

1/16W, 0402, High Precision Thick Film Chip Resistor  
(Lead / Halogen Free)

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

PFR05	X	—	XXXX	—	X	NH
(1)	(2)		(3)		(4)	(5)

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 (  $0\Omega$  )

100 =  $10\Omega$

102 =  $1k\Omega$

Four digits of number (E-96 Series)

11R3 =  $11.3\Omega$

1131 =  $1.13k\Omega$

(4) Resistance tolerance :

B =  $\pm 0.1\%$

D =  $\pm 0.5\%$

F =  $\pm 1.0\%$

J =  $\pm 5.0\%$

(5) NH = Sn plating ( Lead free / Halogen free)

3. Electrical Specifications

Table 1. :

Power Rating**	Resistance Values	Resistance Tolerance	Resistance Range ( Ω )	Temperature Coefficient of Resistance ppm/°C (code) *	Operating Temperature Range	Max. Operating Voltage***
1/16 W	E-24 series E-96 series	± 0.1%(B) ± 0.5%(D)	10 ~ 97.6	± 100 (R)	-55℃ to +125℃	50V
			100 ~ 1M	± 50 (Q)		
		± 1.0%(F)	1.0 ~ 9.76	0 ~ 500 (S)		
			10 ~ 97.6	± 100 (R)		
			1.02M ~ 10M			
			100 ~ 1M	± 50 (Q)		
	10 ~ 10M	± 200 (S)				
	E-24 series	± 5.0%(J)	1.0 ~ 9.1	0 ~ 500 (S)		
			10 ~ 10M	± 200 (S)		

Note: \*TCR “S” is standard parts, the other part can be make at request.

Note: \*\*Package Power Temperature Derating Curve

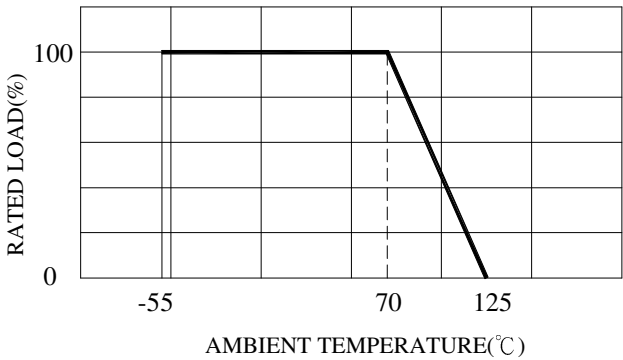


Figure 1. : Power Temperature Derating Curve

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

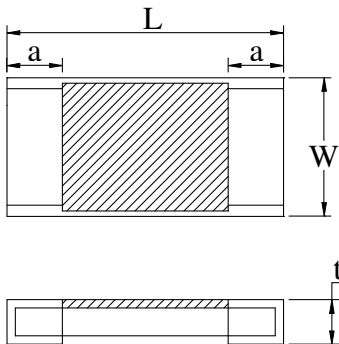
$$V = \sqrt{P \times R}$$
  
Where V : Rated voltage (V)  
P : Rated power (W)  
R : Nominal resistance (Ω)

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 mΩ
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 (Refer to JIS C 5201)
	Resistor	Jumper	
Short Time Overload	<ul style="list-style-type: none"><li>TCR ≤ 100ppm ΔR: ± (1%+ 0.05Ω)</li><li>TCR &gt; 100ppm ΔR: ± (2%+ 0.1Ω)</li></ul> Without damage by flashover, spark, arcing, burning or breakdown	Max. 50mΩ	(1) Applied voltage : 2.5 x rated voltage or 2 x maximum operating voltage which ever is less (2) Test time : 5 seconds
Insulation Resistance	Over 100 MΩ on Overcoat layer face up Over 1,000 MΩ on Substrate side face up		(1) Setup as figure 2 (2) Test voltage : 50V <sub>DC</sub> (3) Test time : 60 + 10 / -0 seconds
Voltage Proof	ΔR: ± (2%+ 0.1Ω) Without damage by flashover, spark, arcing, burning or breakdown	Max. 50mΩ	(1) Setup as figure 2 (2) Test voltage : 100V <sub>AC</sub> (rms.) (3) Test time : 60 +10 / -0 seconds

