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（0Ω）
   100 = 10Ω
   102 = 1kΩ
   Four digits of number (E-96 Series)
   11R3 = 11.3Ω
   1131 =1.13kΩ

(4) Resistance tolerance :
   B = ± 0.1%
   D = ± 0.5%
   F = ± 1.0%
   J = ± 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/℃ (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

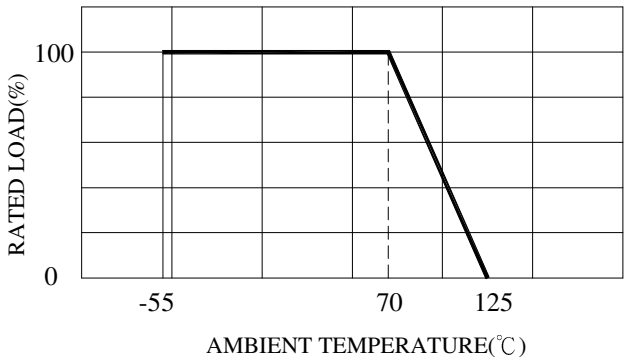


Figure 1.：Power Temperature Derating Curve

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)

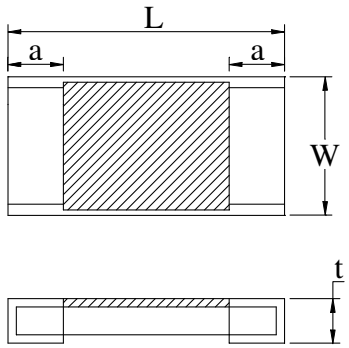
R : Nominal resistance (Ω)

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℃ to 125℃

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	● TCR ≤ 100ppm △R: ± (1%+ 0.05Ω) ● TCR > 100ppm △R: ± (2%+ 0.1Ω) 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_{DC} (3) Test time : 60 + 10 / -0 seconds
Voltage Proof	△R: ± (2%+ 0.1Ω) Without damage by flashover, spark, arcing, burning or breakdown	Max. 50mΩ	(1) Setup as figure 2 (2) Test voltage : 100V_{AC}(rms.) (3) Test time : 60 +10 / -0 seconds

