           100         0.976         2.936         5.384           105         0.860         2.528         4.594           110         0.759         2.184         3.934           115         0.673         1.893	15	14.720	74.754	162.559
30         8.309         37.636         79.222           35         6.939         30.326         63.167           40         5.824         24.583         50.677           45         4.911         20.043         40.904           50         4.160         16.433         33.195           55         3.539         13.545         27.091           60         3.024         11.223         22.224           65         2.593         9.345         18.323           70         2.233         7.818         15.184           75         1.929         6.571         12.635           80         1.673         5.548         10.566           85         1.455         4.704         8.873           90         1.270         4.004         7.481           95         1.112         3.422         6.337           100         0.976         2.936         5.384           105         0.860         2.528         4.594           110         0.759         2.184         3.934           115         0.673         1.893         3.380           120         0.598         1.646	20	12.099	59.075	127.057
35         6.939         30.326         63.167           40         5.824         24.583         50.677           45         4.911         20.043         40.904           50         4.160         16.433         33.195           55         3.539         13.545         27.091           60         3.024         11.223         22.224           65         2.593         9.345         18.323           70         2.233         7.818         15.184           75         1.929         6.571         12.635           80         1.673         5.548         10.566           85         1.455         4.704         8.873           90         1.270         4.004         7.481           95         1.112         3.422         6.337           100         0.976         2.936         5.384           105         0.860         2.528         4.594           110         0.759         2.184         3.934           115         0.673         1.893         3.380           120         0.598         1.646         2.916	25	10.000	47.000	100.000
40         5.824         24.583         50.677           45         4.911         20.043         40.904           50         4.160         16.433         33.195           55         3.539         13.545         27.091           60         3.024         11.223         22.224           65         2.593         9.345         18.323           70         2.233         7.818         15.184           75         1.929         6.571         12.635           80         1.673         5.548         10.566           85         1.455         4.704         8.873           90         1.270         4.004         7.481           95         1.112         3.422         6.337           100         0.976         2.936         5.384           105         0.860         2.528         4.594           110         0.759         2.184         3.934           115         0.673         1.893         3.380           120         0.598         1.646         2.916	30	8.309	37.636	79.222
45         4.911         20.043         40.904           50         4.160         16.433         33.195           55         3.539         13.545         27.091           60         3.024         11.223         22.224           65         2.593         9.345         18.323           70         2.233         7.818         15.184           75         1.929         6.571         12.635           80         1.673         5.548         10.566           85         1.455         4.704         8.873           90         1.270         4.004         7.481           95         1.112         3.422         6.337           100         0.976         2.936         5.384           105         0.860         2.528         4.594           110         0.759         2.184         3.934           115         0.673         1.893         3.380           120         0.598         1.646         2.916	35	6.939	30.326	63.167
50         4.160         16.433         33.195           55         3.539         13.545         27.091           60         3.024         11.223         22.224           65         2.593         9.345         18.323           70         2.233         7.818         15.184           75         1.929         6.571         12.635           80         1.673         5.548         10.566           85         1.455         4.704         8.873           90         1.270         4.004         7.481           95         1.112         3.422         6.337           100         0.976         2.936         5.384           105         0.860         2.528         4.594           110         0.759         2.184         3.934           115         0.673         1.893         3.380           120         0.598         1.646         2.916	40	5.824	24.583	50.677
55         3.539         13.545         27.091           60         3.024         11.223         22.224           65         2.593         9.345         18.323           70         2.233         7.818         15.184           75         1.929         6.571         12.635           80         1.673         5.548         10.566           85         1.455         4.704         8.873           90         1.270         4.004         7.481           95         1.112         3.422         6.337           100         0.976         2.936         5.384           105         0.860         2.528         4.594           110         0.759         2.184         3.934           115         0.673         1.893         3.380           120         0.598         1.646         2.916	45	4.911	20.043	40.904
60         3.024         11.223         22.224           65         2.593         9.345         18.323           70         2.233         7.818         15.184           75         1.929         6.571         12.635           80         1.673         5.548         10.566           85         1.455         4.704         8.873           90         1.270         4.004         7.481           95         1.112         3.422         6.337           100         0.976         2.936         5.384           105         0.860         2.528         4.594           110         0.759         2.184         3.934           115         0.673         1.893         3.380           120         0.598         1.646         2.916	50	4.160	16.433	33.195
65         2.593         9.345         18.323           70         2.233         7.818         15.184           75         1.929         6.571         12.635           80         1.673         5.548         10.566           85         1.455         4.704         8.873           90         1.270         4.004         7.481           95         1.112         3.422         6.337           100         0.976         2.936         5.384           105         0.860         2.528         4.594           110         0.759         2.184         3.934           115         0.673         1.893         3.380           120         0.598         1.646         2.916	55	3.539	13.545	27.091
70         2.233         7.818         15.184           75         1.929         6.571         12.635           80         1.673         5.548         10.566           85         1.455         4.704         8.873           90         1.270         4.004         7.481           95         1.112         3.422         6.337           100         0.976         2.936         5.384           105         0.860         2.528         4.594           110         0.759         2.184         3.934           115         0.673         1.893         3.380           120         0.598         1.646         2.916	60	3.024	11.223	22.224
75         1.929         6.571         12.635           80         1.673         5.548         10.566           85         1.455         4.704         8.873           90         1.270         4.004         7.481           95         1.112         3.422         6.337           100         0.976         2.936         5.384           105         0.860         2.528         4.594           110         0.759         2.184         3.934           115         0.673         1.893         3.380           120         0.598         1.646         2.916	65	2.593	9.345	18.323
80         1.673         5.548         10.566           85         1.455         4.704         8.873           90         1.270         4.004         7.481           95         1.112         3.422         6.337           100         0.976         2.936         5.384           105         0.860         2.528         4.594           110         0.759         2.184         3.934           115         0.673         1.893         3.380           120         0.598         1.646         2.916	70	2.233	7.818	15.184
85         1.455         4.704         8.873           90         1.270         4.004         7.481           95         1.112         3.422         6.337           100         0.976         2.936         5.384           105         0.860         2.528         4.594           110         0.759         2.184         3.934           115         0.673         1.893         3.380           120         0.598         1.646         2.916	75	1.929	6.571	12.635
90         1.270         4.004         7.481           95         1.112         3.422         6.337           100         0.976         2.936         5.384           105         0.860         2.528         4.594           110         0.759         2.184         3.934           115         0.673         1.893         3.380           120         0.598         1.646         2.916	80	1.673	5.548	10.566
95         1.112         3.422         6.337           100         0.976         2.936         5.384           105         0.860         2.528         4.594           110         0.759         2.184         3.934           115         0.673         1.893         3.380           120         0.598         1.646         2.916	85	1.455	4.704	8.873
100         0.976         2.936         5.384           105         0.860         2.528         4.594           110         0.759         2.184         3.934           115         0.673         1.893         3.380           120         0.598         1.646         2.916	90	1.270	4.004	7.481
105         0.860         2.528         4.594           110         0.759         2.184         3.934           115         0.673         1.893         3.380           120         0.598         1.646         2.916	95	1.112	3.422	6.337
110     0.759     2.184     3.934       115     0.673     1.893     3.380       120     0.598     1.646     2.916	100	0.976	2.936	5.384
115         0.673         1.893         3.380           120         0.598         1.646         2.916	105	0.860	2.528	4.594
120 0.598 1.646 2.916	110	0.759	2.184	3.934
	115	0.673	1.893	3.380
125 0.532 1.436 2.522	120	0.598	1.646	2.916
	125	0.532	1.436	2.522

