

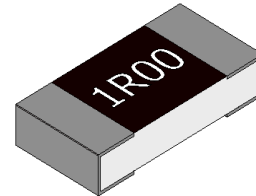
## The history of revision change for the specification

Date	Revision	Changes
2022/03/23	A0	New approval
2022/08/05	A1	Update TCR specifications
2024/03/04	A2	Add" Max. Operating Voltage"

## 1W, 1206, Anti-Surge, High Power Chip Resistor

### Features / Applications :

- Telecommunication Equipment, Digital Cameras  
Watches, Pocket Calculators, Computers, Instruments
- Excellent surge resistance characteristics
- Halogen Free Epoxy
- RoHS compliant, No RoHS exemption

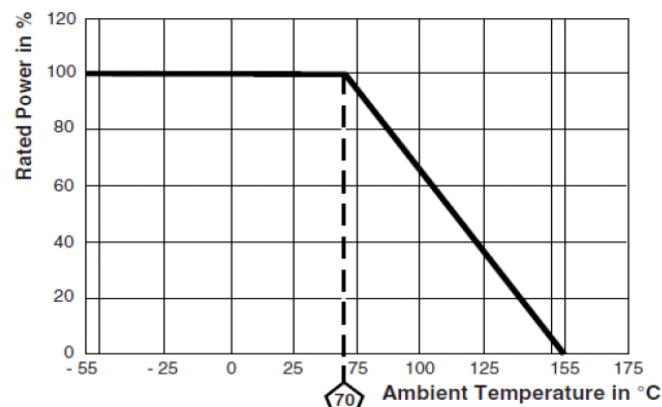


### Electrical Specifications :

Characteristics	Feature		
Power Rating*	1 W		
Resistance Values	E-24 & E-96 series		
Resistance Range	1Ω~<10Ω	10Ω~100Ω	>100Ω~1KΩ
Temperature Coefficient of Resistance(ppm/°C)	±150	±100	±150
Resistance Tolerance	±0.5%(D), ±1%(F), ±2%(G), ±5%(J)		
Max. Operating Voltage**	200V		
Operation Temperature Range	-55°C ~ +155°C		

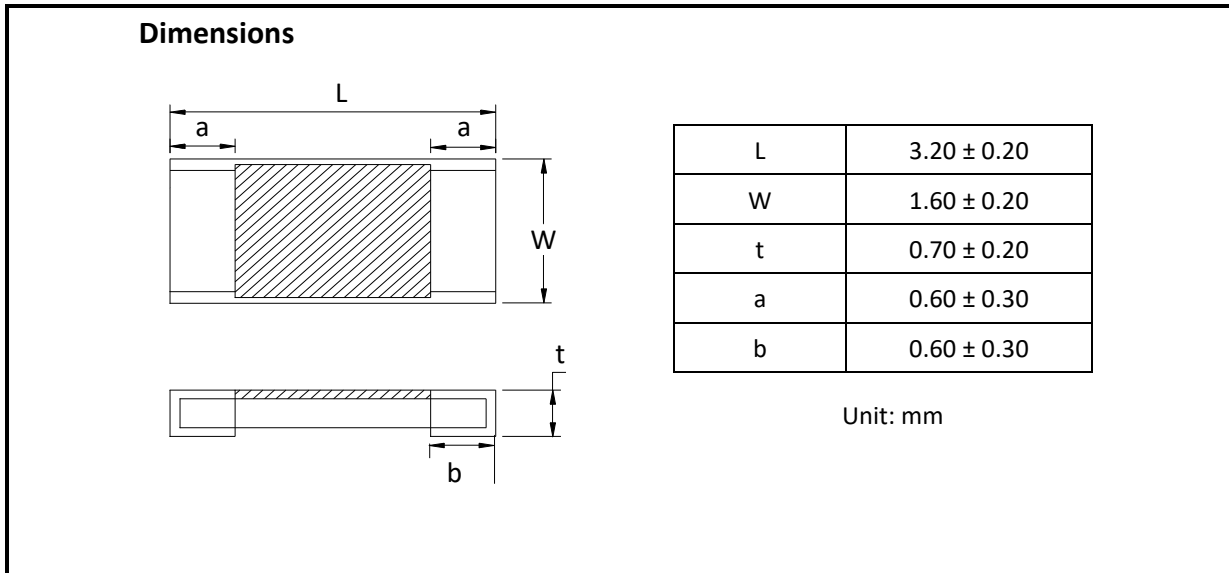
\*Note :

For sensor operated at ambient temperature in excess of 70°C, the maximum load shall be derated in accordance with the following 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  $V = \sqrt{P \times R}$ . If the voltage obtained exceeds the maximum operating voltage, this maximum operating voltage shall be the rated voltage.