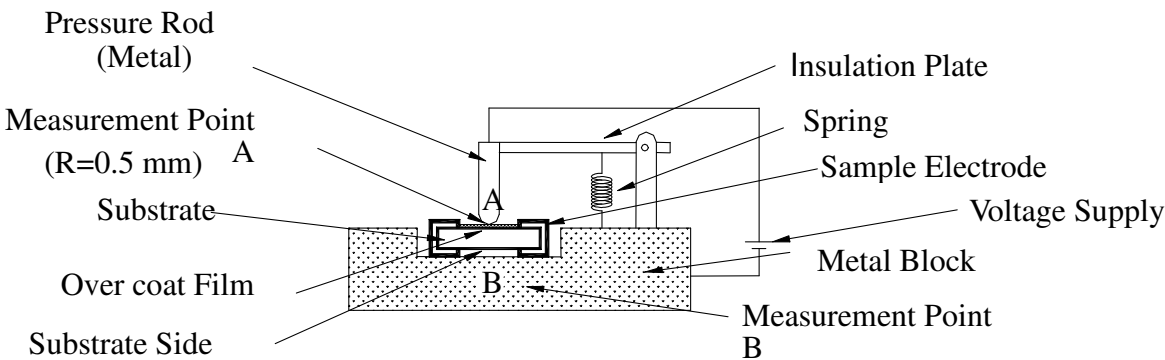


Figure 2 :  
Measurement Setup

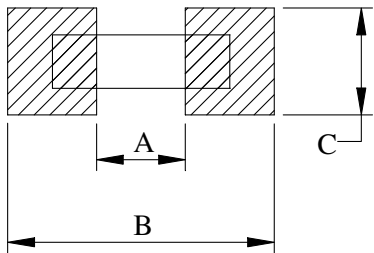
5-2 Mechanical

Item	Specification and Requirement		Test Method (Refer to JIS C 5201)
	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 $2 \pm 0.5$ seconds
Resistance to Solder Heat	$\Delta R: \pm (1.0\% + 0.05\Omega)$ Without distinct deformation in appearance	Max. $50\text{m}\Omega$	(1) Pre-heat: $100\sim 110^{\circ}\text{C}$ for 30 seconds (2) Immersed at solder bath of $270 \pm 5^{\circ}\text{C}$ for $10 \pm 1$ 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 : $10\text{Hz}$ to $55\text{Hz}$ to $10\text{Hz}$ in 60 seconds as a period (2) Vibration time : period cycled for 2 hours in each of 3 mutual perpendicular directions (3) Amplitude : $1.5\text{mm}$
Shock	$\Delta R: \pm (0.25\% + 0.05\Omega)$ Without mechanical damage such as break		(1) Peak value : $490\text{N}$ (2) Duration of pulse : $11\text{ms}$ (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. $50\text{m}\Omega$	Bending value : $3\text{ mm}$ for $30 \pm 1$ seconds

5-3 Endurance

Item	Specification and Requirement		Test Method (Refer to JIS C 5201)
	Resistor	Jumper	
Thermal Shock	$\Delta R: \pm (1.0\% + 0.05\Omega)$ Without distinct damage in appearance	Max. 50m $\Omega$	(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 $\Omega$	(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 $\Omega$	(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 $\Omega$	(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 $\Omega$	(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



