

0402 Series Thick Film Chip Resistor

1. Scope

This specification applies to 1.0mm x 0.5mm (0402) size, fixed metal chip resistors rectangular type for use in electronic equipment.

2. Type Designation

RR0510	X	—	XXX	—	X	N
(1)	(2)		(3)		(4)	(6)
RR0510	X	—	000	—	X	N
(1)	(2)		(3)		(5)	(6)

Where

- (1) Series No.
- (2) Tolerance of TCR :
X = Jumper
Resistor refer to paragraph 3
- (3) Nominal resistance value :
For example —
Three digits of number (E-24 Series)
000 = Jumper (0Ω)
100 = 10Ω
102 = $1k\Omega$
Four digits of number (E-96 Series)
11R3 = 11.3Ω
1131 = $1.13k\Omega$
- (4) Resistance tolerance :
D = $\pm 0.5\%$
F = $\pm 1.0\%$
J = $\pm 5.0\%$
- (5) Resistance tolerance :
X = Jumper (Below $50m\Omega$)
- (6) N = Sn plating (Lead free, RoHS compliant)

3. Electrical Specifications

Table 1. :

Power Rating*	1/16 W				
Resistance Values	E-24 series , E-96 series				
Resistance Tolerance	$\pm 0.1\%(B)$, $\pm 0.5\%(D)$, $\pm 1.0\%(F)$		$\pm 1.0\%(F)$	$\pm 1.0\%(F)$, $\pm 5.0\%(J)$	
Resistance Range (Ω)	10 ~ 97.6	100 ~ 1M	1.02M ~ 10M	1.0 ~ 9.76	10 ~ 10M
Temperature Coefficient of Resistance ppm/°C (code)	± 100 (R)	± 50 (Q)	± 100 (R)	0 ~ 500 (S)	± 200 (S)
Operating Temperature Range	-55°C to +125°C				
Max. Operating Voltage**	50V				

Note: *Package Power Temperature Derating Curve

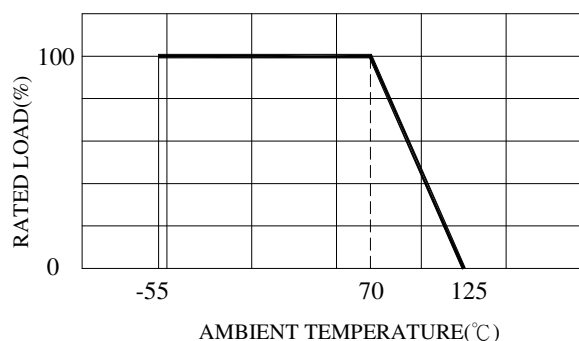


Figure 1. : Power Temperature Derating Cure

Note: **Resistors shall have a rated DC or AC(rms.) continuous operating voltage corresponding to the power rating, as calculated from the following formula

$$V = \sqrt{P \times R}$$

Where V : Rated voltage (V)

P : Rated power (W)

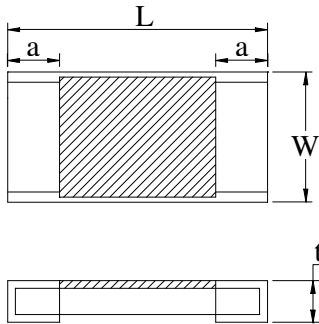
R : Nominal resistance (Ω)

If the voltage so obtained exceeds the maximum operating voltage, this maximum voltage shall be the rated voltage.

Table 2. : Jumper:

Resistance Tolerance	Below 50 m Ω
Rated current	1A
Operating Temperature Range	-55°C to 125°C