Part Number	NTS□□XM202	NTS□□XR502	NTS□□XH103	NTS□□XV103	NTS□□WB203	NTS□□WC303	NTS□□WD503	NTS□□WF104
Resistance	2.0kΩ	5.0kΩ	10kΩ	10kΩ	20kΩ	30kΩ	50kΩ	100kΩ
B-Constant	3500K	3700K	3380K	3900K	4050K	4100K	4150K	4250K
Temp. (°C)	Resistance (kΩ)							
-40	44.657	123.484	195.652	347.808	733.007	1149.500	1948.575	4256.752
-35	33.505	92.295	148.171	248.591	524.831	819.651	1387.289	3005.888
-30	25.388	69.614	113.347	179.973	380.184	591.391	999.456	2148.514
-25	19.402	52.860	87.559	131.832	277.845	430.529	728.895	1555.020
-20	14.961	40.480	68.237	97.679	205.260	316.870	537.039	1137.312
-15	11.644	31.275	53.650	73.119	153.642	236.337	399.167	839.314
-10	9.133	24.339	42.506	55.301	116.016	177.842	299.469	625.338
-5	7.198	19.154	33.892	42.257	88.125	134.630	226.186	469.127
0	5.716	15.148	27.219	32.582	67.522	102.816	172.393	355.224
5	4.571	11.964	22.021	25.324	52.168	79.183	132.857	272.045
10	3.682	9.520	17.926	19.847	40.617	61.460	103.089	209.803
15	2.987	7.624	14.674	15.679	31.847	48.045	80.430	162.713
20	2.437	6.160	12.081	12.478	25.151	37.834	63.201	127.117
25	2.000	5.000	10.000	10.000	20.000	30.000	50.000	100.000
30	1.651	4.082	8.315	8.068	16.014	23.955	39.825	79.215
35	1.371	3.354	6.948	6.552	12.902	19.249	31.918	63.150
40	1.143	2.773	5.834	5.353	10.457	15.560	25.733	50.649
45	0.958	2.299	4.917	4.399	8.527	12.657	20.877	40.885
50	0.807	1.914	4.161	3.635	6.993	10.354	17.034	33.195
55	0.683	1.607	3.535	3.020	5.771	8.525	13.929	27.014
60	0.582	1.356	3.014	2.521	4.789	7.058	11.439	22.079
65	0.497	1.149	2.586	2.115	3.992	5.869	9.485	18.226
70	0.426	0.978	2.228	1.783	3.343	4.905	7.906	15.124
75	0.367	0.834	1.925	1.510	2.809	4.113	6.614	12.598
80	0.318	0.714	1.669	1.284	2.376	3.472	5.558	10.542
85	0.276	0.612	1.452	1.096	2.020	2.945	4.686	8.852
90	0.240	0.527	1.268	0.939	1.724	2.509	3.967	7.463
95	0.210	0.456	1.110	0.808	1.476	2.143	3.373	6.321
100	0.183	0.396	0.974	0.698	1.264	1.832	2.878	5.374
105	0.161	0.345	0.858	0.605	1.085	1.571	2.465	4.585
110	0.142	0.302	0.758	0.527	0.935	1.350	2.118	3.925
115	0.125	0.264	0.671	0.460	0.812	1.171	1.828	3.376
120	0.111	0.232	0.596	0.403	0.708	1.019	1.583	2.913
125	0.099	0.205	0.531	0.354	0.617	0.886	1.374	2.520

