Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!

Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832
Email & Skype: info@chipsmall.com Web: www.chipsmall.com
Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

NTC Thermistors

Innovator in Electronics

Murata Manufacturing Co., Ltd.

Cat.No.R44E-12

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).

CONTENTS

● Part Numbering

NTC Thermistors for Temp. Sensor and Compensation Chip Type

(Part Number)

NC	P	18	XH	103	J	03	RB
❶	❷	❸	❹	❺	❻	❼	❽

❶Product ID

Product ID	
NC	NTC Thermistors Chip Type

❷Series

Code	Series
P	Plated Termination Series

❸Dimensions (L×W)

Code	Dimensions (L×W)	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

❹Temperature 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
XC	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

❺Resistance

Expressed by three-digit alphanumerics. The unit is ohm (Ω). 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
102	1kΩ
103	10kΩ
104	100kΩ

❻Resistance Tolerance

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

❼Individual Specifications

Structures and others are expressed by two figures.

Code	Individual Specifications
03	Standard Type

Please contact us for details.

❽Packaging

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

NTC Thermistor for Temperature Sensor Thermo String Type

(Part Number) **NXF** **T** **15** **XH** **103** **F** **A** **2** **B** **025**
❶ ❷ ❸ ❹ ❺ ❻ ❼ ❽ ❾ ❿

❶Product ID

Product ID	
NXF	NTC Thermistors Sensor Thermo String Type

❷Individual Specifications

Code	Individual Specifications
T	Commercial Type

❸Chip Dimensions

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

❹Temperature Characteristics

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

❺Resistance

Expressed by three figures. The unit is (Ω). 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

❻Resistance Tolerance

Code	Resistance Tolerance
F	±1%

❼Lead Wire Type

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

❽Shape of the Lead Wire Kink

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

❾Packaging

Code	Packaging
B	Bulk

❿Dimensions (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

(Part Number) **NT** **SA0** **XH** **103** **F** **E1** **B0**
❶ ❷ ❸ ❹ ❺ ❻ ❼

❶Product ID

Product ID	
NT	NTC Thermistors

❷Series

Code	Series
SA0	for Temperature Sensors No Lead-coating Type
SD0	for Temperature Sensors Lead-coating Type (Total Length 30mm max.)
SD1	for Temperature Sensors Lead-coating Type (Total Length 30 to 50mm)

❸Temperature 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
XH	Nominal B-Constant 3350—3399K
XM	Nominal B-Constant 3500—3549K
XR	Nominal B-Constant 3700—3749K
XV	Nominal B-Constant 3900—3949K

❹Resistance

Expressed by three-digit alphanumerics. The unit is ohm (Ω). 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
202	2kΩ
203	20kΩ

❺Resistance Tolerance

Code	Resistance Tolerance
E	±3%
F	±1%

❻Individual 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)
PB	Standard Bulk (**NTSD1** Series)

❼Packaging (NTSA/NTSD0 Series)

Code	Packaging
A0	Ammo Pack Taping
B0	Bulk

❼Total Length (NTSD1 Series)

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

NTC Thermistors for Inrush Current Suppression Lead Type

(Part Number) **NT** **PA7** **160** **L** **BM** **B0**
❶ ❷ ❸ ❹ ❺ ❻

❶Product ID

Product ID	
NT	NTC Thermistors

❷Series

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

❸Resistance

Expressed by three-digit alphanumerics. The unit is ohm (Ω). 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	3Ω
100	10Ω

❹Resistance Tolerance

Code	Resistance Tolerance
L	±15%

❺Individual 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
BM	Standard Type (Bulk)	ø7mm, ø9mm
D6	Standard Type (Ammo Pack)	ø10mm, ø13mm
DK	Standard (Bulk)	ø18mm, ø22mm
DN	Standard (Bulk)	ø10mm, ø13mm