## Outline Drawing :



## Type Designation :

HPFR16S - □□□□ - □ 6 TF  
 (1) (2) (3) (4) (5)

Note :

- (1) Series No.
- (2) Resistance value:  
 Three digits of number (E-24 Series)  
 100 = 10Ω  
 102 = 1KΩ  
 Four digits of number (E-96 Series)  
 11R3 = 11.3Ω
- (3) Tolerance (%): D=±0.5%, F=±1%, G=±2%, J=±5%
- (4) Power Rating: 6 = 1W
- (5) TF is total lead free (without RoHS exemption)

## Characteristics :

### Electrical

Item	Specification and Requirement	Test Method (JIS 5201)
Temperature Coefficient of Resistance(ppm/°C)	As electrical specifications	Room temperature Room temperature +100°C
Short Time Overload	$\Delta R: \pm(2\% + 0.0005\Omega)$ Without damage by flashover, spark, arcing, burning or breakdown	(1) Preconditioning (2) 2.5 * rated voltage for 5seconds
Insulation Resistance	Over 100 M $\Omega$ on Overcoat layer face up Over 1,000 M $\Omega$ on Substrate side face up	(3) Setup as figure 1 (4) Test voltage: 100VDC (5) Test time: 60 + 10 / - 0 seconds
Voltage Proof	$\Delta R: \pm (0.5\% + 0.0005\Omega)$ Without damage by flashover, spark, arcing, burning or breakdown	(1) Setup as figure 1 (2) Test voltage: 50VAC(rms.) (3) Test time: 60 + 10 / - 0 seconds

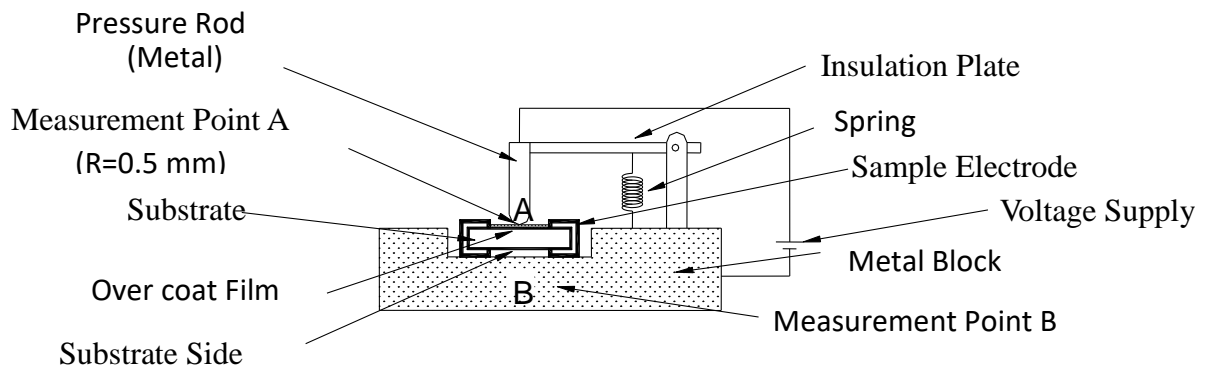


Figure 1 : Measurement Setup

## Mechanical

Item	Specification and Requirement	Test Method (JIS 5201)
Lead Solderability	$\Delta R: \pm(0.5\% + 0.0005\Omega)$ The surface of terminal immersed shall be minimum of 95% covered with a new coating of solder	(1) Pretest Requirement: All samples shall be subjected to steam aging for a period of 8 hours as a precondition to testing (2) Lead Solderability $245 \pm 5^\circ\text{C}$ for $5+0/0.5$ seconds
Reflow Soldering	$\Delta R: \pm(2.0\% + 0.0005\Omega)$ Without distinct deformation in appearance	(1) Reflow at $260^\circ\text{C}$ for 10 seconds, 3 cycles, and cool down in still (2) Measuring resistance 1 hours after test
Solder Cycles	$\Delta R: \pm(2.0\% + 0.0005\Omega)$ Without distinct deformation in appearance	(1) One Reflow cycle; (2) Followed by cool down; then Hand Soldering: (3) Immersion in molten solder $260^\circ\text{C}$ for 10 seconds
Vibration Test	$\Delta R: \pm(0.5\% + 0.0005\Omega)$ Without mechanical damage such as break	(1) Preconditioning (2) Parts are tested at 10Hz to 2kHz at 15g, 20min, 12 times per 3 mutually perpendicular directions, total 12hours
Mechanical Shock Test	$\Delta R: \pm(0.5\% + 0.0005\Omega)$ Without mechanical damage such as break	(1) Preconditioning (2) Parts are tested at $50 \pm 5\text{G}$ , 11ms, 3 shocks per 3 mutually perpendicular axes, total 18 shocks
Flexure Strength	$\Delta R: \pm(0.5\% + 0.0005\Omega)$ Without mechanical damage such as break	(1) Bending value: 2 mm for $60 \pm 1$ seconds

