



# **GENERAL PURPOSE RESISTORS**

**General Purpose Wire Wound / Fusible Resistors**

[www.DataSheet4U.com](http://www.DataSheet4U.com)

## **Token Electronics Industry Co., Ltd.**

**Taiwan:** No. 137, Sec. 1, Chung Shin Rd., Wu Ku Hsiang, Taipei Hsien, Taiwan, R.O.C  
TEL: 886-2-2981 0109; FAX: 886-2-2988 7487

**China:** 12F, Zhongxing Industry Bld., Chuangye Rd., Nanshan District, Shenzhen, Guangdong  
TEL: 86-755-2605 5363, 2605 5364; FAX: 86-755-2605 5365



<http://www.token.com.tw>



[rfq@token.com.tw](mailto:rfq@token.com.tw)

[www.DataSheet4U.com](http://www.DataSheet4U.com)

# Product Index

## Information

|  |    |
|--|----|
| ● General Information .....            | 01 |
| ● Terminology & Glossary .....         | 03 |
| ● Selecting The Optimum Resistor ..... | 05 |

## Wire Wound Resistors

|   |    |
|---|----|
| ● BWW Series - High Precision Wirewound Resistor .....            | 07 |
| ● KNP-R Series - Power Precision Wirewound Resistor .....         | 10 |
| ● KNP-VE Series - Vitreous Enamel Coated Wirewound Resistor ..... | 13 |
| ● KNP Series - General Purpose Wirewound Resistor .....           | 16 |
| ● KNPN Series - Non-Inductive Wirewound Resistor .....            | 19 |

## Fusible Resistors

|   |    |
|---|----|
| ● FRN Series - Precision Fusible Resistor .....                 | 22 |
| ● FKN Series - Wirewound Fusible Resistor .....                 | 22 |
| ● FSQ Series - Thermal Dissipation Fusible Resistor .....       | 22 |
| ● FKU, FRU Series - Cement Resistor with Thermal Cut-offs ..... | 26 |

## General Purpose Resistors

|  |    |
|--|----|
| ● PGM Series - Light Dependent / CdS Photoresistor .....               | 29 |
| ● RCR Series - Pulse Load Anti-Surge Resistor .....                    | 36 |
| ● CCR Series - Carbon Composition Resistor .....                       | 39 |
| ● MF Series - Precision Resistor .....                                 | 42 |
| ● RSS, RSN Series - Power Film Resistor .....                          | 45 |
| ● CF Series - General Purpose Carbon Film Resistor .....               | 48 |
| ● ZO, JW Series - Zero Ohm and Jumper Wire .....                       | 51 |
| ● SQ Series - Thermal Dissipation Ceramic Housed Cement Resistor ..... | 54 |

Notice: Specification Changed or Version Updated will be posted at irregular intervals.  
All Updated and Final Specifications, Please Confirm with TOKEN ELECTRONICS  
REPRESENTATIVES.

# Information of General Purpose Resistors

## General Purpose Resistors With Customized Service

Token Electronics is expanding business to include a broad range of General Purpose Resistor products designed for high volume applications. This expanded range of commercial resistor presents a more comprehensive product offering for Customer Experience Management (CEM) and other high volume customers that require quality products at competitive pricing.

Backed by the same customer service, technical support and quality assurance that Token has always provided, these new commercial products enable you the opportunity to source a wider range of resistors from a trusted supplier.

## General Use

When an ambient temperature exceeds a rated ambient temperature, resistor shall be applied on the derating curve by derating the load power. General purpose resistor under overloads is not combustion resistant and is likely to emit, flame, gas, smoke, red heat, etc. Flame retardant resistor generally emit smoke and red heat in a certain power and over but do not emit fire or flame.

When resistors are shielded or coated with resin etc., stress from the storage heat and the resin are applied. So, performance and reliability should be checked well before use.

When a voltage higher than rated is applied in a short time (single pulse, repeated pulses, surge, etc.), it does not necessarily ensure safety that an effective wattage is not higher than a rated wattage. Then consult with us with your specified pulse wave shape. Resistors shall be used in a condition causing no dew condensation.

[www.DataSheet4U.com](http://www.DataSheet4U.com)

Keep temperature from rising by choosing resistor with a higher rated capacity; do not use a component having the exact load value required. For considerations of safety in extended period applications, the rating should be more than four times higher than the actual wattage involved, but never use resistors at less than 25% of its rated power.

In applications where resistors are subject to intermittent current surges and spikes, be sure in advance that the components selected are capable of withstanding brief durations of increased load.

Do not exceed the recommended rated load. Resistor must used within the rated voltage range to prevent the shortening of service life and/or failure of the wound resistance elements.

Minimum load: Resistor must be utilized at 1/10 or more of the rated voltage to prevent poor conductance due to oxidation build-up. For basic particulars for cautions, refer to EIAJ Technical Report RCR-2121 "Guidance for care note on fixed-resistors".

# Glossary Terminology of General Purpose Resistors

## **Fusible Resistor (Fuse Resistor, Circuit Protect Resistor)**

A resistor designed to protect a circuit against overload; its resistance limits current flow and thereby protects against surges when power is first applied to a circuit; its fuse characteristic opens the circuit when current drain exceeds design limits.

## **Thermal Cutoff Resistor**

The maximum nominal resistance value at which the rated power can be applied continuously without exceeding the maximum working voltage is the critical resistance value. The rated voltage is equal to the maximum working voltage in the critical resistance value. If the circuit designs permits, the choice of a high ohmic value resistor or divider network will eliminate this consideration.

A thermal fuse is a cutoff which uses a one-time fusible link. Unlike the thermostat which automatically resets itself when the temperature drops, the thermal fuse is more like an electrical fuse: a single-use device that cannot be reset and must be replaced when it fails or is triggered. A thermal fuse is most useful when the overheating is a result of a rare occurrence, such as failure requiring repair (which would also replace the fuse) or replacement at the end of service life.