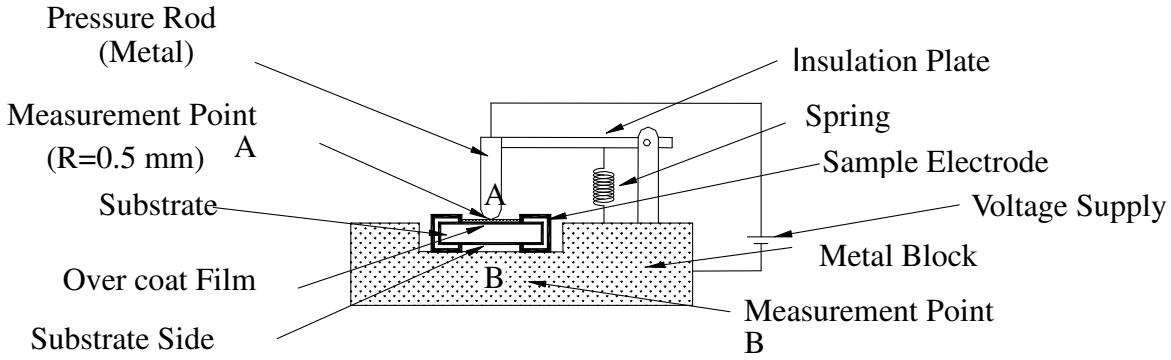


Figure 2 :
Measurement Setup

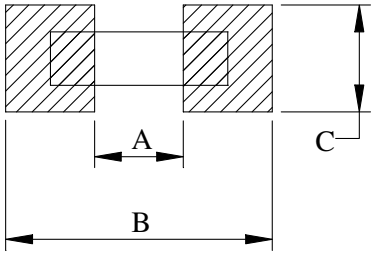
5-2 Mechanical

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 ± 5℃ molten solder bath for 2 ± 0.5 seconds
Resistance to Solder Heat	△R: ± (1.0%+ 0.05Ω) Without distinct deformation in appearance	Max. 50mΩ	(1) Pre-heat: 100~110℃ for 30 seconds (2) Immersed at solder bath of 270 ± 5℃ for 10 ± 1 seconds (3) Measuring resistance 1 hour after test
Vibration	△R: ± (0.5%+ 0.05Ω) Without mechanical damage such as break		(1) Vibration frequency : 10Hz to 55Hz to10Hz 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	△R: ± (0.25%+ 0.05Ω) 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	△R: ± (1.0%+ 0.05Ω) Without mechanical damage such as break	Max. 50mΩ	Bending value : 3 mm for 30 ± 1 seconds

5-3 Endurance

Item	Specification and Requirement		Test Method (Refer to JIS C 5201)
	Resistor	Jumper	
Thermal Shock	△R: ± (1.0%+ 0.05Ω) Without distinct damage in appearance	Max. 50mΩ	(1) Repeat 5 cycle as follows : (-55 ± 3℃,30minutes) →(Room temperature, 2~3 minutes) →(+125 ± 2℃,30minutes) →(Room temperature, 2~3 minutes) (2) Measuring resistance 1 hour after test
Moisture with Load	△R: ± (5.0%+ 0.1Ω) Without distinct damage in appearance Marking should be legible	Max. 50mΩ	(1) Environment condition : 40 ± 2℃,90~95% RH (4) Applied Voltage: rated voltage (2) Test period: (1.5 hour ON →(0.5 hour OFF) cycled for total 1,000 + 48 / - 0 hours (3) Measuring resistance 1 hour after test
Load Life	△R: ± (5.0%+ 0.1Ω) Without distinct damage in appearance	Max. 100mΩ	(1) Test temperature : 70 ± 2℃ (2) Applied Voltage: rated voltage (3) Test period : (1.5 hour ON) →(0.5 hour OFF) cycled for total 1,000 + 48 / - 0 hours (4) Measuring resistance 1 hour after test
Low Temperature Store	△R: ± (5.0%+ 0.1Ω) Without distinct damage in appearance	Max. 100mΩ	(1) Store temperature : -55 ± 3℃ for total 1,000 + 48 / - 0 hours (2) Measuring resistance 1 hour after test
High Temperature Store	△R: ± (5.0%+ 0.1Ω) Without distinct damage in appearance	Max. 100mΩ	(1) Store temperature : +125 ± 2℃ for total 1,000 + 48 / - 0 hours (2) Measuring resistance 1 hour after test