## Endurance

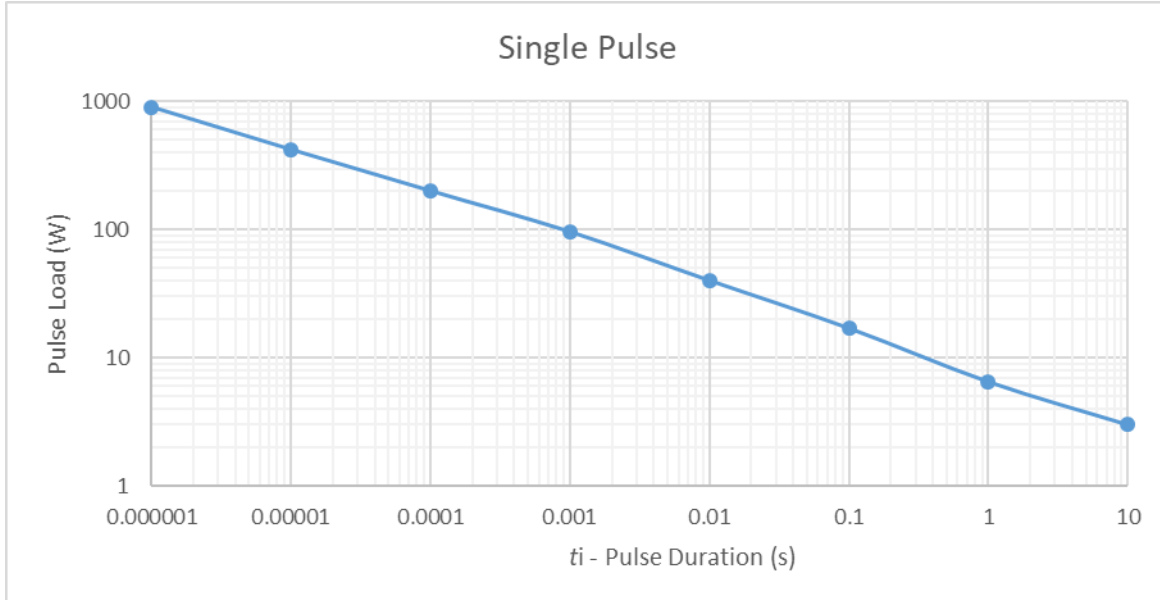
Item	Specification and Requirement	Test Method (JIS 5201)
Thermal cycling (Air to Air) Test	$\Delta R: \pm(2.0\% + 0.0005\Omega)$ Without distinct damage in appearance	(1) Preconditioning (2) Parts are tested at $-55 \pm 3^\circ\text{C}$ to $125 \pm 3^\circ\text{C}$ with 30 min dwell time at each temperature, 1min max transition time, 1000 cycles. (3) Measuring resistance 1 hour after test
Temperature Humidity Test	$\Delta R: \pm(3.0\% + 0.0005\Omega)$ Without distinct damage in appearance Marking should be legible	(1) Preconditioning (2) Soldering heat (3) Flexure strength (4) Parts are tested at 1,000 hours at $60^\circ\text{C} \pm 2^\circ\text{C}$ , 90-95% RH
Load Life (Endurance) Test (Power Cycling)	$\Delta R: \pm(2.0\% + 0.0005\Omega)$ Without distinct damage in appearance	(1) Preconditioning (2) Parts must be cycled at $70^\circ\text{C}$ at full rated power for 1.5hr power on and 0.5hr power off for 1000 hours
Load Life (Endurance) Test	$\Delta R: \pm(2.0\% + 0.0005\Omega)$ Without distinct damage in appearance	(1) Preconditioning Parts are tested at a temperature of $125 \pm 2^\circ\text{C}$ and rated power (or maximum rated temperature) for 1,000 hours
HAST(Autoclave) (This test should be performed after resistance to soldering heat and flexure strength tests)	$\Delta R: \pm(3.0\% + 0.0005\Omega)$ Without distinct damage in appearance	(1) Preconditioning (2) Soldering heat (3) Flexure strength Part are tested for 48 hours, $121^\circ\text{C}$ , 100% R.H., 29.7 psia
Terminal Strength	$\Delta R: \pm(0.5\% + 0.0005\Omega)$ Without mechanical damage such as break	(1) Thrust 17.7 N (2) Times: 60 seconds