Token offers “Thermal Cut-off Resistor”, a thermal Cut-offs is a fusible alloy and a resistor is a voltage divider, both are surrounded by a ceramic cement with special resin. Under normal operating temperatures the fusible alloy joins the two lead wires within the body of the cutoff and the power resistor acts as a normal function resistor. When the preset temperature of the cutoff is reached, the fusible alloy melts and with the aid of the special resin, complete cutoff is ensured.

Thermal fuse resistors are usually found in heat-producing electrical appliances such as coffeemakers and hair dryers. They function as safety devices to disconnect the current to the heating element in case of a malfunction (such as a defective thermostat) that would otherwise allow the temperature to rise to dangerous levels, possibly starting a fire.

[www.DataSheet4U.com](http://www.DataSheet4U.com)

## Anti-Surge Resistor (RCR)

Surges in electronic circuits are caused by internal conditions — switching operations from other electronic components or due to external conditions on the AC power mains — switching operations in the power grid or from nearby lightning strikes, either directly to the power distribution system or to nearby ground. Electronic products have to be surge immune to ensure their continued reliable operation if subjected to realistic levels of surge voltages, and they are required to comply with safety requirements. Token's RCR series is a perfect fit when an anti-surge resistor is required.

## Light Dependent Resistor (LDR)

A photoresistor or light dependent resistor or cadmium sulfide (CdS) cell is a resistor whose resistance decreases with increasing incident light intensity. It can also be referenced as a photoconductor.

A photoresistor is made of a high resistance semiconductor. If light falling on the device is of high enough frequency, photons absorbed by the semiconductor give bound electrons enough energy to jump into the conduction band. The resulting free electron (and its hole partner) conduct electricity, thereby lowering resistance.

## Carbon Composition Resistor (CCR)

CCR is made up of a solid rod of conductive composite material, the chemical composition of which is altered to produce different resistance values. The general composition consists of the carbon conductor and ceramic filler materials. By altering the ratio of filler to conductor it is possible to change the resistance value. Interference-fit end caps are attached to the rods, leads are welded onto these caps, and the resistor body is then protected with a specially formulated epoxy coating. The resistors are then colour code marked.

## Ayrton-Perry Winding

Winding of two wires in parallel but opposite directions to give better cancellation of magnetic fields than is obtained with a single winding.

Wirewound technology has long been known as a leading technology for power resistor needs. The most critical drawback with this technology is that it is inherently inductive. This is logical given that a wirewound inductor and a wirewound resistor are made with essentially the same materials and processes. This fact limits the use of wirewounds for applications with high switching speeds, which require low inductance.

Now the same standard wirewounds can be used for these applications by using a non-inductively wound version. This manufacturing method greatly reduces the inductance of any given resistor size and value combination, however it does not completely eliminate the inductance. A non-inductively wound wirewound has one winding in one direction and one in the other direction; known as Ayrton Perry winding. This non-inductive winding is available in all Token standard wire-wound resistor series.

[www.DataSheet4U.com](http://www.DataSheet4U.com)

► Selecting The Optimum Resistor Technology to Best Match The Performance Requirements

| Comparison of Axial Lead Resistor Characteristics Table |       |             |            |                  |                  |            |               |             |
|---|-------|-------------|------------|------------------|------------------|------------|---------------|-------------|
| Characteristics   |       | Thin Film   |            | Thick Film       |                  | Wire Wound |               | Alloy Strip |
|   |       | Carbon Film | Metal Film | Metal Oxide Film | Metal Glaze Film | Standard   | Non-Inductive |             |
| Tolerance (%)   | ±0.01 |             | ✓          |                  |                  | ✓          |               |             |
|   | ±0.02 |             | ✓          |                  |                  | ✓          |               |             |
|   | ±0.05 |             | ✓          |                  |                  | ✓          |               |             |
|   | ±0.1  |             | ✓          |                  |                  | ✓          |               |             |
|   | ±0.25 |             | ✓          |                  |                  | ✓          |               |             |
|   | ±0.5  |             | ✓          |                  |                  | ✓          |               |             |
|   | ±1.0  |             | ✓          |                  | ✓                | ✓          | ✓             | ✓           |
|   | ±2.0  | ✓           |            | ✓                | ✓                | ✓          | ✓             | ✓           |
|   | ±5.0  | ✓           |            | ✓                | ✓                | ✓          | ✓             | ✓           |
|   | ±10   | ✓           |            | ✓                | ✓                | ✓          | ✓             | ✓           |
| Temperature Coefficient (PPM/°C)                        | 5     |             | ✓          |                  |                  |            |               |             |
|   | 10    |             | ✓          |                  |                  |            |               |             |
|   | 15    |             | ✓          |                  |                  |            |               |             |
|   | 25    |             | ✓          |                  |                  | ✓          |               | ✓           |
|   | 50    |             | ✓          |                  |                  | ✓          | ✓             | ✓           |
|   | 100   |             | ✓          |                  | ✓                | ✓          | ✓             | ✓           |
|   | 200   | ✓           |            | ✓                | ✓                | ✓          | ✓             |             |
|   | 400   | ✓           |            | ✓                | ✓                | ✓          | ✓             |             |
|   | 1,000 | ✓           |            |                  |                  |            |               |             |
| Operating Temperature Range (°C)                        | 200   |             |            | ✓                |                  |            |               | ✓           |
|   | 165   |             | ✓          | ✓                | ✓                | ✓          | ✓             | ✓           |
|   | 125   | ✓           | ✓          | ✓                | ✓                | ✓          | ✓             | ✓           |
|   | 70    | ✓           | ✓          | ✓                | ✓                | ✓          | ✓             | ✓           |
|   | 40    | ✓           |            | ✓                | ✓                | ✓          | ✓             | ✓           |
|   | 10    | ✓           |            | ✓                | ✓                | ✓          | ✓             | ✓           |
| Wattage (W)   | 1/16  |             |            |                  |                  |            |               |             |
|   | 1/8   | ✓           | ✓          |                  |                  |            |               |             |
|   | 1/4   | ✓           | ✓          | ✓                | ✓                | ✓          |               |             |
|   | 1/2   | ✓           | ✓          | ✓                | ✓                | ✓          | ✓             | ✓           |
|   | 1     | ✓           | ✓          | ✓                | ✓                | ✓          | ✓             | ✓           |
|   | 2     | ✓           | ✓          | ✓                | ✓                | ✓          | ✓             | ✓           |
|   | 3     | ✓           | ✓          | ✓                | ✓                | ✓          | ✓             | ✓           |
|   | 5     |             |            | ✓                | ✓                | ✓          | ✓             |             |
| 10  |       |             | ✓          | ✓                | ✓                |            |               |             |

Continued on the following page. 