Detailed Resistance - Temperature Tables are downloadable from the following URL.

http://search.murata.co.jp/Ceramy/CatsearchAction.do?sLang=en



### for Temperature Sensor Thermo String Type/Lead Type (1) Caution/Notice

### ■ **(**Caution (Storage and Operating Conditions)

This product is designed for application in an ordinary environment (normal room temperature, humidity and atmospheric pressure).

Do not use under the following conditions because all these factors can deteriorate the product characteristics or cause failures and burn-out.

- Corrosive gas or deoxidizing gas
   (Chlorine gas, Hydrogen sulfide gas, Ammonia gas,
   Sulfuric acid gas, Nitric oxide gas, etc.)
- 2. Volatile or flammable gas
- 3. Dusty conditions
- 4. Under vacuum, or under high or low-pressure
- 5. Wet or humid locations
- Places with salt water, oils, chemical liquids or organic solvents
- 7. Strong vibrations
- Other places where similar hazardous conditions
   exist

### ■ ①Caution (Others)

Be sure to provide an appropriate fail-safe function on your product to prevent secondary damages that may be caused by the abnormal function or the failure of our product.

### ■ Notice (Storage and Operating Conditions)

To keep solderability of product from declining, the following storage condition is recommended.

- Storage condition:
   Temperature -10 to +40 degrees C
   Humidity less than 75%RH (not dewing condition)
- Storage term:
   Use this product within 6 months after delivery by first-in and first-out stocking system.

### ■ Notice (Rating)

Use this product within the specified temperature range.

Higher temperature may cause deterioration of the characteristics or the material quality of this product.

### ■ Notice (Soldering and Mounting) NTS Series

- Be sure that the preheat-up does not melt the soldering of this product. Excessive heat may cause failure to open, short or insulation break down.
- Do not touch the body with soldering iron.The soldering point should be min. 5mm away from the root of lead wire.

 Handling after unpacking:
 After unpacking, reseal product promptly or store it in a sealed container with a drying agent.

Storage place:
 Do not store this product in corrosive gas
 (Sulfuric acid gas, Chlorine gas, etc.) or in direct sunlight.



sales representatives or product engineers before ordering.

• This PDF catalog has only typical specifications because there is no space for detailed specifications. Therefore, please approve our product specifications or transact the approval sheet for product specifications before ordering.

### for Temperature Sensor Thermo String Type/Lead Type (1) Caution/Notice

### ■ Notice (Soldering and Mounting) NXF Series

Please notice as shown below when you mount this product.

- 1. Do not melt the solder in resin head, when you solder this product. If you melt the solder in resin head, it has posibility that the break of wire, short and break of lead insulation. In case you cut the lead wire of this product less than 20mm from resin head, the heat of melted solder at lead wire edge is propagated easily to the resin head along the lead wire.
- 4. If you mold by resin this product, please evaluate the qualityl of this product before you use it.
- 5. Do not bend the lead wire radius 1mm or less when you bend the lead wire.

2. Do not touch the resin head directly by solder iron.

3. Do not separate the parallel lead wires 10mm or less

from theresin head, when you separate parallel lead

It may cause the melt of solder in resin head.

