



Chip Resistor

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

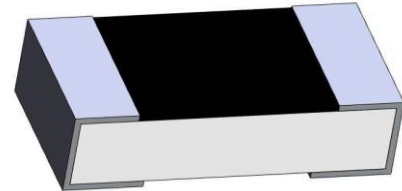
Reversion History :

Date	Revision	Changes
2019.09.17	A0	New Version
2020.10.12	A1	Augment X = Jumper (Below 50mΩ);Pega3 by figure 1 changed to figure 2
2021.01.11	A2	Modify lead free related description

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

Features / Applications :

- Telecommunication Equipment, Digital Cameras
Watches, Pocket Calculators, Computers, Instruments
- Halogen Free Epoxy
- RoHS compliant
 - Glass/electrode of resistor with lead free meet RoHS requirements
 - Pb contained in resistive element is exempted by RoHS



Electrical Specifications :

Power Rating*	Resistance Values Series	Resistance Tolerance	Resistance Range (Ω)	Temperature Coefficient of Resistance ppm / °C(Code)	Operating Temperature Range	Max. Operating Voltage**
1/16W	E24 series & E96 series	± 0.5%(D)	10~97.6	± 100 (R)	-55°C to 125°C	50V
			100~1M	± 50 (Q)		
			1K~1.8M	± 25 (P)		
		± 1.0%(F)	1.0~9.76	0~500 (S)		
			10~97.6	± 100 (R)		
			1.02M~10M	± 50 (Q)		
	E24 series	± 5.0%(J)	10~10M	± 200 (S)		
			1.0~9.1	0~500 (S)		
Jumper	Resistance		Rated current		Operating Temperature Range	
	Below 50mΩ		1A		-55°C to 125°C	

Note: *Package Power Temperature Derating Curve

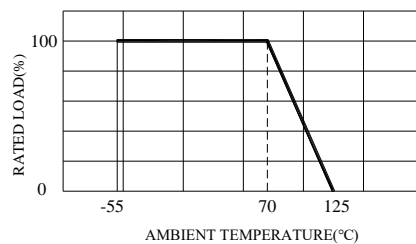


Figure 1. : Power Temperature Derating Curve

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

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

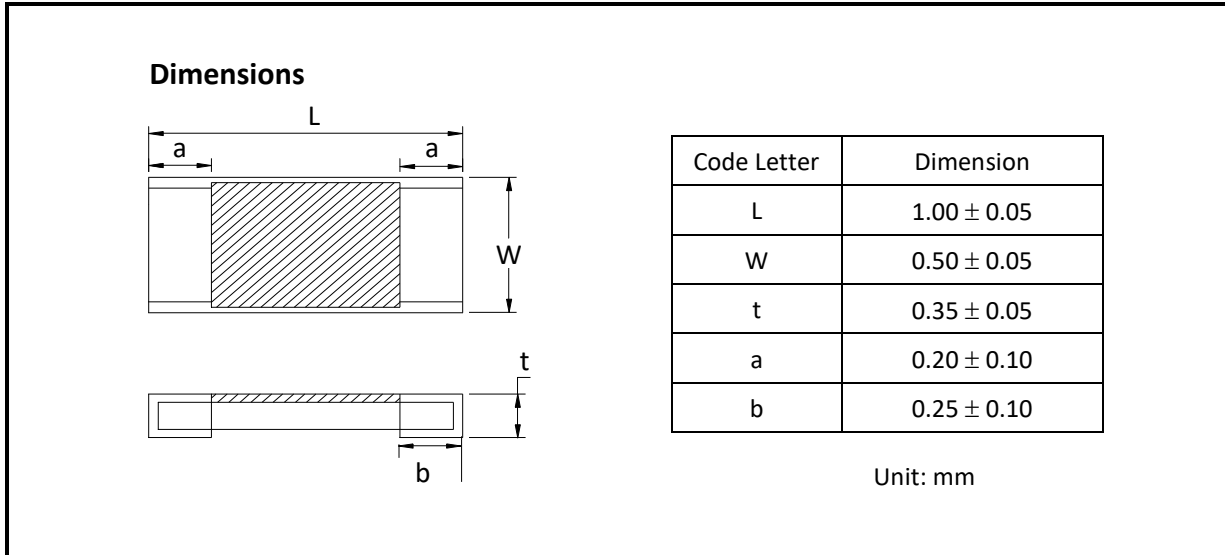
Where V : Rated voltage (V)

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.