↑ Continued from the preceding page.

| Characteristics      |           | Thin Film   |            | Thick Film       |                  | Wire Wound |               | Alloy Strip |
|----------------------|-----------|-------------|------------|------------------|------------------|------------|---------------|-------------|
|                      |           | Carbon Film | Metal Film | Metal Oxide Film | Metal Glaze Film | Standard   | Non-Inductive |             |
| Resistance Range (Ω) | 0.1       |             |            |                  |                  |            |               |             |
|                      | 1         |             | ✓          |                  |                  |            |               |             |
|                      | 10        | ✓           | ✓          | ✓                | ✓                | ✓          | ✓             |             |
|                      | 100       | ✓           | ✓          | ✓                | ✓                | ✓          | ✓             |             |
|                      | 1K        | ✓           | ✓          | ✓                | ✓                | ✓          |               |             |
|                      | 10K       | ✓           | ✓          | ✓                | ✓                | ✓          |               |             |
|                      | 100K      | ✓           | ✓          |                  | ✓                | ✓          |               |             |
|                      | 1M        | ✓           | ✓          |                  | ✓                | ✓          |               |             |
|                      | 10M       | ✓           |            |                  | ✓                | ✓          |               |             |
| Volume Size          | Standard  | Standard    | Standard   | Standard         | Standard         | Bigger     | Compact       |             |
| High Frequency       | Available | Available   | Available  | Available        | None             | Available  | Available     |             |
| Cost                 | Cheap     | Fair        | Fair       | Fair             | High             | High       | Fair          |             |
| Noise                | Fair      | Good        | Fair       | Fair             | Fair             | Good       | Good          |             |
| Stability            | Fair      | Excellent   | Good       | Good             | Excellent        | Good       | Excellent     |             |

| Class                           | Advantage  | Disadvantage                                 |
|---------------------------------|--|--|
| Carbon Resistors                | Cheap, General Purposes  | High TCR,                                    |
| Metal Film Resistors            | Low TCR, Tight Tolerance, High Stability                               | Fair Withstanding Voltage                    |
| Metal Oxide Resistors           | Replace high resistance wire wound resistor, Good withstanding voltage | Resistance Range Limitation, Fair Tolerance  |
| Wirewound Resistors             | High Pulse Load, Anti-Surge, High Stability                            | High Inductance, Resistance Range Limitation |
| Non-Inductive Resistors         | High Pulse Load, Anti-Surge, High Stability                            | Resistance Range Limitation, High Cost       |
| Ceramic Housed Cement Resistors | Rugged, excellent heat dissipation, withstanding high temperature      | Heavy Weight, Big Volume                     |
| Metal Glaze Resistors           | High Pulse Load, Anti-Surge, High Stability                            | High TCR, Fair Tolerance                     |
| Alloy Strip                     | Low TCR, Low Ohmic   | Fair Tolerance                               |

www.DataSheet4U.com



# Precision Moulded Wirewound Resistors

## (BWW) Precision Wirewound Power Resistors Operate in Harsh Environments

### ▶ Preview

The new BWW series moulded axial leaded wirewound resistors from Token use high-purity alumina ceramic cores with wire winding which are spot welded by precision CNC machine tools to ensure total operational consistency throughout.

Also, using advanced encapsulation die/mould technologies, this precision power resistors are encapsulated with epoxy molding compound.

The BWW models possess a wide resistance value from 0.1Ω to 39KΩ and meets the stringent requirements of MIL-R-93. Ayrton Perry noninductive windings are available on request. The BWW precision version has low ohmic values for current sensing applications.

All versions are miniaturised for better power to dimension ratios and are available in 0.5W to 10W rated power at 25°C. Tolerance is available in ±0.1%, ±0.25%, ±0.5%, ±1% and ±2% with TCR ±25PPM/°C, ±50PPM/°C and ±150PPM/°C which makes them ideally suited for use in precision applications.

The BWW series is RoHS compliant with 100% Sn (lead free) coated terminals. To address your need for technical and economic success in a timely manner, our custom solutions are the best option. Contact us with your specific needs.

### ▶ Features

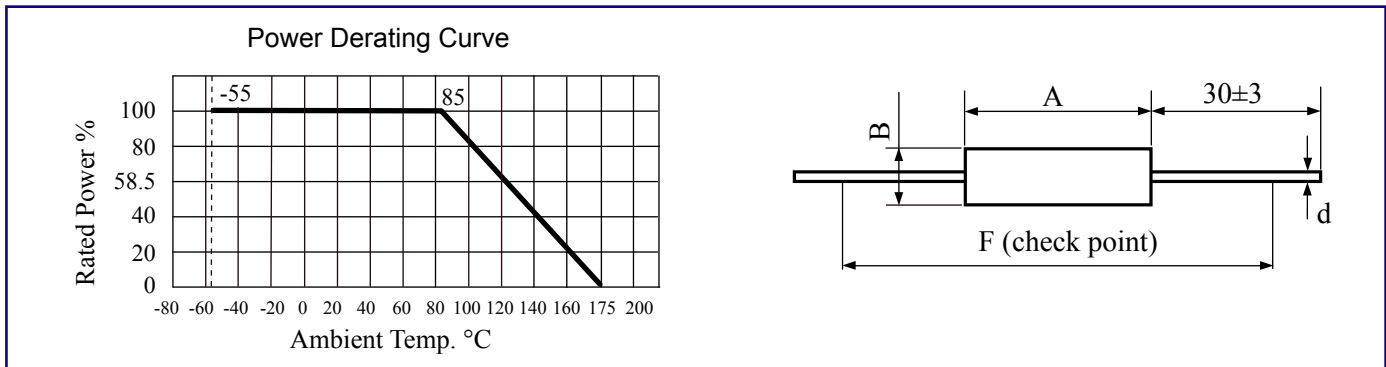
- Axial Moulded
- Excellent load life stability
- Insulation, Moisture Proof
- High Precision and reliability
- Meets the Standards of MIL-R-93
- RoHS compliant with 100% lead free