### ■ Notice (Handling)

- The ceramic element of this product is fragile, and care must be taken not to load an excessive press-force or not to give a shock at handling.
   Such forces may cause cracking or chipping.
- Do not apply an excessive force to the lead.
   Otherwise, it may cause junction between lead and element to break or crack. Holding element by side lead wire is recommended when lead wire is bent or cut.

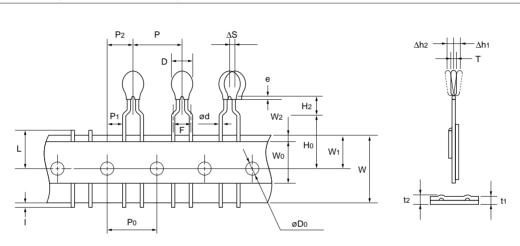
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### for Temperature Sensor Thermo String Type/Lead Type Package

### ■ Minimum Quantity

Part Number	Minimum Quantity (pcs.)		
Part Number	Bulk	Ammo Pack Taping	
NXF	1000	-	
NTSA	500	3000	
NTSD0	500	-	
NTSD1_30	500	-	
NTSD1_40	200	-	
NTSD1_50	200	-	

### ■ Taping Dimensions (NTSA\_N6A0 Series)



Item	Code	Dimensions (mm)
Pitch of Component	P	12.7
Pitch of Sprocket Hole	Po	12.7±0.3
Lead Spacing	F	5.0+0.8/-0.2
Length from Hole Center to Component Center	P <sub>2</sub>	6.35±1.3
Length from Hole Center to Lead	P1	3.85±0.8
Body Diameter	D	3.5 max.
Deviation along Tape, Left or Right	ΔS	0±2.0
Carrier Tape Width	W	18.0±0.5
Position of Sprocket Hole	W1	9.0±0.5
Lead Distance between Reference and Bottom Planes	H <sub>0</sub>	16.0±1.0
Height of Component	H <sub>2</sub>	4.0 max.
Protrusion Length	I	+0.5 to -1.0
Diameter of Sprocket Hole	Do	4.0±0.1
Lead Diameter	d	0.50±0.03
Total Tape Thickness	t1	0.6±0.3
Total Thickness, Tape and Lead Wire	t2	1.6 max.
Deviation across Tape	Δh1, Δh2	1.0 max.
Portion to Cut in Case of Defect	L	11.0+0/–2.0
Hole Down Tape Width	Wo	11.0 min.
Hole Down Tape Position	W <sub>2</sub>	1.5±1.5
Coating Extension on Lead	е	Up to the crimp point
Body Thickness	Т	2.6 max.

(in mm)



## **NTC Thermistors**

### for Inrush Current Suppression Lead Type

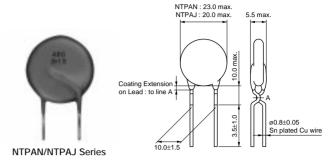
This product effectively supresses surge currents which are generated when switching power regulators are turned on.

### ■ Features

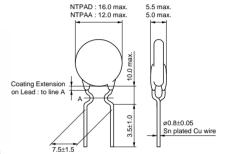
- 1. Lead is not contained in the ceramic element, the terminations, the solder for inner connection and the coating resin.
- 2. Most suitable for power supplies of less than 100W
- 3. Excellent recovery characteristics due to resin coating with excellent heat characteristics
- 4. Highly reliable

### ■ Applications

- 1. Switching power supplies
- 2. CRT monitors
- 3. Color televisions
- 4. VCR-Power supplies
- 5. Other power circuits

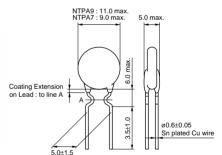






(in mm)





(in mm)

Part Number	Resistance (25°C) (ohm)	Permissible Max. Current (25°C) (A)	Permissible Max. Current (55°C) (A)	Thermal Time Constant (25°C) (s)	Thermal Dissipation Constant (25°C) (mW/°C)
NTPAN3R0LDKB0	3.0 ±15%	5.4	4.7	135	26.8
NTPAN4R0LDKB0	4.0 ±15%	4.7	4.1	130	26.8
NTPAN6R0LDKB0	6.0 ±15%	3.9	3.4	130	26.8
NTPAJ4R0LDKB0	4.0 ±15%	4.0	3.5	125	21.8
NTPAJ6R0LDKB0	6.0 ±15%	3.4	2.9	125	21.8
NTPAJ8R0LDKB0	8.0 ±15%	3.0	2.6	130	21.8
NTPAJ100LDKB0	10.0 ±15%	2.6	2.2	130	21.8
NTPAD3R9LDNB0	3.9 ±15%	3.3	2.9	65	18.2
NTPAD5R1LDNB0	5.1 ±15%	3.0	2.6	85	18.8
NTPAD8R0LDNB0	8.0 ±15%	2.7	2.3	65	18.7
NTPAD160LDNB0	16.0 ±15%	2.0	1.7	100	19.1
NTPAA2R2LDNB0	2.2 ±15%	3.7	3.2	70	13.5