Outline Drawing :



Type Designation :

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

Note:

- (1) Series No.
- (2) TCR : X= Jumper
 Resistor refer to paragraph 2
- (3) Resistance value : 103 = $10k\Omega$ (E24) ; 1131 = $1.13k\Omega$ (E96)
- (4) Tolerance: D= $\pm 0.5\%$, F = $\pm 1\%$, J = $\pm 5\%$, X = Jumper (Below $50m\Omega$)
- (5) NH=Lead free, Halogen free

Characteristics :

Electrical

Item	Specification and Requirement		Test Method (Refer to JIS C 5201)
	Resistor	Jumper	
Short Time Overload	<ul style="list-style-type: none"> ● TCR \leq 100ppm $\Delta R: \pm (1\%+0.05\Omega)$ ● TCR $>$ 100ppm $\Delta R: \pm (2\%+0.1\Omega)$ Without damage by flashover, spark, arcing, burning or breakdown	Max. 50m Ω	(1) Applied voltage: 2.5 x rated voltage or 2 x maximum operating voltage whichever is less (2) Test time : 5 seconds
Insulation Resistance	Over 100 M Ω on Overcoat layer face up Over 1,000 M Ω on Substrate side face up		(1) Setup as figure 2 (2) Test voltage: 50VDC (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. 50m Ω	(1) Setup as figure 2 (2) Test voltage: 100VAC(rms.) (3) Test time: (4) 60 +10 / -0 seconds

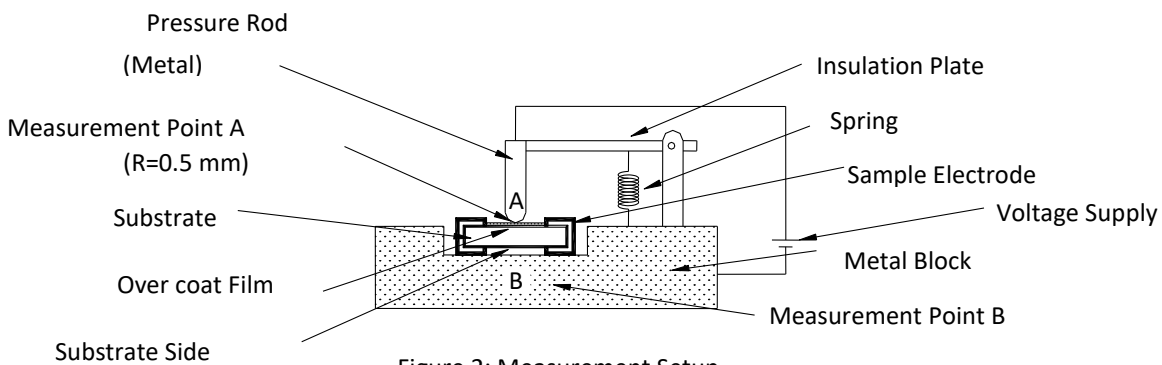


Figure 2: Measurement Setup

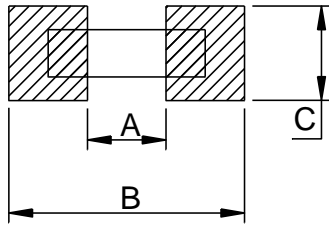
Mechanical

Item	Specification and Requirement		Test Method (Refer to JIS C 5201)
	Resistor	Jumper	
Solder ability	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. $50\text{m}\Omega$	(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 ± 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	$\Delta R: \pm (0.5\% + 0.05\Omega)$ Without distinct damage in appearance		Bending value: 3mm for 30 ± 1 seconds

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 Ω	(1) Repeat 5 cycle as follows: (-55 \pm 3 $^{\circ}$ C, 30minutes) \rightarrow (Room temperature, 2~3minutes) \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 (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
Load Life	$\Delta R: \pm (5.0\% + 0.1\Omega)$ Without distinct damage in appearance	Max. 100m Ω	(1) Test temperature : 70 \pm 2 (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