### ▶ Applications

- Electrical loads, Filament dropping
- DC/DC converters, AC/DC inverters
- High-voltage bleeders, Dynamic braking
- Capacitor charging/discharging regulation
- Motor speed controls, Voltage divider networks
- Bias supply, Current shunts, Voltage dropping, Crow-bar circuits



## Technical Specifications



| Type    | RateWatts at 25°C (W) | Resistance Range (Ω) |     | Tolerance (%)                     | TCR (PPM/°C)       | Dimensions (mm) |         |     |      |
|---------|-----------------------|----------------------|-----|-----------------------------------|--------------------|-----------------|---------|-----|------|
|         |                       | Min                  | Max |                                   |                    | A±0.25          | ΦB±0.25 | Φd  | F    |
| BWW-0.5 | 0.5                   | 0.1                  | 100 | ±0.1<br>±0.25<br>±0.5<br>±1<br>±2 | ±25<br>±50<br>±150 | 7.0             | 3.0     | 0.8 | 27.0 |
| BWW-1   | 1.0                   | 0.1                  | 1K  |                                   |                    | 11.0            | 3.0     | 0.8 | 31.0 |
| BWW-3   | 3.0                   | 0.1                  | 10K |                                   |                    | 15.0            | 5.2     | 0.8 | 34.0 |
| BWW-4   | 4.0                   | 0.1                  | 15K |                                   |                    | 18.0            | 6.5     | 0.8 | 38.0 |
| BWW-5   | 5.0                   | 1                    | 24K |                                   |                    | 24.0            | 8.4     | 1.0 | 44.0 |
| BWW-10  | 10.0                  | 1                    | 39K |                                   |                    | 46.5            | 10.0    | 1.0 | 66.0 |

## Performance

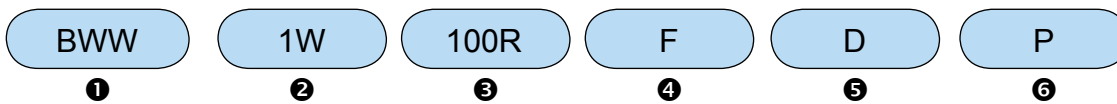
| Test Items                      | Test Conditions                  | Specifications   |
|---------------------------------|----------------------------------|------------------|
| Operating Temp. Range           |                                  | -55°C ~ 175°C    |
| Insulation Resistance           | 500V                             | >1GΩ             |
| Dielectric Withstanding Voltage | 500V AC 1 Min.                   | ΔR ≤ ±0.1%R      |
| Load Life                       | 70°C on~off cycle 1000 Hrs.      | ΔR ≤ ±1%R        |
| Moisture-Proof Load Life        | 40°C 95% RH on~off cycle 21 Hrs. | ΔR ≤ ±0.2%R      |
| Resistance to soldering heat    | 350°C, 3.5s                      | ΔR ≤ ±0.1%R      |
| Solderability                   | 235±5°C, 5s(solder bath method)  | IEC68-2-20(1968) |

## ▶ Application Notes

### Precision Wire-wound Resistors Application Notes:

- When being used in AC circuits, some wirewound structures give inductance ingredients or parasitic capacity, so they may cause unusual phenomena such as oscillations etc. Quorum deviations of other components should be carefully taken into account for use.
- Application and Placement: Wire wound resistors use different gauges of wire as resistance elements. Sometimes the gauge is extremely thin (finer than a strand of human hair) and very susceptible to breakage in environments containing salts, ash, dust and corrosives. Avoid utilization in such environments.
- Do not install in dusty areas because the accumulation will cause shorts and poor conductance.

## ▶ How to Order



❶ Part Number: BWW

❷ Rated Power (W)

❸ Resistance Value ( $\Omega$ )

| Code | Resistance Value ( $\Omega$ ) |
|------|-------------------------------|
| OR1  | 0.1 $\Omega$                  |
| 100R | 100 $\Omega$                  |
| 1K   | 1000 $\Omega$                 |

❹ Resistance Tolerance (%)

| Code | Resistance Tolerance |
|------|----------------------|
| B    | $\pm 0.1\%$          |
| C    | $\pm 0.25\%$         |
| D    | $\pm 0.5\%$          |
| F    | $\pm 1\%$            |
| G    | $\pm 2\%$            |

❺ TCR (PPM/ $^{\circ}$ C)

| Code | TCR                                  |
|------|--------------------------------------|
| C    | $\pm 25\text{PPM}/^{\circ}\text{C}$  |
| D    | $\pm 50\text{PPM}/^{\circ}\text{C}$  |
| K    | $\pm 150\text{PPM}/^{\circ}\text{C}$ |

❻ Package

| Code | Package |
|------|---------|
| P    | Bulk    |

# Power Precision Wirewound Resistors

## Wirewound Resistors Boast Consistent Precision Power Operation

### ▶ Preview

Token's highest quality conformal axial terminal ceramic-silicone coated KNP-R power resistors for applications requiring high stability and precision. The KNP-R wire-wound has a low temperature coefficient and maintain a high degree of stability under demanding conditions.

The power precision KNP-R series meeting MIL-R-26E (U and V characteristics) and surface temperature (hot spot) 375°C max. Resistors with a wide range of 0.01Ω ~ 82kΩ, covering applications from precision to power. Products with lead-free terminations meet EU RoHS and China RoHS requirements.

#### Characteristics U :

275°C Maximum hot spot temperature. 1% Maximum ΔR in 1000 hours load life.