\*Preconditioning:  $125^\circ\text{C} \times 24\text{H}$ 、 $85^\circ\text{C} / 85\% \text{RH} \times 168\text{H}$ 、3 reflow cycles

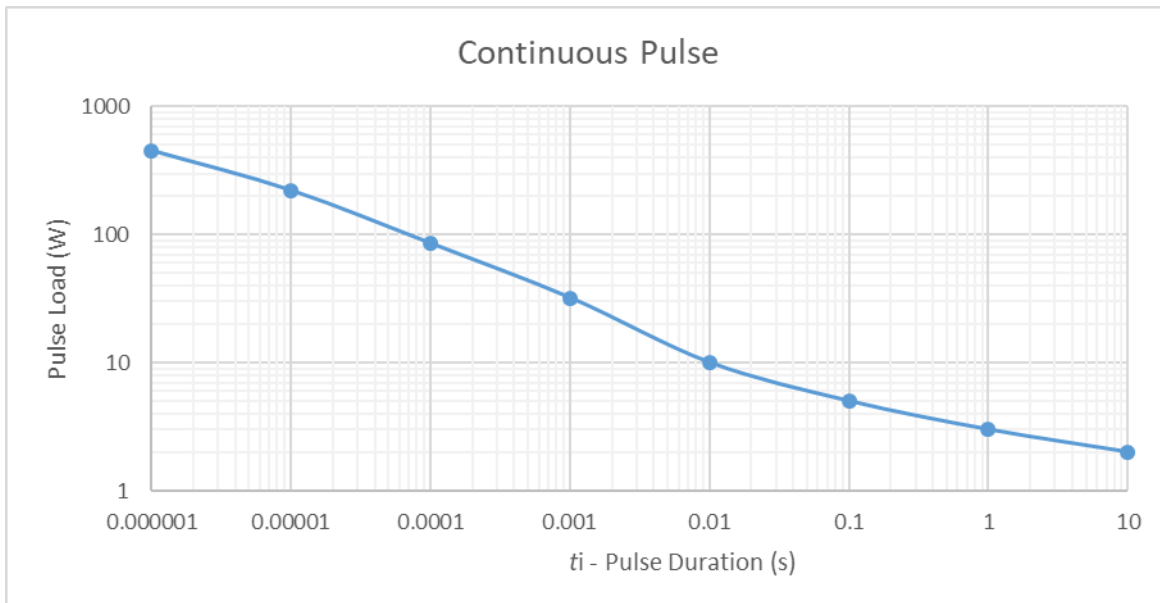
## Pulse test

Item	Specification and Requirement	Test Method (JIS 5201)
Single pulsed operational life	$\Delta R: \pm 1.0\%$ Without distinct damage in appearance	(1) Preconditioning (2) Applied for the single pulse and its duration is 1us to 10s (3) The maximum power load is shown in Table 1
Continuous pulsed operational life	$\Delta R: \pm 1.0\%$ Without distinct damage in appearance	(1) Preconditioning (2) Applied for the continuous pulse, its one cycle: ON time is 1us to 10s (ti), OFF time is 10*ti. (3) Test cycles: 1000 cycles (4) The maximum power load is shown in Table 2

## Single Pulse (Table 1)

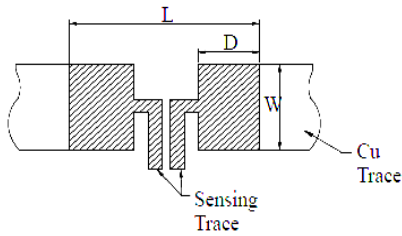


## Continuous Pulse (Table 2)





Recommend Land Pattern Dimensions :