❻Packaging

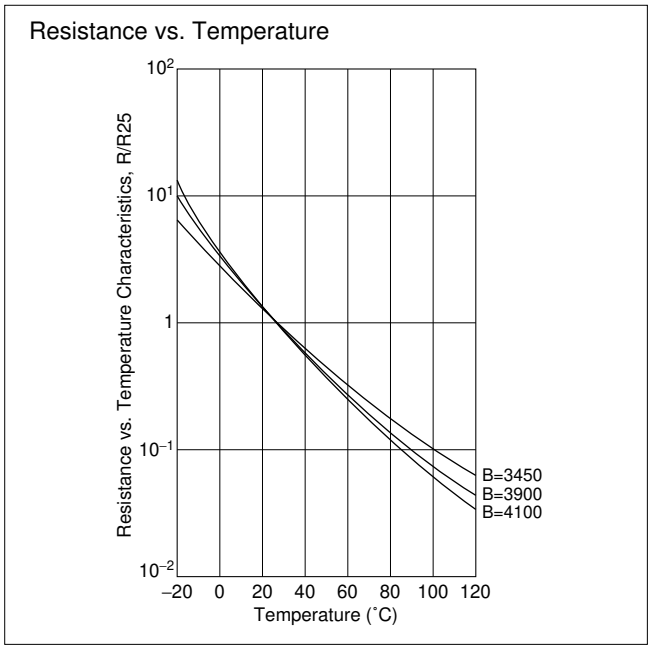
Code	Packaging
A0	Ammo Pack Taping
B0	Bulk

■Basic Characteristics

1. Zero-power Resistance of Thermistor: R

$R=R_0 \exp B(1/T-1/T_0)$ ·····(1)

R: Resistance in ambient temperature T (K)
(K: absolute temperature)
R_0: Resistance in ambient temperature T_0 (K)
B: B-Constant of Thermistor



2. B-Constant

as (1) formula

$B=\ell n (R/R_0) / (1/T-1/T_0)$ ·····(2)

3. Thermal Dissipation Constant

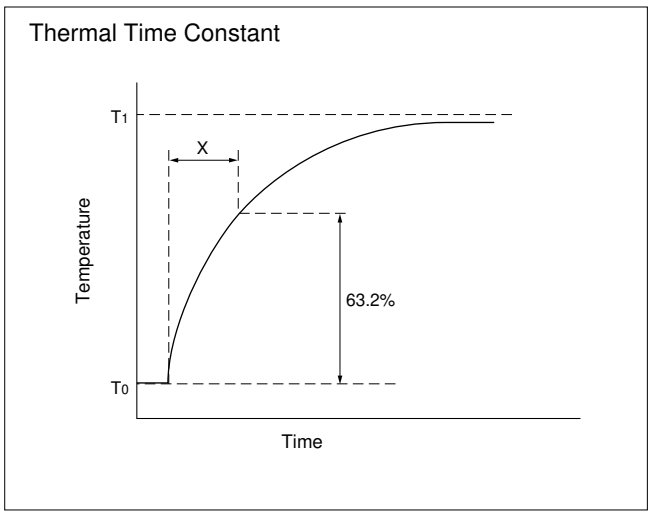
When electric power P (mW) is spent in ambient temperature T_1 and thermistor temperature rises T_2, there is a formula as follows

$P=C(T_2-T_1)$ ·····(3)

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_0 (°C) to T_1 (°C).



■Performance

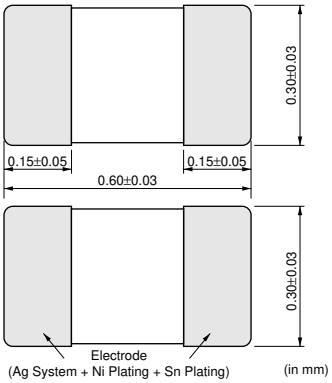
Item	Condition
Resistance	Measured by zero-power in specified ambient temperature.
B-Constant	Calculated between two specified ambient temperatures by next formula. T and T_0 is absolute temperature (K). $B=\frac{\ell n (R/R_0)}{1/T-1/T_0}$
Thermal Dissipation Constant	Shows necessary electric power 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.