#### Characteristics V :

375°C Maximum hot spot temperature. 3% Maximum ΔR in 1000 hours load life.

Operating temperature range is -55°C ~ +375°C and derated power at high ambient temperatures as according to the chart below. Token is equipped to design and produce custom components to meet many design and reliability demands. In addition to standard military-grade resistor products, we also have many resistive products designed to meet various source-controlled drawings.

Contact us with your specific needs.

### ▶ Features

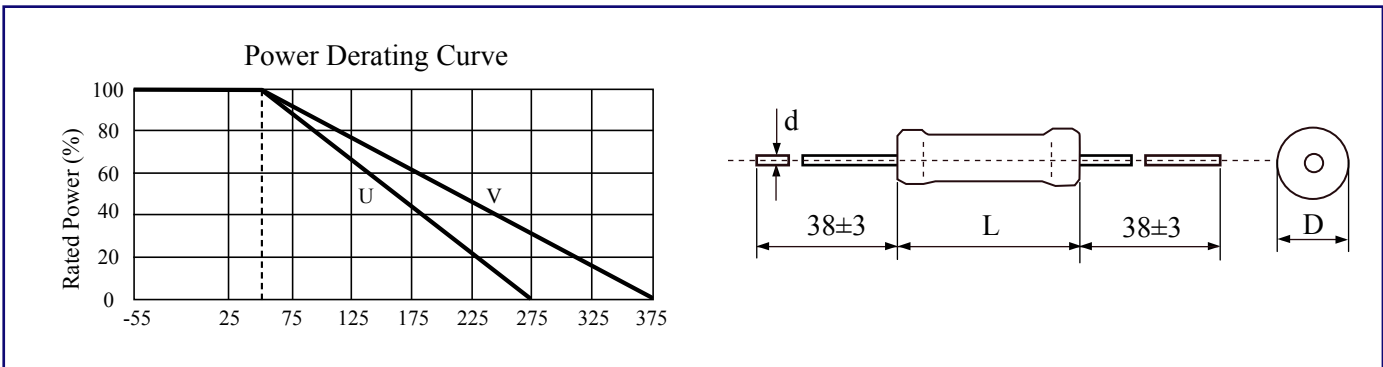
- Excellent load life stability
- High Precision and reliability
- Axial ceramic-silicone coated
- Meets the Standards of MIL-R-26E
- RoHS compliant with 100% lead free

### ▶ Applications

- Radar, Ground Vehicles
- Communications systems
- Bias supply, Current shunts, Voltage dropping
- Motor speed controls, Voltage divider networks
- Medical instrumentation and Medical implantables



## ► Technical Specifications



| Type     | MIL - R-26E | Power Rating (W) |       | Max. Working Voltage (V) |     | Resistance Range (Ω) |       |      |            | Dimensions (mm) |    |    |        |        |       |
|----------|-------------|------------------|-------|--------------------------|-----|----------------------|-------|------|------------|-----------------|----|----|--------|--------|-------|
|          |             | U                | V     | U                        | V   | 0.1%                 | 0.25% | 0.5% | 1%         | 2%              | 3% | 5% | L±0.81 | D±0.81 | d±0.1 |
| KNP-R1/4 | -           | 0.40             | -     | 20                       | -   | 10~950               |       |      | 1~3.4K     |                 |    |    | 6.35   | 1.98   | 0.51  |
| KNP-R1/2 | RW70        | 0.75             | -     | 29                       | -   | 10~1.3K              |       |      | 1~4.9K     |                 |    |    | 7.92   | 1.98   | 0.51  |
| KNP-R1A  | -           | 1.00             | -     | 53                       | -   | 1~2.7K               |       |      | 0.1~10.4K  |                 |    |    | 10.31  | 2.36   | 0.64  |
| KNP-R1   | RW69        | 1.10             | -     | 62                       | -   | 1~4.0K               |       |      | 0.1~15K    |                 |    |    | 13.49  | 2.36   | 0.64  |
| KNP-R2A  | -           | 2.50             | 3.25  | 138                      | 157 | 1~8.6K               |       |      | 0.01~32.3K |                 |    |    | 12.70  | 5.33   | 0.81  |
| KNP-R2   | RW79        | 3.00             | 3.75  | 135                      | 148 | 1~5K                 |       |      | 0.01~2K    |                 |    |    | 13.49  | 4.06   | 0.81  |
| KNP-R3A  | -           | 3.00             | 3.75  | 135                      | 148 | 1~6.5K               |       |      | 0.01~34.5K |                 |    |    | 14.27  | 5.33   | 0.81  |
| KNP-R3   | -           | 3.25             | 4.75  | 185                      | 220 | 1~11.4K              |       |      | 0.01~42.1K |                 |    |    | 20.62  | 5.33   | 1.02  |
| KNP-R4   | RW67        | 4.00             | 5.50  | 210                      | 250 | 1~12.7K              |       |      | 0.01~47.1K |                 |    |    | 15.88  | 7.62   | 1.02  |
| KNP-R5   | RW74        | 5.00             | 6.50  | 330                      | 376 | 0.5~24.5K            |       |      | 0.01~51K   |                 |    |    | 22.22  | 7.62   | 1.02  |
| KNP-R7   | RW68        | 7.00             | 9.00  | 504                      | 576 | 0.5~41.4K            |       |      | 0.01~75K   |                 |    |    | 30.94  | 9.52   | 1.02  |
| KNP-R10  | RW78        | 10.00            | 13.00 | 799                      | 911 | 0.5~71.3K            |       |      | 0.01~82K   |                 |    |    | 45.21  | 9.52   | 1.02  |

Temperature Coefficient: 1 Ω and below ± 150 ppm/°C, 1 Ω to 9.9 Ω ± 100 ppm/°C, 10 Ω and above ± 100 ppm/°C, (50 ppm/°C on request)