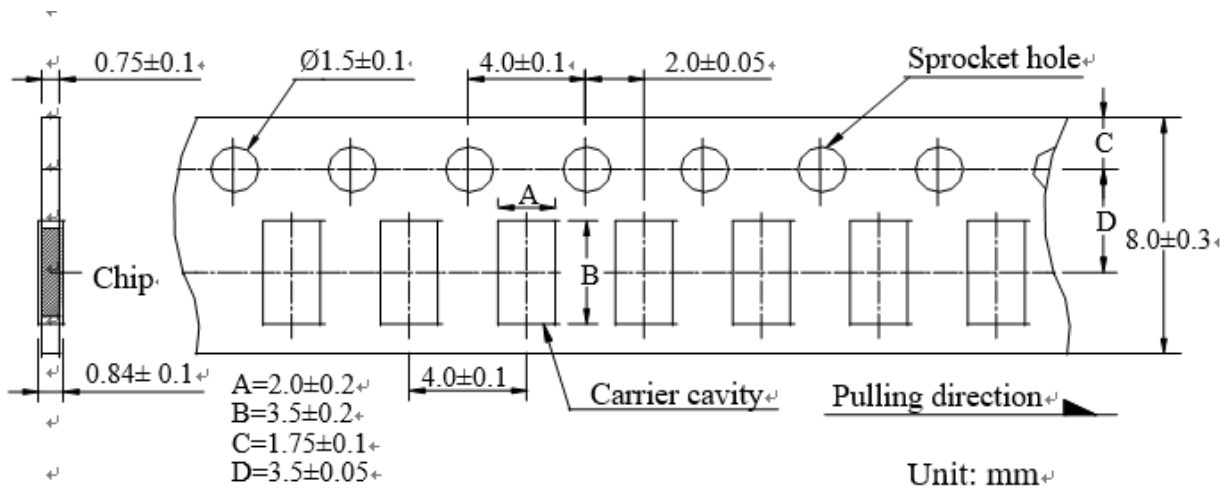
Size	W (mm)	L (mm)	D (mm)	t (um)
1632	1.78	4.14	1.37	105

Unit : mm

t : copper foil minimum thickness of PCB

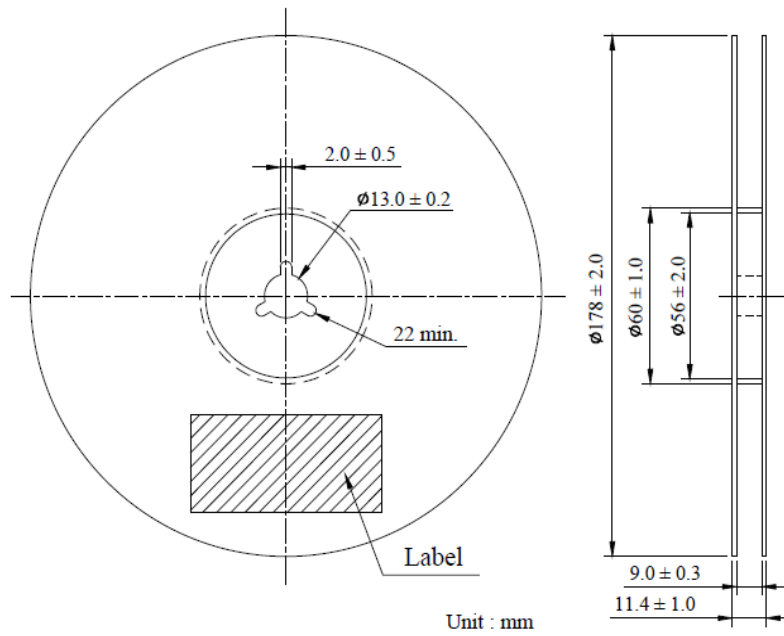
Packaging :

Tape packaging dimensions



Remark: Leader tape length  $\geq 30$  cm ( 150 Hollow carrier cavity)

## Reel dimensions



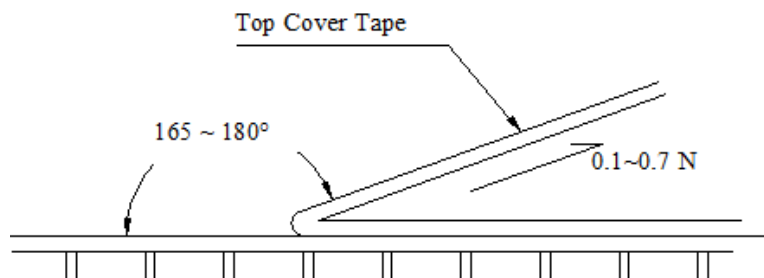
Numbers of Taping : 5,000 pieces /reel

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 30 to 80% 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).

### 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.