6. Recommend Land Pattern Dimensions



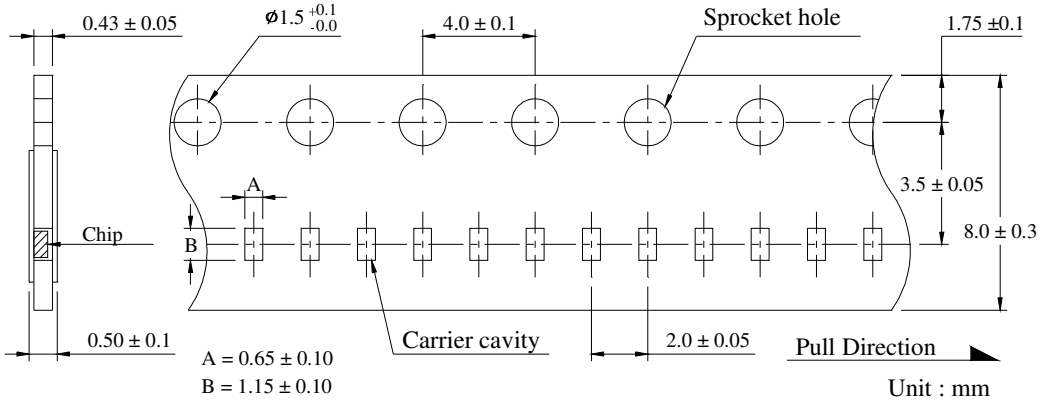
A	0.5
B	1.5
C	0.4~0.8

Unit : mm

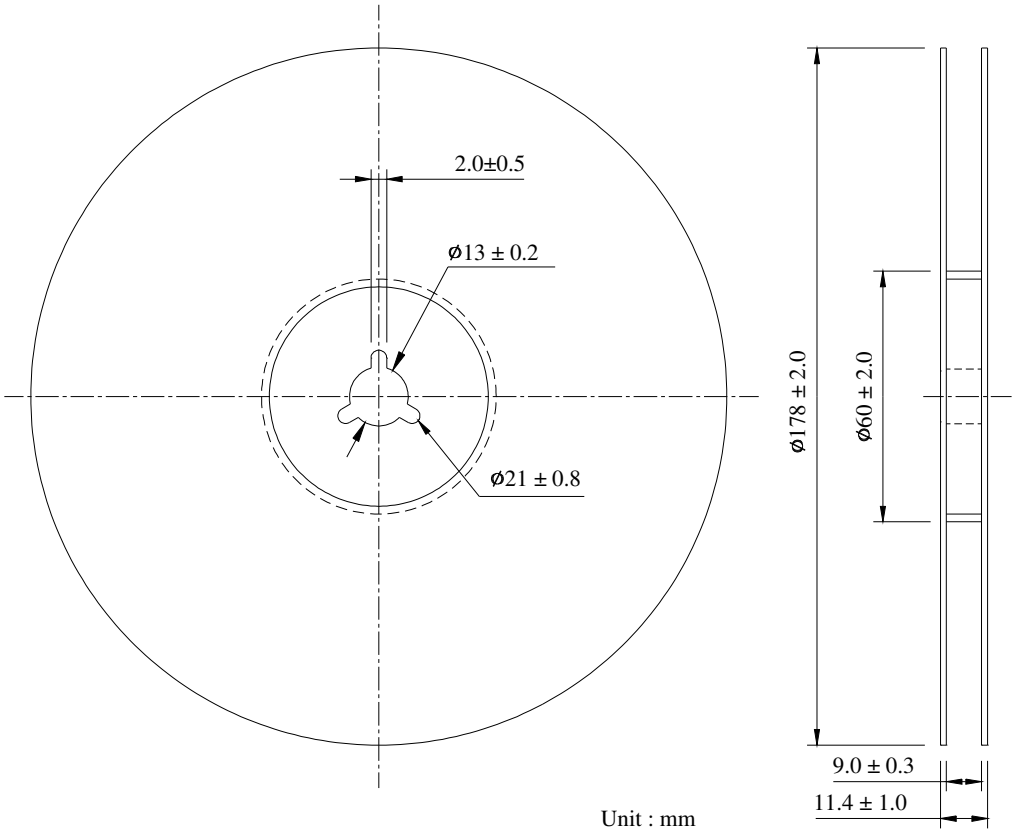
7. Packaging

7-1 Dimensions

7-1-1 Tape packaging dimensions



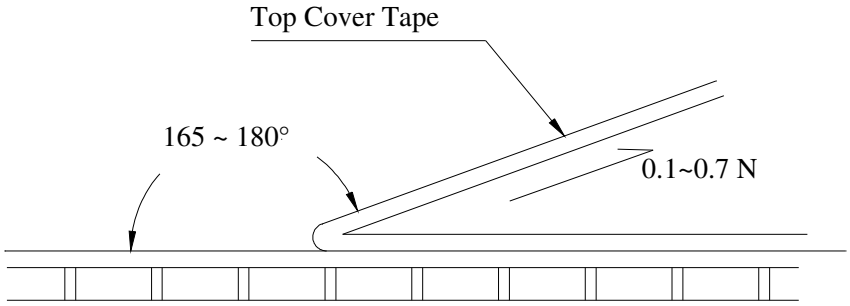
7-1-2 Reel dimensions



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℃, 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.