## ► Electrical Performance

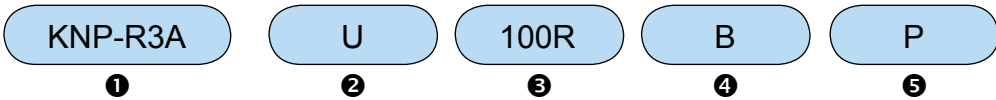
| Test Items                 | Test Method                                    | Specifications                       |
|----------------------------|--|--------------------------------------|
| Short Time Overload        | 2.5 times of rated voltage 5 sec.              | ΔR±(2%+0.05Ω)                        |
| Rated Load                 | Rated wattage 30 minutes.                      | ΔR±(1%+0.05Ω)                        |
| Voltage Withstanding       | 500VAC 1 minute.                               | ΔR±(1%+0.05Ω)                        |
| Insulation Resistance      | 500V   | 20MΩ                                 |
| Temp. Cycle                | -20°C ~ 85°C 5 cycles                          | ΔR±(1%+0.05Ω)                        |
| Soldering After Resistance | 235°C for 3 sec                                | ΔR±(0.5%+0.05Ω)                      |
| Incombustibility           | 16 times of rated wattage for 5 min.           | Not flamed                           |
| Load Life                  | +25°C, 1.5Hrs on ~ 0.5Hrs off cycle, 1000 Hrs. | U: ΔR±(1%+0.05Ω)<br>V: ΔR±(3%+0.05Ω) |

## Application Notes

### Wire-wound Resistors Application Notes:

- When being used in AC circuits, some wirewound structures give inductance ingredients or parasitic capacity, so they may cause unusual phenomena such as oscillations etc. Quorum deviations of other components should be carefully taken into account for use.
- Application and Placement: Wire wound resistors use different gauges of wire as resistance elements. Sometimes the gauge is extremely thin (finer than a strand of human hair) and very susceptible to breakage in environments containing salts, ash, dust and corrosives. Avoid utilization in such environments.
- Do not install in dusty areas because the accumulation will cause shorts and poor conductance.

## How to Order



❶ Part Number: KNP-R

❷ Characteristic (°C)

| Code | Resistance Value (Ω) |
|------|----------------------|
| U    | 275°C                |
| V    | 375°C                |

❸ Resistance Value (Ω)

| Code | Resistance Value |
|------|------------------|
| 0R1  | 1.0Ω             |
| 1R   | 1Ω               |
| 100R | 100Ω             |
| 1K   | 1000Ω            |

❹ Resistance Tolerance (%)

| Code | Resistance Tolerance |
|------|----------------------|
| B    | ±0.1%                |
| C    | ±0.25%               |
| D    | ±0.5%                |
| F    | ±1%                  |
| G    | ±2%                  |
| H    | ±3%                  |
| J    | ±5%                  |

❺ Package

| Code | Package    |
|------|------------|
| TB   | Taping Box |
| P    | Bulk       |

# Vitreous Enamel Coated Wirewound Resistors

## Vitreous Enamel Coated Power High Energy Wirewound Resistors

### ▶ Preview

The KNP-VE Series of vitreous enamel coated power resistors from Token offers a cost-competitive alternative over the 2.5W-12W power range. The range is available with resistance values of 1Ω to 39KΩ in power ratings of 2.5W, 3W, 5W, 6W, 8W, 9W and 12W (at 25°C), and with body sizes that match the industry standards.

Vitreous enamelled resistors were introduced at a time when alternative directly applied coatings could not withstand the thermal stresses caused by the resistors' high body temperatures.

Token offers the durability of a lead free conformal vitreous enamel coating, permits the KNP-VE Series resistors to maintain a hard coating while operating at high temperatures. Mechanical integrity is enhanced by the all-welded construction.

Power KNP-VE Wirewound Series are ideal for computer, communications and industrial applications in which cost, quality, and reliability are key considerations. The KNP-VE series is RoHS compliant and Ayrton Perry noninductive windings are available on request.

To address your need for technical and economic success in a timely manner, our custom solutions are the best choice.

Contact us with your specific needs.

### ▶ Applications

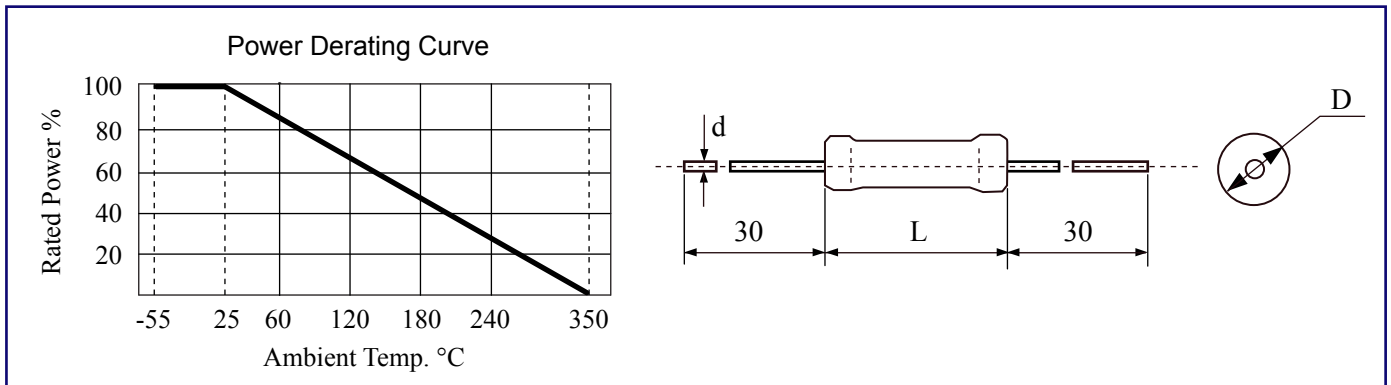
- Power tools
- Consumer applications
- Power supplies, Welders
- High voltage applications
- High-switching applications
- Home entertainment, appliances

### ▶ Features

- Excellent pulse load capability
- Axial leads, All-welded construction
- A wide range of power ratings 2.5W to 12W
- A wide resistance range 1Ω to 39KΩ, Tolerance ±5%, ±10%
- Products with Pb-free Terminations and RoHS compliant
- Rugged vitreous enamel coating withstands high humidity and temperature cycling
- Durable construction, recommended for industrial applications where reliability is paramount



