

## Data Sheet

Customer: \_\_\_\_\_

Product: Non-magnetic Thick Film Chip Resistor – NMP Series

Size: 0402/0603/0805/1206/1210/2010/2512

Issued Date: \_\_\_\_\_

Edition: \_\_\_\_\_



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## Non-magnetic Thick Film Chip Resistor (NMP Series)

### Scope

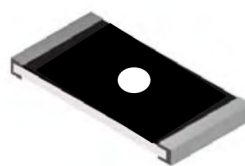
– This specification applies to all sizes of rectangular-type fixed chip resistors with Ruthenium-base as material.

### Features

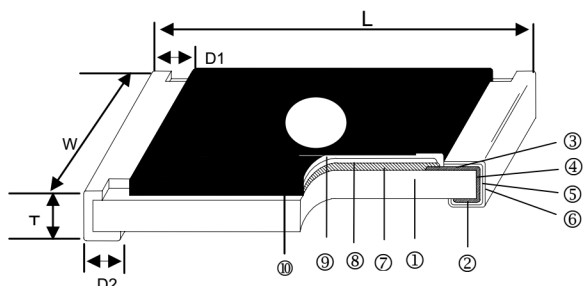
- Cu/Sn Terminations
- Suitable for Soldering
- Non-magnetic

### Applications

- Medical and military equipment
- MRI coil industries
- Computer tomography (CT)



### Construction



① Alumina Substrate	④ Edge Electrode (Ag)	⑦ Resistor Layer (RuO <sub>2</sub> /Ag)
② Bottom Electrode (Ag)	⑤ Barrier Layer (Cu)	⑧ Primary Overcoat (Glass)
③ Top Electrode (Ag-Pd)	⑥ External Electrode (Sn)	⑨ Secondary Overcoat (Epoxy)
⑩ Marking (Epoxy)		

### Dimensions

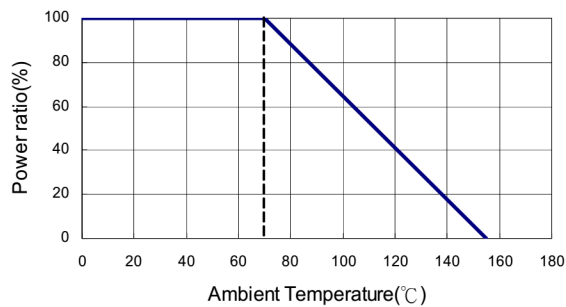
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
NMP02	0402	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.20±0.10	0.620
NMP03	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	2.042
NMP05	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	4.368
NMP06	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	8.947
NMP10	1210	3.10±0.10	2.60±0.15	0.55±0.10	0.50±0.25	0.50±0.20	15.959
NMP0A	2010	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20	24.241
NMP12	2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.25	0.50±0.20	39.448

## Part Numbering

<b>NMP</b>	<b>03</b>	<b>F</b>	<b>L</b>	<b>7</b>	<b>---10K</b>
Product Type	Dimensions	Resistance Tolerance	Function Code	Packaging Code	Resistance
	02: 0402 03: 0603 05: 0805 06: 1206 10: 1210 0A: 2010 12: 2512	F: $\pm 1\%$ J: $\pm 5\%$	L: Standard	4: 7" Reel 4Kpcs 6: 7" Reel 10Kpcs 7: 7" Reel 5Kpcs 9: 10" Reel 8Kpcs A: 10" Reel 10Kpcs B: 10" Reel 20Kpcs C: 13" Reel 40Kpcs D: 13" Reel 20Kpcs	--- 1R2: 1.2 $\Omega$ --- 3K3: 3.3K $\Omega$ --- 10K: 10K $\Omega$ -- 100K: 100K $\Omega$ "- " to fill up 6 spaces