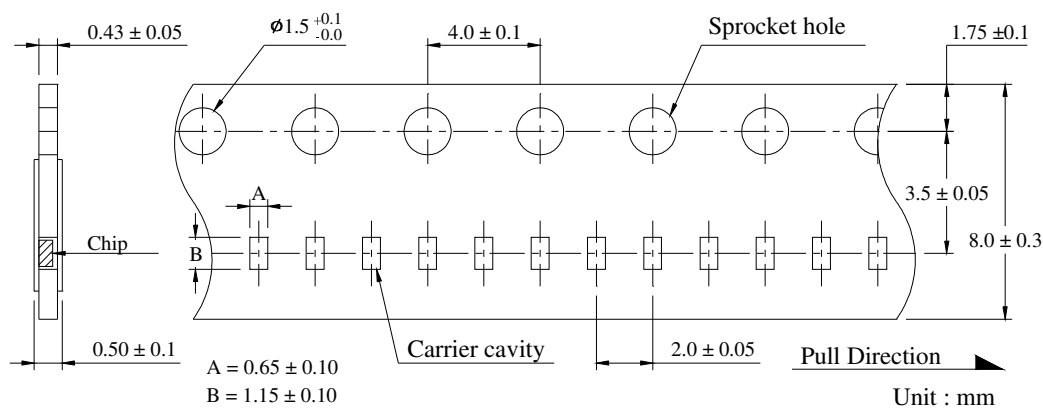
A	0.5
B	1.5
C	0.4~0.8

Unit : mm

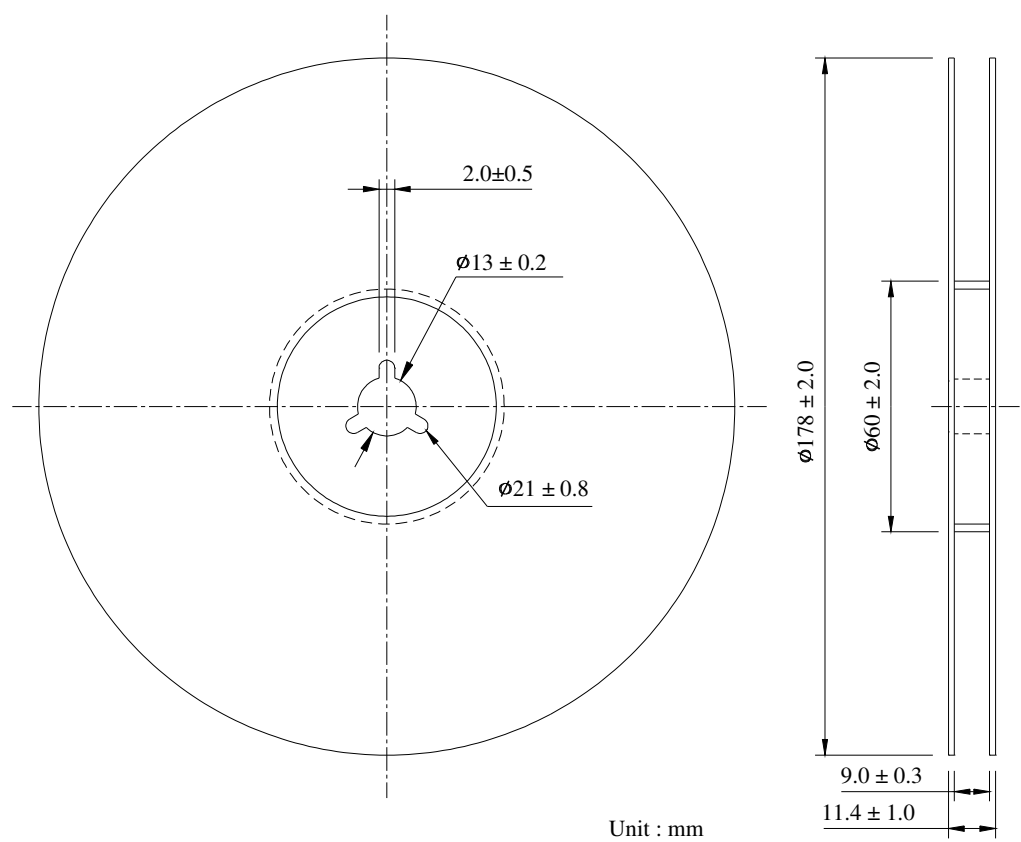
7. Packaging

7-1 Dimensions

7-1-1 Tape packaging dimensions



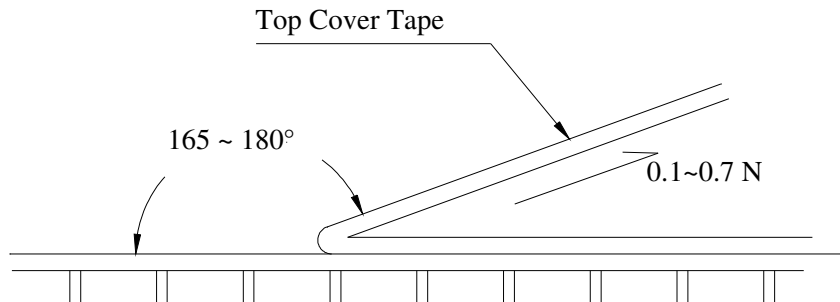
7-1-2 Reel dimensions



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.