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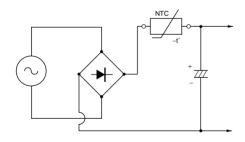
	31 9				
Part Number	Resistance (25°C) (ohm)	Permissible Max. Current (25°C) (A)	Permissible Max. Current (55°C) (A)	Thermal Time Constant (25°C) (s)	Thermal Dissipation Constant (25°C) (mW/°C)
NTPAA3R9LDNB0	3.9 ±15%	2.7	2.3	70	13.5
NTPAA5R1LDNB0	5.1 ±15%	2.5	2.2	70	13.5
NTPAA8R2LDNB0	8.2 ±15%	2.0	1.7	70	13.5
NTPAA100LDNB0	10.0 ±15%	1.7	1.5	70	13.5
NTPA9160LBMB0	16.0 ±15%	1.4	1.2	65	11.6
NTPA74R0LBMB0	4.0 ±15%	2.3	2.0	40	9.4
NTPA78R0LBMB0	8.0 ±15%	1.7	1.5	40	9.5
NTPA7160LBMB0	16.0 ±15%	1.2	1.0	40	9.9
NTDA72201 DMD0	22.0 ±159/	1.0	0.00	40	0.1

NTPAD/NTPAA/NTPA9/NTPA7 series are also availabe on tape. The final alphabet of the part number should be "DNB0=>D6A0", "BNB0 =>B1A0". Operating Temperature Range: -20°C to +160°C

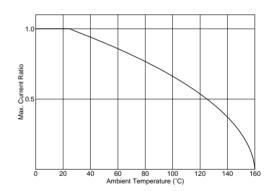
### ■ Permissible Electrolytic Capacitor

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Voltage (AC)	100Vrms	120Vrms	132Vrms	220Vrms	240Vrms	264Vrms
Part Number		120711110	102111110	220711110	210111110	201111110
NTPAN	8600μF	5972μF	4936μF	1777μF	1493μF	1234μF
NTPAJ	5000μF	3472μF	2870μF	1033μF	868µF	717µF
NTPAD	2700μF	1875μF	1550μF	558μF	469μF	387μF
NTPAA	1400μF	972μF	803μF	289µF	243μF	201μF
NTPA9	800μF	556μF	459μF	165μF	139µF	115μF
NTPA74R0	700μF	486μF	402μF	145μF	122μF	100μF
NTPA78R0	570μF	396μF	327μF	118µF	99μF	82μF
NTPA7160	400F	270	220⊑	02	40F	E7F
NTPA7220	400μF	278μF	230μF	83μF	69μF	57μF

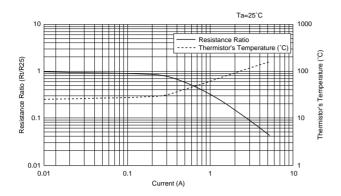
### ■ Application Circuit



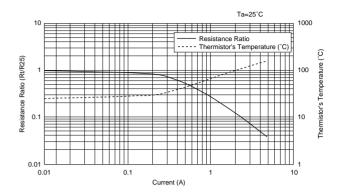
### ■ Determination of Allowable Current



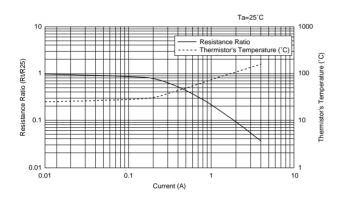
### ■ NTPAN3R0L Type



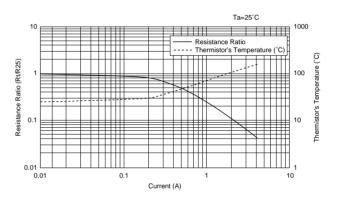
### ■ NTPAN4R0L Type



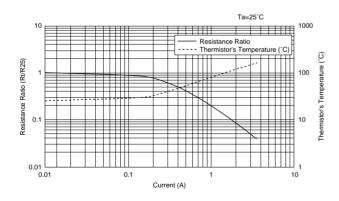
### ■ NTPAN6R0L Type



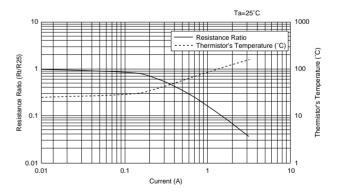
### ■ NTPAJ4R0L Type



### ■ NTPAJ6R0L Type



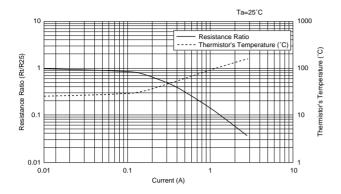
### ■ NTPAJ8R0L Type



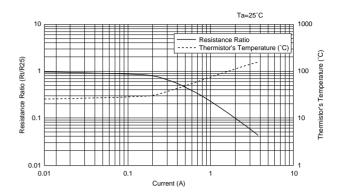


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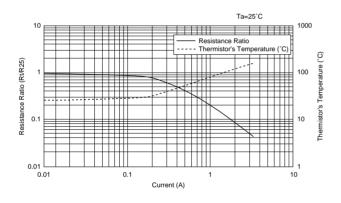
### ■ NTPAJ100L Type