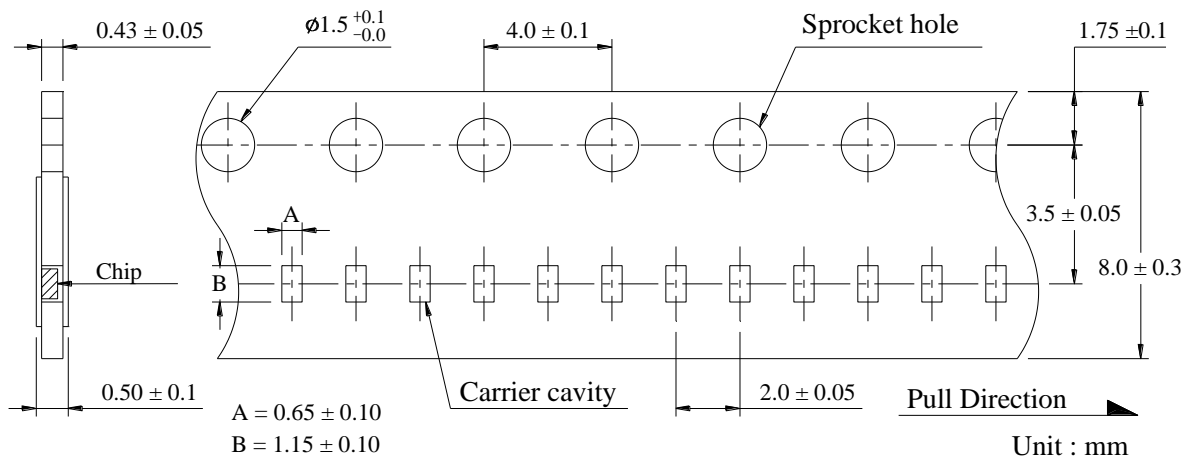
Recommend Land Pattern Dimensions :



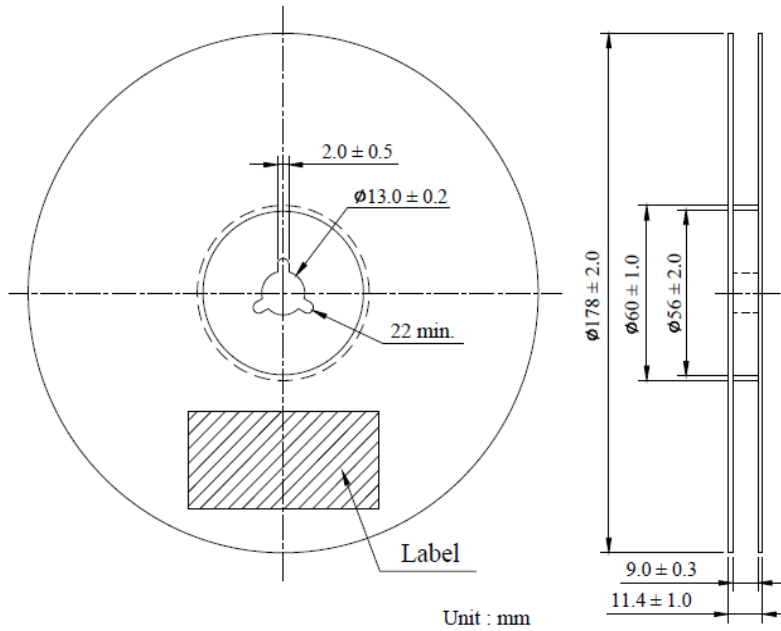
A	0.5
B	1.5
C	0.4~0.8

Unit:mm

TAPE PACKAGING DIMENSIONS:



REEL DIMENSIONS:



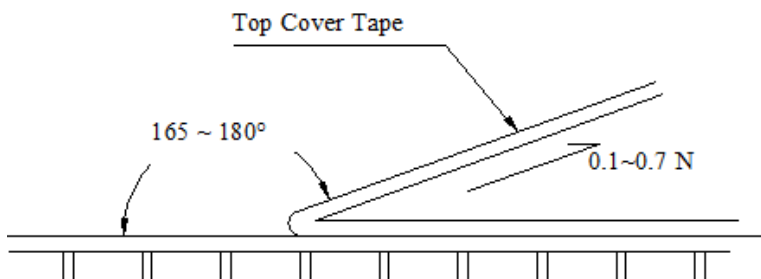
Numbers of Taping: 10,000 pieces/reel

The following items shall be marked on the reel.

- (1) Type designation.
- (2) Quantity
- (3) Manufacturing date code
- (4) Manufacturer's name

Peel force of top cover tape

The peel speed shall be about 300 mm/min. The peel force of top cover tape shall be between 0.1 to 0.7 N.



Care Note :

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 solder ability inferior, and a harmful gas (Hydrogen chloride, sulfurous acid gas, and Hydrogen sulfide)

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.