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

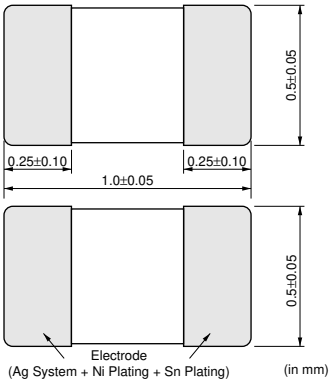
Part Number	Resistance (25°C) (ohm)	B-Constant (25-50°C) (K)	B-Constant (25-80°C) (Reference Value) (K)	B-Constant (25-85°C) (Reference Value) (K)	B-Constant (25-100°C) (Reference Value) (K)	Permissive Operating Current (25°C) (mA)	Rated Electric Power (25°C) (mW)	Typical Dissipation Constant (25°C) (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

Continued on the following page.

Continued from the preceding page.

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
NCP15WM224□03RC	220k	4500 ±3%	4571	4582	4614	0.06	100	1
NCP15WM474□03RC	470k	4500 ±3%	4571	4582	4614	0.04	100	1

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

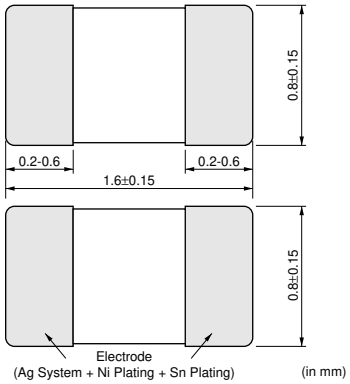
Rated Electric Power is necessary electric power that Thermistor's temperature rises 100°C by self heating at 25°C in still air.

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

NTC Thermistors

for Temperature Sensor and Compensation 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

Continued on the following page.

Continued from the preceding page.

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)
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: ±3%, J: ±5%).

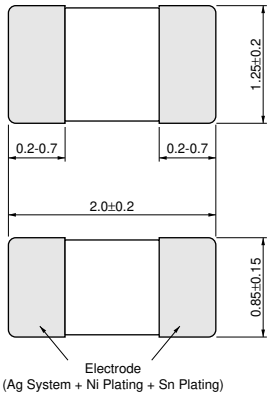
Rated Electric Power is necessary electric power that Thermistor's temperature rises 100°C by self heating at 25°C in still air.

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

NTC Thermistors

for Temperature Sensor and Compensation 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

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)

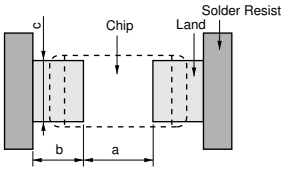
■ Applications

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)
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 Methods	Dimensions (mm)			
		Chip (LxW)	a	b	c
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
	Reflow Soldering		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
	Reflow Soldering		1.0-1.1	0.6-0.7	1.0-1.2

for Temp. Sensor and Compensation Chip Type Temperature Characteristics (Center Value)

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
−15	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
−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	22.792
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	7.345	12.454	10.461	18.019
80	2.605	5.210	4.299	7.814	6.448	11.130	9.184	16.102
85	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