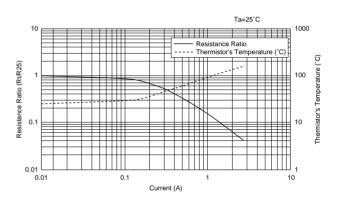
### ■ NTPAD3R9L Type



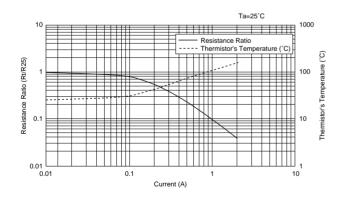
### ■ NTPAD5R1L Type



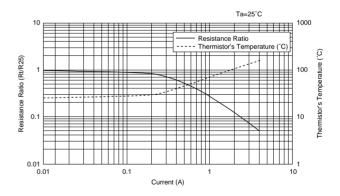
### ■ NTPAD8R0L Type



### ■ NTPAD160L Type



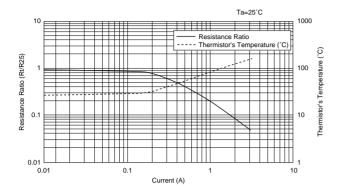
### ■ NTPAA2R2L Type



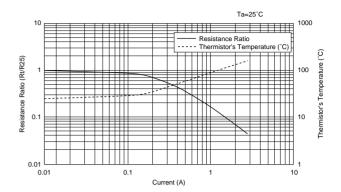


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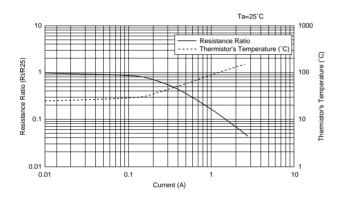
### ■ NTPAA3R9L Type



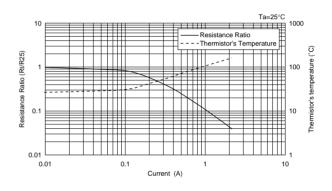
### ■ NTPAA5R1L Type



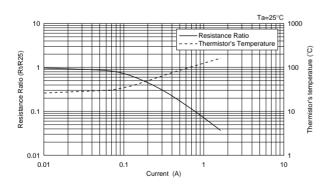
### ■ NTPAA8R2L Type



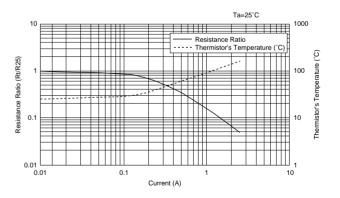
### ■ NTPAA100L Type



### ■ NTPA9160L Type



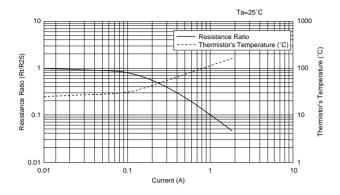
### ■ NTPA74R0L Type



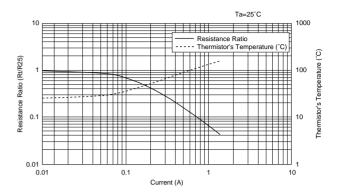


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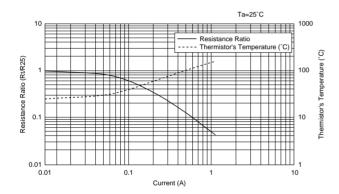
### ■ NTPA78R0L Type



### ■ NTPA7160L Type



### ■ NTPA7220L Type



### sales representatives or product engineers before ordering. • This PDF catalog has only typical specifications because there is no space for detailed specifications. Therefore, please approve our product specifications or transact the approval sheet for product specifications before ordering.

### for Inrush Current Suppression Lead Type **(A)** Caution/Notice

### ■ ∆Caution (Storage and Operating Conditions)

- This product is designed for the Switching Power Supply with smoothing capacitors.
   Other applications of this product may result in fire.
- 2. Use this product within the specified maximum current. Otherwise it may catch fire in the worst
- Use this product with smoothing capacitor within the specified maximum capacitance value. Otherwise it may catch fire in the worst case.
- This product is designed for application in an ordinary environment (normal room temperature, humidity and atmospheric pressure).