## Derating Curve



## Standard Electrical Specifications

Type	Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range		TCR (PPM/°C)
						$\pm 1\%$	$\pm 5\%$	
NMP02 (0402)		1/16W	-55 ~ +155°C	50V	100V	1 $\Omega$ - 9.76 $\Omega$ 10 $\Omega$ - 1M $\Omega$ 1.02M $\Omega$ - 10M $\Omega$		$\pm 200$ $\pm 100$ $\pm 200$
	Jumper	1A				0 $\Omega$ (<50m $\Omega$ )		-
NMP03 (0603)		1/10W	-55 ~ +155°C	50V	100V	1 $\Omega$ - 9.76 $\Omega$ 10 $\Omega$ - 1M $\Omega$ 1.02M $\Omega$ - 10M $\Omega$		$\pm 200$ $\pm 100$ $\pm 200$
	Jumper	1A				0 $\Omega$ (<50m $\Omega$ )		-
NMP05 (0805)		1/8W	-55 ~ +155°C	150V	300V	1 $\Omega$ - 9.76 $\Omega$ 10 $\Omega$ - 1M $\Omega$ 1.02M $\Omega$ - 10M $\Omega$		$\pm 200$ $\pm 100$ $\pm 200$
	NMP06 (1206)	1/4W		200V		400V	0 $\Omega$ (<50m $\Omega$ )	
NMP10 (1210)		1/3W	-55 ~ +155°C	200V	400V	1 $\Omega$ - 9.76 $\Omega$ 10 $\Omega$ - 1M $\Omega$ 1.02M $\Omega$ - 10M $\Omega$		$\pm 200$ $\pm 100$ $\pm 200$
	Jumper	2.5A				0 $\Omega$ (<50m $\Omega$ )		-
NMP0A (2010)		3/4W	-55 ~ +155°C	200V	400V	1 $\Omega$ - 9.76 $\Omega$ 10 $\Omega$ - 1M $\Omega$ 1.02M $\Omega$ - 10M $\Omega$		$\pm 200$ $\pm 100$ $\pm 200$
	Jumper	3.5A				0 $\Omega$ (<50m $\Omega$ )		-
NMP12 (2512)		1W	-55 ~ +155°C	250V	500V	1 $\Omega$ - 9.76 $\Omega$ 10 $\Omega$ - 1M $\Omega$ 1.02M $\Omega$ - 10M $\Omega$		$\pm 200$ $\pm 100$ $\pm 200$
	Jumper	4A				0 $\Omega$ (<50m $\Omega$ )		-

Operating Voltage= $\sqrt{P \cdot R}$  or Max. operating voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$  or Max. overload voltage listed above, whichever is lower.

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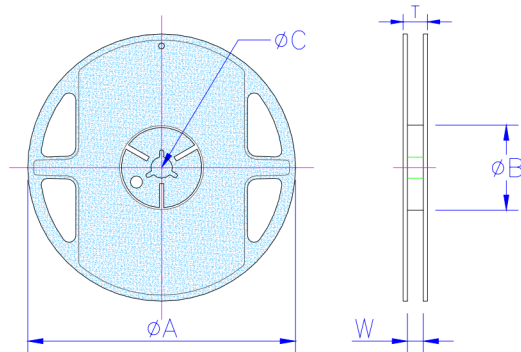
## ■ Environmental Characteristics

Item	Requirement			Test Method
	1%	5%	Jumper	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.			JIS C 5201-1 4.8 IEC 60115-1 4.8 -55°C~+125°C, 25°C is the reference temperature
Short Time Overload	±(1.0%+0.05Ω)	±(2.0%+0.05Ω)	<50mΩ	JIS C 5201-1 4.13 IEC 60115-1 4.13 2.5 times RCWV or Max. overload voltage for 5 seconds
Insulation Resistance	≥ 10G			JIS C 5201-1 4.6 IEC 60115-1 4.6 Max. overload voltage for 1 minute
Endurance	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	<100mΩ	JIS C 5201-1 4.25 IEC 60115-1 4.25.1 70±2°C, Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Damp Heat with Load	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	<100mΩ	JIS C 5201-1 4.24 40±2°C, 90~95% R.H., Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Dry Heat	±(1.0%+0.05Ω)	±(1.5%+0.10Ω)	<50mΩ	JIS C 5201-1 4.23.2 IEC 60115-1 2.23.2 at +155°C for 1000 hrs
Bending Strength	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	JIS-C-5201-1 4.33 IEC-60115-1 4.33 Bending once for 5 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. coverage			JIS-C-5201-1 4.17 IEC-60115-1 4.17 245±5°C for 3 seconds
Resistance to Soldering Heat	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	JIS-C-5201-1 4.18 IEC-60115-1 4.18 260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover			JIS C 5201-1 4.7 IEC 60115-1 4.7 1.42 times RCWV (RMS) for 1 minute
Leaching	Individual leaching area ≤ 5% Total leaching area ≤ 10%			JIS-C-5201-1 4.18 IEC-60068-2-58 8.2.1 260±5°C for 30 seconds
Rapid Change of Temperature	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	JIS C 5201-1 4.19 IEC 60115-1 4.19 -55°C to +155°C, 5 cycles