4. Outline dimensions



Code Letter	Dimension
L	1.0 ± 0.05
W	0.50 ± 0.05
t	0.35 ± 0.05
a	0.2 ± 0.10

Unit : mm

5. Life Tests

5-1 Electrical

Item	Specification and Requirement		Test Method
	Resistor	Jumper	
Short Time Overload	<ul style="list-style-type: none"> • $TCR \leq 100\text{ppm}$ $\Delta R: \pm (1\% + 0.05)\Omega$ • $TCR > 100\text{ppm}$ $\Delta R: \pm (2\% + 0.1)\Omega$ Without damage by flashover, spark, arcing, burning or breakdown	Max. $50\text{m}\Omega$	(1) Applied voltage : $2.5 \times \text{rated voltage}$ or $2 \times \text{maximum operating voltage}$ which ever is less (2) Test time : 5 seconds
Insulation Resistance	Over $100\text{ M}\Omega$ on Overcoat layer face up Over $1,000\text{ M}\Omega$ on Substrate side face up		(1) Setup as figure 2 (2) Test voltage : 50V_{DC} (3) Test time : $60 + 10 / -0$ seconds
Voltage Proof	$\Delta R: \pm (2\% + 0.1)\Omega$ Without damage by flashover, spark, arcing, burning or breakdown	Max. $50\text{m}\Omega$	(1) Setup as figure 2 (2) Test voltage : $100\text{V}_{\text{AC}}(\text{rms.})$ (3) Test time : $60 + 10 / -0$ seconds

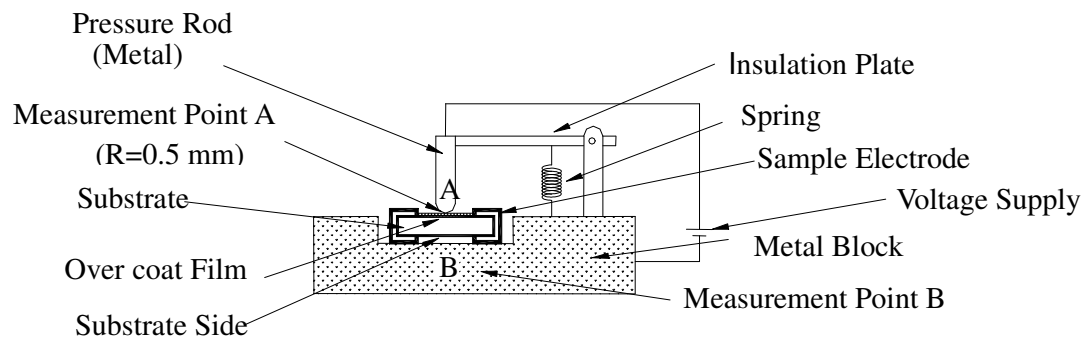


Figure 2 : Measurement Setup

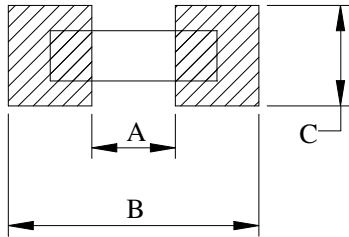
5-2 Mechanical

Item	Specification and Requirement		Test Method
	Resistor	Jumper	
Solderability	The surface of terminal immersed shall be minimum of 95% covered with a new coating of solder		Solder bath : After immersing in flux, dip in $245 \pm 5^{\circ}\text{C}$ molten solder bath for 2 ± 0.5 seconds
Resistance to Solder Heat	$\Delta R: \pm (1.0\% + 0.05) \Omega$ Without distinct deformation in appearance	Max. 50m Ω	(1) Pre-heat: 100~110 $^{\circ}\text{C}$ for 30 seconds (2) Immersed at solder bath of $270 \pm 5^{\circ}\text{C}$ for 10 ± 1 seconds (3) Measuring resistance 1 hour after test
Vibration	$\Delta R: \pm (0.5\% + 0.05) \Omega$ Without mechanical damage such as break		(1) Vibration frequency : 10Hz to 55Hz to 10Hz in 60 seconds as a period (2) Vibration time : period cycled for 2 hours in each of 3 mutual perpendicular directions (3) Amplitude : 1.5mm
Shock	$\Delta R: \pm (0.25\% + 0.05) \Omega$ Without mechanical damage such as break		(1) Peak value : 490N (2) Duration of pulse : 11ms (3) 3 times in each positive and negative direction of 3 mutual perpendicular directions
Bending Test	$\Delta R: \pm (1.0\% + 0.05) \Omega$ Without mechanical damage such as break	Max. 50m Ω	Bending value : 3 mm for 30 ± 1 seconds