Do not use under the following conditions because all these factors can deteriorate the product characteristics cause failure and burn-out.

- (1) Corrosive gas or deoxidizing gas.
   (Chlorine gas, Hydrogen sulfide gas, Ammonia gas, Sulfuric acid gas, Nitric oxide gas, etc.)
- (2) Volatile or flammable gas
- (3) Dusty conditions
- (4) Under high or low pressure
- (5) Wet or humid conditions
- (6) Near with salt water, oils, chemical liquids or organic solvents
- (7) Strong vibrations
- (8) Other places where similar hazardous conditions exist.

### ■ ①Caution (Others)

Be sure to provide an appropriate fail-safe function on your product to prevent secondary damages that may be caused by the abnormal function or the failure of our product.

### ■ Notice (Storage and Operating Conditions)

To keep solderability of product from declining, the following storage condition is recommended.

- Storage condition:
   Temperature -10 to +40 degrees C
   Humidity less than 75%RH (not dewing condition)
- Storage term:
   Use this product within 6 months after delivery by first-in and first-out stocking system.
- Handling after unpacking:
   After unpacking, reseal product promptly or store it in a sealed container with a drying agent.
- Storage place:
   Do not store this product in corrosive gas
   (Sulfuric acid gas, Chlorine gas, etc.) or in direct sunlight.

### ■ Notice (Rating)

Use this product within the specified temperature range

Higher temperature may cause deterioration of the characteristics or the material quality of this product.

### ■ Notice (Soldering and Mounting)

- Be sure that the preheat-up does not melt the soldering of this product. Excessive heat may cause failure to open, short or insulation break down.
- Do not touch the body with soldering iron.The soldering point should be min. 5mm away from the root of lead wire.

### for Inrush Current Suppression Lead Type (1) Caution/Notice

### ■ Notice (Handling)

- When this product is operated, temperature of some area may be about 160 (degree C).
   Use proper surrounding parts and material which withstand such temperature. If they are inadequate and kept at high temperature for long time, they may be deteriorated or may produce harmful gas.
   And, such harmful gas may deteriorate the element of this product.
- This product does not have waterproof construction.
   Splashed water may cause failure mode such as deterioration of characteristics or current leak.
   So, do not apply cleaning to immerse it into water or any solvent.
- Notice (Others)
- This product may allow passing higher current than its initial value when it receives inrush current again just after the last one until it cools down and recovers its original resistance enough.
   Be sure the highest current under actual condition on the operating repetition and the operating temperature.
- The resin coating of this product does not guarantee insulating. Keep an adequate insulating distance to surrounding parts.

- The ceramic element of this product is fragile, and care must be taken not to load an excessive press-force or not to give a shock at handling.
   Such forces may cause cracking or chipping to the element.
- 4. Do not apply an excessive force to the lead wire. Otherwise, it may cause break off junction between lead wire and element, or may crack element. So, fix lead wire of element side when lead wire is bent or cut.

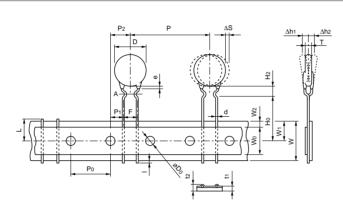
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### for Inrush Current Suppression Lead Type Package

### ■ Minimum Quantity

Part Numbers	Minimum Quantity (pcs.)			
Part Numbers	Bulk	Ammo Pack Taping		
NTPA7	500	1000		
NTPA9	300	1000		
NTPAA	300	750		
NTPAD	150	400		
NTPAJ	100	-		
NTPAN	50	-		

### ■ Taping Dimensions (NTPAD/NTPAA\_D6A0 Series)



Item	Code	Dimensions (mm)
Pitch of Component	Р	30.0
Pitch of Sprocket Hole	P <sub>0</sub>	15.0±0.3
Lead Spacing	F	7.5±0.5
Length from Hole Center to Component Center	P <sub>2</sub>	7.5±1.5
Length from Hole Center to Lead	P <sub>1</sub>	3.75±1.0
Body Diameter	D	(refer to the table below)
Body Thickness	Т	(refer to the table below)
Deviation Along Tape, Left or Right	ΔS	±2.0
Carrier Tape Width	W	18.0±0.5
Position of Sprocket Hole	W1	9.0±0.5
Lead Distance between Reference and Bottom Plane	H <sub>0</sub>	16.0±0.5
Height of Component	H <sub>2</sub>	10.0 max.
Protrusion Length	I	+0.5 to -6.0
Diameter of Sprocket Hole	D <sub>0</sub>	4.0±0.1
Lead Diameter	d	0.8±0.05
Total Tape Thickness	t1	0.6±0.3
Total Thickness, Tape and Lead Wire	t2	2.0 max.
Deviation Across Tape	Δh1, Δh2	2.0 max.
Portion to Cut in Case of Defect	L	11.0 <sup>+0</sup> <sub>-2.0</sub>
Hold Down Tape Width	Wo	11.5 min.
Hold Down Tape Position	W2	4.0 max.
Coating Extension on Lead	е	to line A

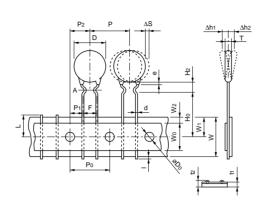
Туре	D (mm)	T (mm)
NTPAD	16.0 max.	5.5 max.
NTPAA	12.0 max.	5.0 max.