## Technical Specifications



| Type       | Rated Watts (W) | Resistance Range (Ω) | Limiting Voltage (V) | Tolerance   | Temperature Coefficient (PPM/°C) | Dimensions (mm) (Max) |     |     |
|------------|-----------------|----------------------|----------------------|-------------|----------------------------------|-----------------------|-----|-----|
|            |                 |                      |                      |             |                                  | L                     | ΦD  | Φd  |
| KNP-VE-2.5 | 2.5             | 1 ~ 1K               | 100                  | ±5%<br>±10% | ±250<br>±400                     | 12.7                  | 5.6 | 0.8 |
| KNP-VE-3   | 3               | 1 ~ 1K               | 120                  |             |                                  | 14.0                  | 7.0 |     |
| KNP-VE-5   | 5               | 1 ~ 3.6K             | 160                  |             |                                  | 23.0                  | 7.0 |     |
| KNP-VE-6   | 6               | 1 ~ 6.8K             | 200                  |             |                                  | 22.2                  | 8.0 |     |
| KNP-VE-8   | 8               | 1 ~ 20K              | 400                  |             |                                  | 33.9                  | 8.0 |     |
| KNP-VE-9   | 9               | 1 ~ 27K              | 500                  |             |                                  | 38.1                  | 8.0 | 1.0 |
| KNP-VE-12  | 12              | 1 ~ 39K              | 750                  |             |                                  | 53.5                  | 8.0 |     |

## Performance

| Test Items                      | Condition                            | Specifications                           |
|---------------------------------|--------------------------------------|--|
| Insulation Resistance           | 500V                                 | 20MΩ                                     |
| Short Time Overload             | 2.5 times of rated voltage 5 sec.    | $\Delta R \leq \pm(2\%R + 0.05\Omega)$   |
| Rated Load                      | Rated wattage 30 min.                | $\Delta R \leq \pm(1\%R + 0.05\Omega)$   |
| Dielectric Withstanding Voltage | 500V AC 1 min                        | $\Delta R \leq \pm(1\%R + 0.05\Omega)$   |
| Temp. Cycle                     | -20°C ~ 85°C 5 cycles                | $\Delta R \leq \pm(1\%R + 0.05\Omega)$   |
| Load Life                       | 70°C on ~ off cycle 1000 hrs.        | $\Delta R \leq \pm(5\%R + 0.05\Omega)$   |
| Moisture-Proof Load Life        | 40°C 95% RH on~off cycle 500 hrs.    | $\Delta R \leq \pm(3\%R + 0.05\Omega)$   |
| Soldering After Resistance      | 350°C for 3 sec                      | $\Delta R \leq \pm(0.5\%R + 0.05\Omega)$ |
| Incombustibility                | 16 times of rated wattage for 5 min. | Not flamed                               |

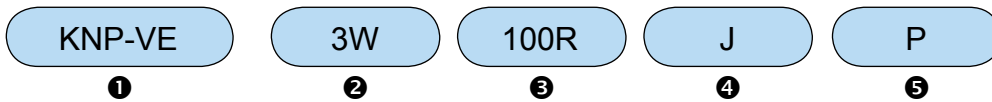


## ▶ Application Notes

### Wire-wound Resistors Application Notes:

- When being used in AC circuits, some wirewound structures give inductance ingredients or parasitic capacity, so they may cause unusual phenomena such as oscillations etc. Quorum deviations of other components should be carefully taken into account for use.
- Application and Placement: Wire wound resistors use different gauges of wire as resistance elements. Sometimes the gauge is extremely thin (finer than a strand of human hair) and very susceptible to breakage in environments containing salts, ash, dust and corrosives. Avoid utilization in such environments.
- Do not install in dusty areas because the accumulation will cause shorts and poor conductance.

## ▶ How to Order



❶ Part Number: KNP-VE

❷ Rated Power (W)

❸ Resistance Value ( $\Omega$ )

| Code | Resistance Value |
|------|------------------|
| 1R   | 1 $\Omega$       |
| 100R | 100 $\Omega$     |
| 1K   | 1000 $\Omega$    |

❹ Resistance Tolerance (%)

| Code | Resistance Tolerance |
|------|----------------------|
| J    | $\pm 5\%$            |
| K    | $\pm 10\%$           |

❺ Package

| Code | Package    |
|------|------------|
| TB   | Taping Box |
| P    | Bulk       |

## Wirewound Resistors

### Wirewound Resistors are Getting Economical Solution to Board Population

#### ▶ Preview

Token has launched its commercial wirewound resistor yet with the introduction of the various package size. Matching price with size to provide an economical solution to board population, Token's wire wound resistors are available in 15 standard size power ranging from 0.5W to 12.5W, all at 1%, 2%, and 5% tolerance.

The KNP series has been designed to give enhanced pulse handling capability and increased flameproof protection. The series is RoHS compliant with Pb-free terminations, and KNP wire-wound series can also be supplied with radial, goalpost or lancet preformed leads.

The KNP drive to miniaturise is as widespread within industrial process control and circuit break products as it is in the consumer sector. These resistors are ideal for high reliability industrial application as the technology removes the excessive temperature risk.

Produced on a high purity ceramic substrate, the resistor is assembled with interference-fit end caps to which are welded terminations. The resistive element is wound on the substrate and welded to the caps. Flameproof silicone cement coating is applied prior to marking with indelible link. The components are then leadformed, if required.

To address your need for technical and economic success in a timely manner, our custom solutions are available. Contact us with your specific needs.