5-3 Endurance

Item	Specification and Requirement		Test Method
	Resistor	Jumper	
Rapid change of Temperature	$\Delta R: \pm (1.0\% + 0.05) \Omega$ Without distinct damage in appearance	Max. 50m Ω	(1) Repeat 5 cycle as follows : (-55 \pm 3 $^{\circ}$ C, 30minutes) \rightarrow (Room temperature, 2~3 minutes) \rightarrow (+125 \pm 2 $^{\circ}$ C, 30minutes) \rightarrow (Room temperature, 2~3 minutes) (2) Measuring resistance 1 hour after test
Moisture with Load	$\Delta R: \pm (5.0\% + 0.1) \Omega$ Without distinct damage in appearance Marking should be legible	Max. 50m Ω	(1) Environment condition : 40 \pm 2 $^{\circ}$ C, 90~95% RH (4) Applied Voltage: rated voltage (2) Test period: (1.5 hour ON \rightarrow (0.5 hour OFF) cycled for total 1,000 + 48 / - 0 hours (3) Measuring resistance 1 hour after test
Load Life	$\Delta R: \pm (5.0\% + 0.1) \Omega$ Without distinct damage in appearance	Max. 100m Ω	(1) Test temperature : 70 \pm 2 $^{\circ}$ C (2) Applied Voltage: rated voltage (3) Test period : (1.5 hour ON) \rightarrow (0.5 hour OFF) cycled for total 1,000 + 48 / - 0 hours (4) Measuring resistance 1 hour after test
Low Temperature Store	$\Delta R: \pm (5.0\% + 0.1) \Omega$ Without distinct damage in appearance	Max. 100m Ω	(1) Store temperature : -55 \pm 3 $^{\circ}$ C for total 1,000 + 48 / - 0 hours (2) Measuring resistance 1 hour after test
High Temperature Store	$\Delta R: \pm (5.0\% + 0.1) \Omega$ Without distinct damage in appearance	Max. 100m Ω	(1) Store temperature : +125 \pm 2 $^{\circ}$ C for total 1,000 + 48 / - 0 hours (2) Measuring resistance 1 hour after test