Part Number	NCP□□XC680	NCP□□YS101	NCP□□XF101	NCP□□XF151	NCP□□XM221	NCP□□XM331	NCP□□XQ471	NCP□□XQ681
Resistance	68Ω	100Ω	100Ω	150Ω	220Ω	330Ω	470Ω	680Ω
B-Constant	3100K	2750K	3250K	3250K	3500K	3500K	3650K	3650K
Temp. (°C)	Resistance (Ω)	Resistance (Ω)	Resistance (Ω)	Resistance (Ω)	Resistance (Ω)	Resistance (Ω)	Resistance (Ω)	Resistance (Ω)
−40	1099.815	1157.874	1824.175	2736.262	4947.904	7421.856	11822.473	17104.854
−35	846.832	924.204	1390.685	2086.028	3703.755	5555.632	8767.745	12685.248
−30	658.372	742.963	1070.653	1605.979	2798.873	4198.309	6570.224	9505.855
−25	516.007	601.346	831.138	1246.708	2135.887	3203.831	4971.784	7193.219
−20	407.991	490.422	650.960	976.440	1645.037	2467.555	3796.933	5493.436
−15	325.529	402.482	514.441	771.661	1278.034	1917.051	2923.400	4229.599
−10	261.707	331.760	409.700	614.550	1000.620	1500.930	2269.599	3283.675
−5	212.123	275.105	328.877	493.315	789.612	1184.418	1775.225	2568.411
0	173.033	229.324	265.759	398.639	627.752	941.628	1399.050	2024.158
5	141.747	192.270	215.785	323.677	502.474	753.711	1110.220	1606.275
10	116.894	162.076	176.395	264.592	405.010	607.514	887.257	1283.691
15	97.042	137.296	145.161	217.742	328.480	492.720	713.463	1032.245
20	81.016	116.902	120.152	180.228	268.044	402.066	577.375	835.351
25	68.000	100.000	100.000	150.000	220.000	330.000	470.000	680.000
30	57.368	85.927	83.669	125.503	181.576	272.365	384.800	556.733
35	48.636	74.197	70.361	105.541	150.668	226.002	316.757	458.287
40	41.426	64.339	59.456	89.184	125.681	188.521	262.177	379.320
45	35.428	56.013	50.470	75.705	105.336	158.004	218.069	315.504
50	30.421	48.989	43.029	64.543	88.717	133.076	182.297	263.749
55	26.235	43.006	36.830	55.246	75.059	112.588	153.150	221.579
60	22.712	37.891	31.649	47.473	63.777	95.666	129.249	186.998
65	19.778	33.517	27.364	41.045	54.415	81.622	109.551	158.499
70	17.293	29.750	23.756	35.634	46.631	69.946	93.281	134.960
75	15.134	26.498	20.651	30.976	40.115	60.172	79.750	115.383
80	13.288	23.680	18.011	27.016	34.637	51.955	68.446	99.029
85	11.729	21.231	15.800	23.700	30.013	45.019	58.996	85.356
90	10.386	19.094	13.908	20.862	26.110	39.165	51.036	73.839
95	9.220	17.221	12.263	18.394	22.790	34.186	44.332	64.140
100	8.208	15.575	10.844	16.265	19.957	29.935	38.640	55.905
105	7.317	14.124	9.622	14.434	17.541	26.312	33.790	48.888
110	6.539	12.840	8.563	12.844	15.453	23.180	29.664	42.918
115	5.874	11.702	7.648	11.472	13.663	20.494	26.123	37.795
120	5.291	10.690	6.850	10.275	12.114	18.171	23.091	33.409
125	4.768	9.787	6.162	9.243	10.778	16.168	20.472	29.618

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

Continued on the following page.

for Temp. Sensor and Compensation Chip Type Temperature Characteristics (Center Value)

Continued from the preceding page.

Part Number	NCP□□XM102	NCP□□XQ102	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)	Resistance (kΩ)	Resistance (kΩ)	Resistance (kΩ)
−40	21.266	25.154	31.899	51.791	46.786	75.961	70.179	113.941
−35	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
−25	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
−10	4.516	4.829	6.773	8.362	9.934	12.264	14.901	18.396
−5	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	0.146	0.236	0.187	0.346	0.275	0.520	0.412
85	0.136	0.126	0.205	0.160	0.300	0.234	0.450	0.351
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