### for Inrush Current Suppression Lead Type Package

Continued from the preceding page.

### ■ Taping Dimensions (NTPA9/NTPA7\_B1A0 Series)



Item	Code	Dimensions (mm)
Pitch of Component	P	12.7
Pitch of Sprocket Hole	P <sub>0</sub>	12.7±0.3
Lead Spacing	F	5.0 <sup>+0.8</sup> 0.3
Length from Hole Center to Component Center	P <sub>2</sub>	6.35±1.3
Length from Hole Center to Lead	P <sub>1</sub>	3.85±0.8
Body Diameter	D	(refer to the table below)
Body Thickness	T	5.0 max.
Deviation Along Tape, Left or Right	ΔS	±1.5
Carrier Tape Width	W	18.0±0.5
Position of Sprocket Hole	W <sub>1</sub>	9.0 <sup>+0.5</sup> <sub>-0.75</sub>
Lead Distance between Reference and Bottom Planes	H <sub>0</sub>	16.0±1.0
Height of Component	H <sub>2</sub>	6.0 max.
Protrusion Length	I	+0.5 to -4.0
Diameter of Sprocket Hole	D <sub>0</sub>	4.0±0.3
Lead Diameter	d	0.6±0.05
Total Tape Thickness	t1	0.6±0.3
Total Thickness, Tape and Lead Wire	t2	2.0 max.
Deviation Across Tape	Δh1, Δh2	1.5 max.
Portion to Cut in Case of Defect	L	11.0 <sup>+0</sup> 2.0
Hold Down Tape Width	Wo	11.0 min.
Hold Down Tape Position	W2	4.0 max.
Coating Extension on Lead	е	to line A

Туре	D (mm)	
NTPA9	11.0 max.	
NTPA7	9.0 max.	

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sales representatives or product engineers before ordering.

• This PDF catalog has only typical specifications because there is no space for detailed specifications. Therefore, please approve our product specifications or transact the approval sheet for product specifications before ordering.

### ⚠ Note:

1. Export Control

<For customers outside Japan>

No Murata products should be used or sold, through any channels, for use in the design, development, production, utilization, maintenance or operation of, or otherwise contribution to (1) any weapons (Weapons of Mass Destruction [nuclear, chemical or biological weapons or missiles] or conventional weapons) or (2) goods or systems specially designed or intended for military end-use or utilization by military end-users.

<For customers in Japan>

For products which are controlled items subject to the "Foreign Exchange and Foreign Trade Law" of Japan, the export license specified by the law is required for export.

- 2. Please contact our sales representatives or product engineers before using the products in this catalog for the applications listed below, which require especially high reliability for the prevention of defects which might directly damage a third party's life, body or property, or when one of our products is intended for use in applications other than those specified in this catalog.
  - 1 Aircraft equipment
- 2 Aerospace equipment
- 3 Undersea equipment
- 4 Power plant equipment
- (5) Medical equipment
- (6) Transportation equipment (vehicles, trains, ships, etc.)
- (7) Traffic signal equipment
- (8) Disaster prevention / crime prevention equipment
- Data-processing equipment
- (f) Application of similar complexity and/or reliability requirements to the applications listed above
- 3. Product specifications in this catalog are as of January 2010. They are subject to change or our products in it may be discontinued without advance notice. Please check with our sales representatives or product engineers before ordering. If there are any questions, please contact our sales representatives or
- 4. Please read rating and 🗘 CAUTION (for storage, operating, rating, soldering, mounting and handling) in this catalog to prevent smoking and/or burning, etc.
- 5. This catalog has only typical specifications because there is no space for detailed specifications. Therefore, please approve our product specifications or transact the approval sheet for product specifications before ordering.
- 6. Please note that unless otherwise specified, we shall assume no responsibility whatsoever for any conflict or dispute that may occur in connection with the effect of our and/or a third party's intellectual property rights and other related rights in consideration of your use of our products and/or information described or contained in our catalogs. In this connection, no representation shall be made to the effect that any third parties are authorized to use the rights mentioned above under licenses without our consent

International Division

7. No ozone depleting substances (ODS) under the Montreal Protocol are used in our manufacturing process.



http://www.murata.com/