6. Recommend Land Pattern Dimensions



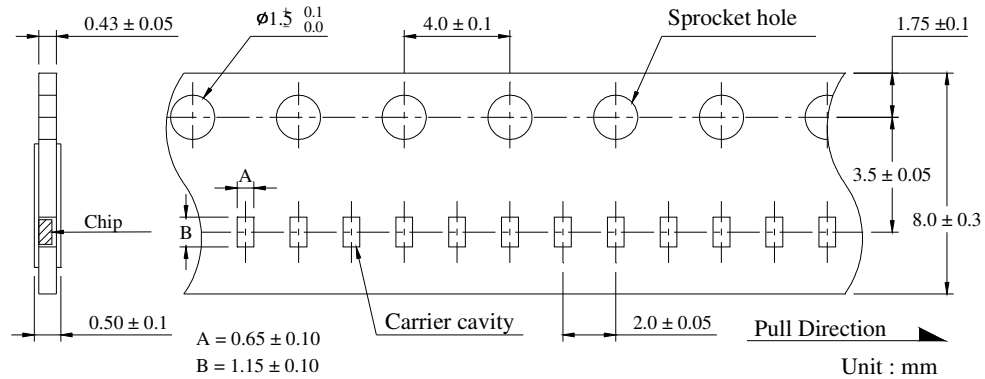
A	0.5
B	1.5
C	0.4~0.8

Unit : mm

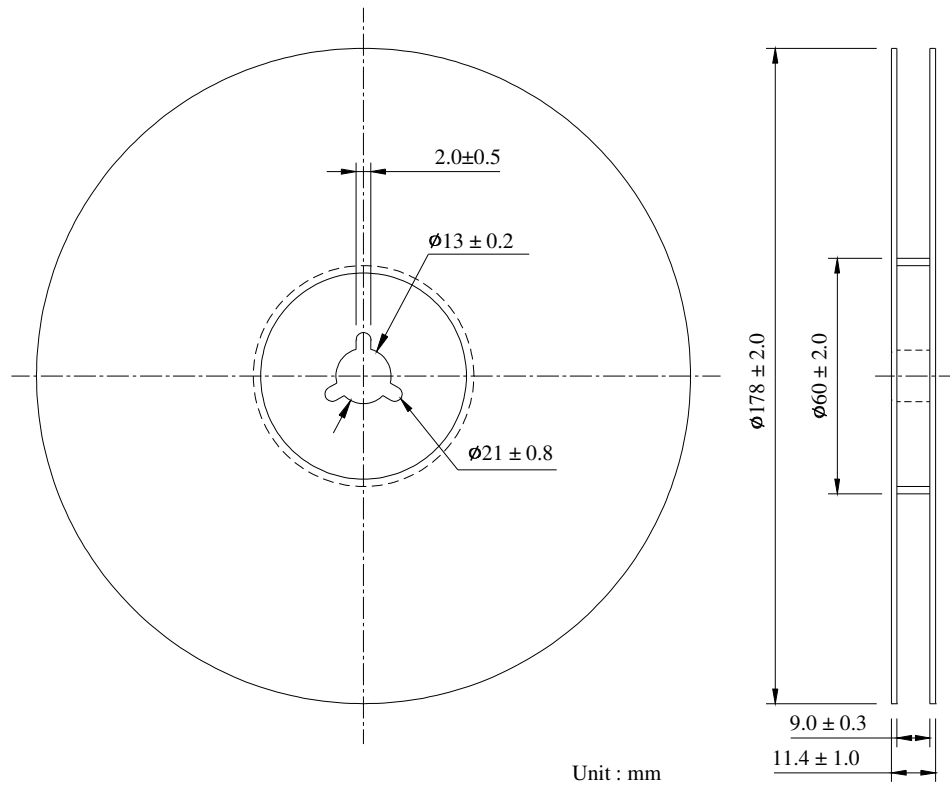
7. Packaging

7-1 Dimensions

7-1-1 Tape packaging dimensions



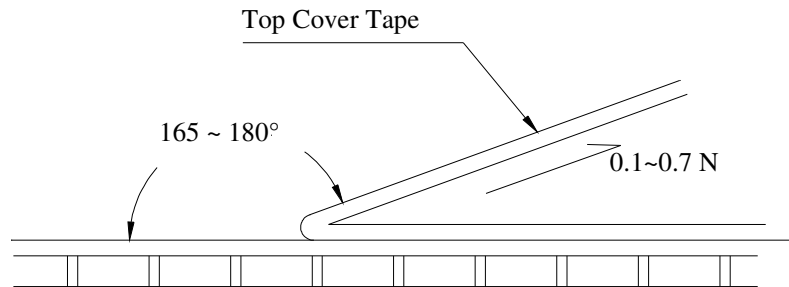
7-1-2 Reel dimensions



7-2 Peel force of top cover tape

The peel speed shall be about 300 mm/minute

The peel force of top cover tape shall be between 0.1 to 0.7 N



7-3 Numbers of taping

10,000 pieces/reel

7-4 Label marking

The following items shall be marked on the production and shipping Label on the reel.

7-4-1 Production Label

- (1) Part No.
- (2) Description
- (3) Quantity
- (4) Taping No.

7-4-2 Shipping Label

- (1) *Customer's name
- (2) *Customer's part No.
- (3) Manufacturer's part No.
- (4) Manufacturer's name
- (5) Manufacturer's country

*Note : Item (1) and (2) are listed by request

8. Care note

8-1 Care note for storage

- (1) Chip resistor shall be stored in a room where temperature and humidity must be controlled. (temperature 5 to 35°C, humidity 45 to 85% RH) However, a humidity keep it low, as it is possible.
- (2) Chip resistor shall be stored as direct sunshine doesn't hit on it.
- (3) Chip resistor shall be stored with no moisture, dust, a material that will make solderability inferior, and a harmful gas (Chloridation hydrogen, sulfurous acid gas, and sulfuration hydrogen)

8-2 Care note for operating and handling

- (1) It is necessary to protect the edge and protection coat of resistors from mechanical stress.
- (2) Handle with care when printing circuit board (PCB) is divided or fixed on support body, because bending of printing circuit board (PCB) mounting will make mechanical stress for resistors.
- (3) Resistors shall be used with in rated range shown in specification. Especially, if voltage more than specified value will be loaded to resistor, there is a case it will make damage for machine because of temperature rise depending on generating of heat, and increase resistance value or breaks.
- (4) In case that resistor is loaded a rated voltage, it is necessary to confirms temperature of a resistor and to reduce a load power according to load reduction curve, because a temperature rise of a resistor depends on influence of heat from mounting density and neighboring element.
- (5) Observe Limiting element voltage and maximum overload voltage specified in each specification
- (6) If there is possibility that a large voltage (pulse voltage, shock voltage) charge to resistor, it is necessary that operating condition shall be set up before use.