Part Number	NCP□□XM472	NCP□□XH682	NCP□□XW682	NCP□□XH103	NCP□□XV103	NCP□□XH153	NCP□□XW153	NCP□□XH223
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)	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
−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
−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
65	1.163	1.759	1.409	2.586	2.115	3.879	3.108	5.690
70	0.996	1.515	1.185	2.228	1.781	3.341	2.613	4.901
75	0.857	1.309	1.001	1.925	1.509	2.887	2.208	4.234
80	0.740	1.135	0.849	1.669	1.284	2.503	1.873	3.671
85	0.641	0.988	0.724	1.452	1.097	2.178	1.597	3.195
90	0.558	0.862	0.620	1.268	0.941	1.902	1.367	2.790
95	0.487	0.755	0.532	1.110	0.810	1.664	1.174	2.441
100	0.426	0.662	0.459	0.974	0.701	1.461	1.013	2.142
105	0.375	0.583	0.398	0.858	0.608	1.287	0.878	1.888
110	0.330	0.515	0.346	0.758	0.530	1.137	0.763	1.668
115	0.292	0.457	0.302	0.672	0.463	1.007	0.665	1.477
120	0.259	0.406	0.264	0.596	0.406	0.895	0.582	1.312
125	0.230	0.361	0.232	0.531	0.358	0.797	0.511	1.169

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

Continued on the following page.

for Temp. Sensor and Compensation Chip Type Temperature Characteristics (Center Value)

Continued from the preceding page.

Part Number	NCP□□XW223	NCP□□WL223	NCP□□WB333	NCP□□WF333	NCP□□WL333	NCP□□WB473	NCP□□WL473	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)	Resistance (kΩ)	Resistance (kΩ)	Resistance (kΩ)	Resistance (kΩ)
−40	759.605	1073.436	1227.263	1451.049	1610.154	1747.920	2293.249	2735.359
−35	545.196	753.900	874.449	1019.238	1130.850	1245.428	1610.605	1937.391
−30	396.070	535.073	630.851	725.084	802.609	898.485	1143.110	1389.345
−25	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
−15	161.977	202.813	253.363	279.371	304.219	360.850	433.281	547.456
−10	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

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)	Resistance (kΩ)	Resistance (kΩ)	Resistance (kΩ)	Resistance (kΩ)	Resistance (kΩ)	Resistance (kΩ)	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
−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

Continued on the following page.

for Temp. Sensor and Compensation Chip Type Temperature Characteristics (Center Value)

Continued from the preceding page.

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
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
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 ⚠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.

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 vacuum, or under high or low-pressure
5. Wet or humid locations
6. Places with salt water, oils, chemical liquids or organic solvents
7. Strong vibrations
8. Other places where similar hazardous conditions exist

■ ⚠Caution (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.

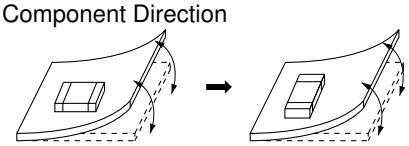
for Temp. Sensor and Compensation Chip Type ⚠Caution/Notice

■ Notice (Soldering and Mounting)

1. Mounting Position

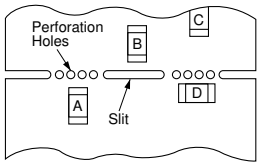
Choose a mounting position that minimizes the stress imposed on the chip during flexing or bending of the board.

Component Direction



Locate this product horizontal to the direction in which stress acts.

Mounting Close to Board Separation Line



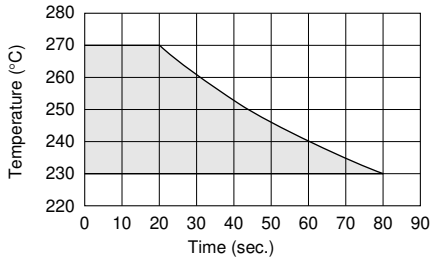
Keep this product on the PC Board away from the Separation Line.
Worst ← A-C-B-D → Better

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 solder-wetting 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.)