■ Storage Temperature: 25±3°C; Humidity < 80%RH

## ■ Packaging

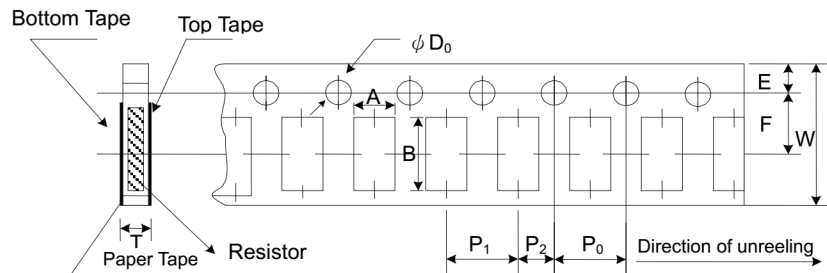
### Reel Specifications & Packaging Quantity



Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
NMP02	Paper	10K	8mm	7 inch	178.5±1.5	60 <sup>+1/-0</sup>	13.0±0.2	9.0±0.5	12.5±0.5
		20K		10 inch	254±1	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		40K		13 inch	330±1	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
NMP03	Paper	5K	8mm	13 inch	330±1	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
NMP05		10K							
NMP06		20K							
NMP10		20K							
NMP0A	Embossed	4K	12mm	7 inch	178.5±1.5	60 <sup>+1/-0</sup>	13.0±0.5	13.0±0.5	15.5±0.5
		NMP12		8K	10 inch	250±1	62±0.5	13.0±0.5	12.5±0.5

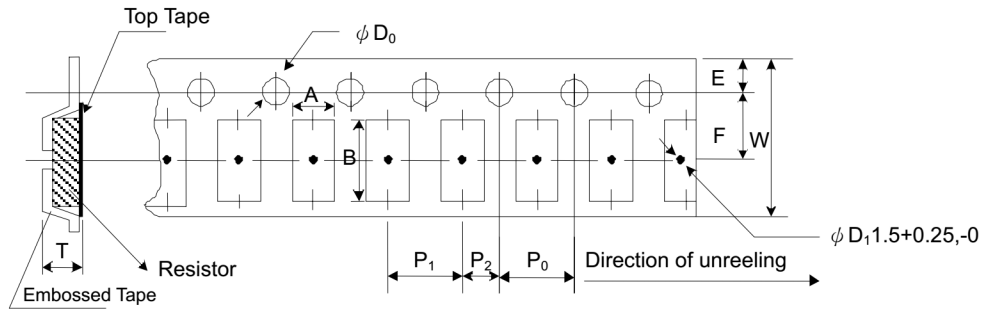
### Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>	ΦD <sub>0</sub>	T
NMP02	0.65±0.10	1.15±0.1	8.0±0.2	1.75±0.1	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.45±0.1
NMP03	1.10±0.10	1.90±0.1	8.0±0.2	1.75±0.1	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.70±0.1
NMP05	1.60±0.10	2.40±0.2	8.0±0.2	1.75±0.1	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.1
NMP06	1.90±0.10	3.50±0.2	8.0±0.2	1.75±0.1	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.1
NMP10	2.90±0.10	3.50±0.2	8.0±0.2	1.75±0.1	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.1

Embossed Plastic Tape Specifications

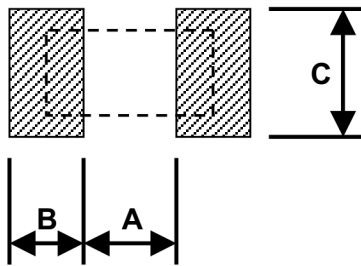


Unit: mm

Type	A	B	W	E	F	P <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>	ΦD <sub>0</sub>	T
NMP0A	2.8±0.10	5.5±0.10	12.0±0.3	1.75±0.1	5.5±0.05	4.00±0.10	4.00±0.1	2.00±0.05	1.50+0.1, -0	1.2 <sup>+0</sup>
NMP12	3.5±0.10	6.7±0.10	12.0±0.3	1.75±0.1	5.5±0.05	4.00±0.10	4.00±0.1	2.00±0.05	1.50+0.1, -0	1.2 <sup>+0</sup>

■ **Recommend Land Pattern**

Unit: mm



Type	A	B	C
NMP02	0.50	0.45	0.60
NMP03	0.90	0.60	0.90
NMP05	1.20	0.70	1.30
NMP06	2.00	0.90	1.60
NMP10	2.00	0.90	2.80
NMP0A	3.80	0.90	2.80
NMP12	3.80	1.60	3.50