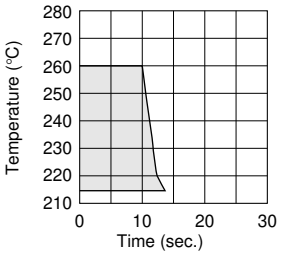
NCP03/15 Series

Allowable Reflow Soldering Temp. and Time

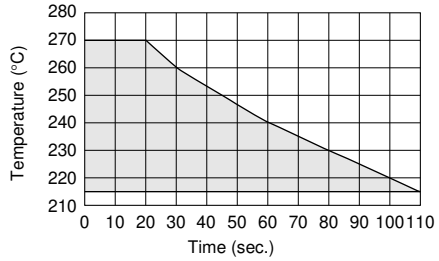


NCP18/21 Series

Allowable Flow Soldering Temp. and Time



Allowable Reflow Soldering Temp. and Time



Continued on the following page.

for Temp. Sensor and Compensation Chip Type ⚠Caution/Notice

Continued from the preceding page.

3. Recommendable Temperature Profile for Soldering

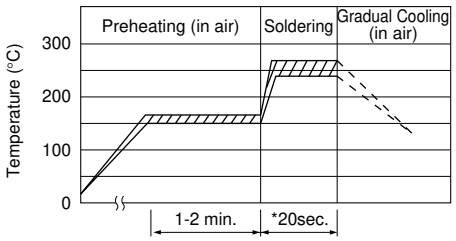
(a) Insufficient preheating may cause a crack on ceramic body. The difference between preheating temperature and maximum temperature in the profile shall be 100 °C.

(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.

NCP03/15 Series

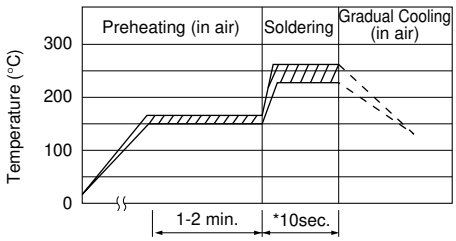
Reflow Soldering Conditions



Preheating: 160±10°C, 1-2 min.
Soldering: 240-270°C, 20sec.

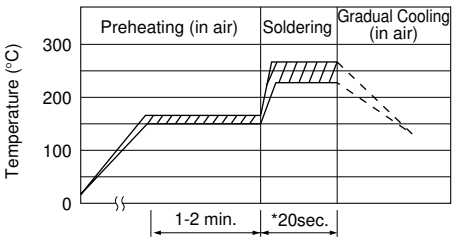
NCP18/21 Series

Flow Soldering Conditions



Preheating: 160±10°C, 1-2 min.
Soldering: 230-260°C, 10sec.

Reflow Soldering Conditions



Preheating: 160±10°C, 1-2 min.
Soldering: 230-270°C, 20sec.

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.

•Sn:Pb=63wt%:37wt%

•Sn:Ag:Cu=96.5wt%:3.0wt%:0.5wt%

(2) Flux

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.)

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.

	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/ℓ Frequency of 28kHz to 40kHz	Less than 1 minute and 20W/ℓ Frequency of several 10kHz to 100kHz

6. Drying

After cleaning, promptly dry this product.

Continued on the following page.

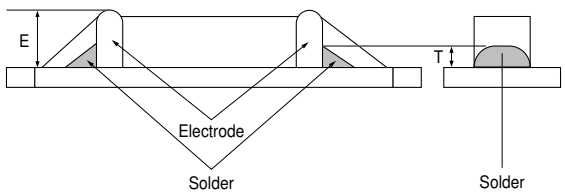
for Temp. Sensor and Compensation Chip Type ⚠Caution/Notice

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.

Reference: Optimum Solder Amount



Part Number	The Solder Paste Thickness	T
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.

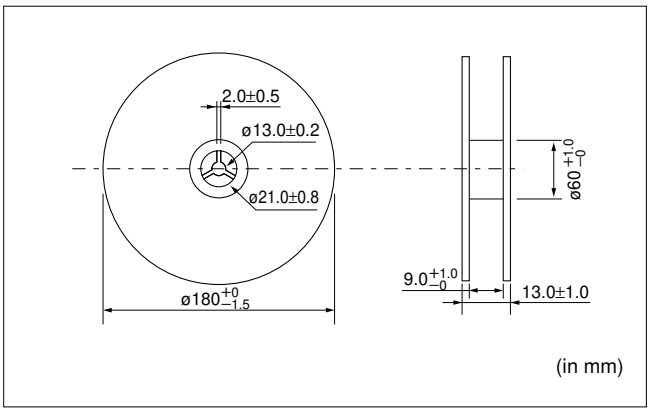
for Temp. Sensor and Compensation Chip Type Package

■ Minimum Quantity Guide

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

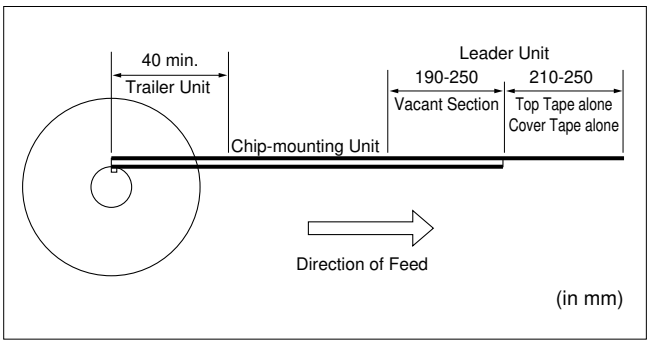
■ Tape Carrier Packaging

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.



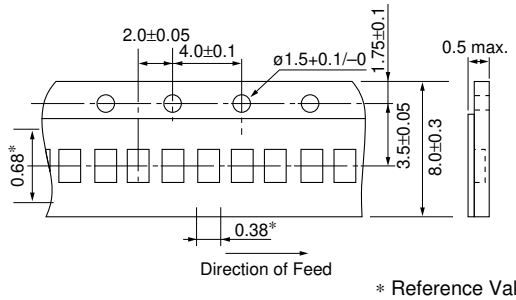
Continued on the following page.

for Temp. Sensor and Compensation Chip Type Package

Continued from the preceding page.

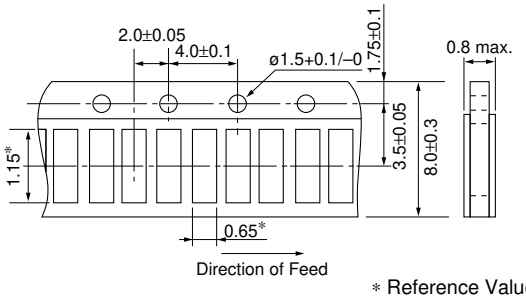
3. Paper Tape (NCP03/15/18 Series)

NCP03 Series



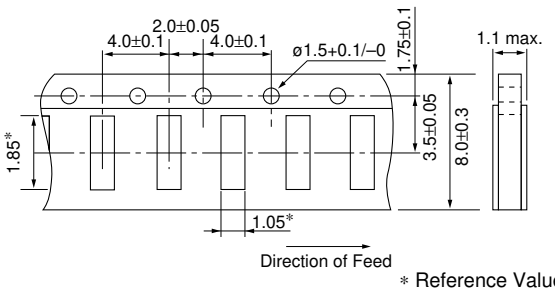
* Reference Value

NCP15 Series



* Reference Value

NCP18 Series



* Reference Value

(in mm)

(1) Other Conditions

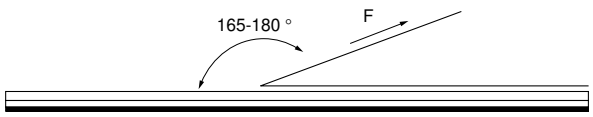
(a) Packaging

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



* 1 Peeling angle: 165 to 180 degrees against the fixed surface of tape.
* 2 Peeling speed: 300mm/min.
* 3 Peeling force: 0.1 - 0.6N

(3) Pull Strength

Pull strength of top tape is specified at 10N minimum.

Pull strength of bottom tape should be specified 5N minimum.

Continued on the following page.