#### ▶ Applications

- Ballast
- Power tools
- Consumer applications
- Power supplies, Welders
- High voltage applications
- Home entertainment, appliances

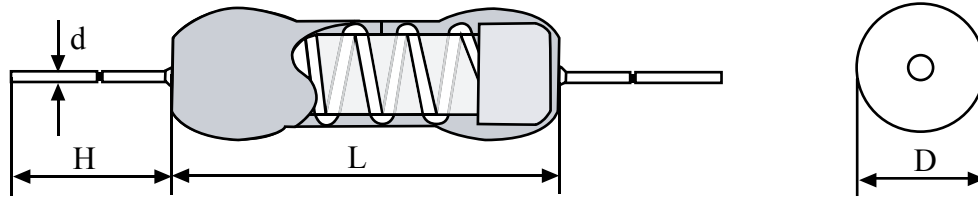
#### ▶ Features

- Low cost
- Excellent pulse load capability
- A wide resistance range 0.1  $\Omega$  to 3 k $\Omega$
- Operating temperature range -55°C ~ 155°C
- A wide range of power ratings 0.5W to 12.5W
- Products with Pb-free Terminations and RoHS compliant



www.DataSheet4U.com

## General Specifications



| Type | Rated Watts | Dimensions (mm) |           |           |              | Resistance Range ( $\Omega$ ) | Tolerance                           |
|------|-------------|-----------------|-----------|-----------|--------------|-------------------------------|-------------------------------------|
|      |             | $D \pm 0.5$     | $L \pm 1$ | $H \pm 3$ | $d \pm 0.05$ |                               |                                     |
| KNP  | KNP-50      | 1/2W            | 4         | 9.0       | 26           | 0.50~0.55                     | $\pm 1\%$<br>$\pm 2\%$<br>$\pm 5\%$ |
|      | KNP-100     | 1W              | 4         | 9.0       | 26           | 0.50~0.55                     |                                     |
|      | KNP-100B    | 1W              | 4.5       | 11.5      | 26           | 0.75~0.80                     |                                     |
|      | KNP-200     | 2W              | 4.5       | 11.5      | 26           | 0.75~0.80                     |                                     |
|      | KNP-200B    | 2W              | 5.5       | 15.5      | 35           | 0.75~0.80                     |                                     |
|      | KNP-300     | 3W              | 5.5       | 15.5      | 35           | 0.75~0.80                     |                                     |
|      | KNP-400     | 4W              | 6.5       | 17.5      | 35           | 0.75~0.80                     |                                     |
|      | KNP-500     | 5W              | 6.5       | 17.5      | 35           | 0.75~0.80                     |                                     |
|      | KNP-500B    | 5W              | 8.5       | 24.5      | 38           | 0.75~0.80                     |                                     |
|      | KNP-600     | 6W              | 8.5       | 24.5      | 38           | 0.75~0.80                     |                                     |
|      | KNP-700     | 7W              | 8.5       | 24.5      | 38           | 0.75~0.80                     |                                     |
|      | KNP-800     | 8W              | 8.5       | 42        | 38           | 0.75~0.80                     |                                     |
|      | KNP-1000    | 10W             | 8.5       | 42        | 38           | 0.75~0.80                     |                                     |
|      | KNP-1000B   | 10W             | 8.5       | 54        | 38           | 0.75~0.80                     |                                     |
|      | KNP-1250    | 12.5W           | 8.5       | 54        | 38           | 0.75~0.80                     |                                     |

## Application Notes

### Wire-wound Resistors Application Notes:

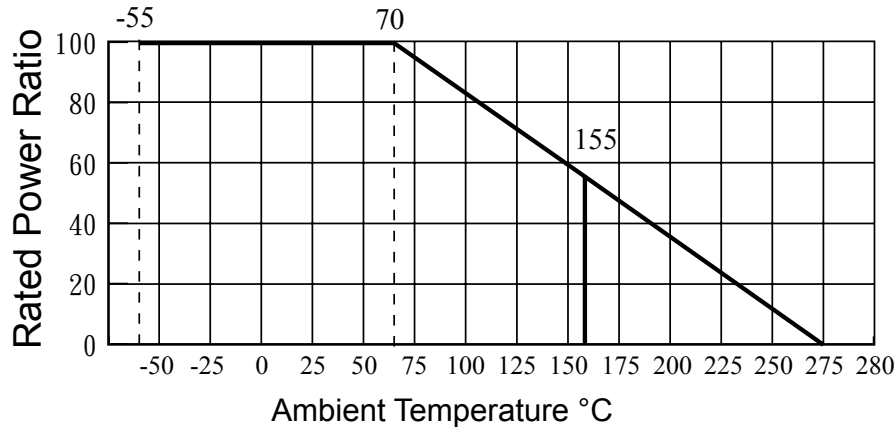
- When being used in AC circuits, some wirewound structures give inductance ingredients or parasitic capacity, so they may cause unusual phenomena such as oscillations etc. Quorum deviations of other components should be carefully taken into account for use.

- Application and Placement: Wire wound resistors use different gauges of wire as resistance elements. Sometimes the gauge is extremely thin (finer than a strand of human hair) and very susceptible to breakage in environments containing salts, ash, dust and corrosives. Avoid utilization in such environments.

www.DataSheet4U.com

- Do not install in dusty areas because the accumulation will cause shorts and poor conductance.

## Electrical Performance



| TEST ITEMS               | CONDITION                            | SPEC           |
|--------------------------|--------------------------------------|----------------|
| Resistance Temp. Coeff.  | -55 °C ~ 155 °C                      | ± 300 PPM / °C |
| Resistance Temp. Coeff.  | Room temperature/100 °C up           | ± 300 PPM / °C |
| Short Time Overload      | 10 times of rated wattage for 5 sec. | ± 2 %          |
| Rated Load               | Rated wattage 30 min.                | ± 1 %          |
| Voltage Withstanding     | 500VAC 1 min                         | ± 1 %          |
| Temperature Cycling      | -20 °C ~ 85 °C 5 cycles              | ± 1 %          |
| Load Life                | 70 °C on ~ off cycle 1000 hrs.       | ± 5 %          |
| Moisture-Proof Load Life | 40 °C 95% RH on ~ off cycle 500 hrs. | ± 3 %          |
| Incombustibility         | 16 times of rated wattage for 5 min  | not flamed     |

## How to Order

KNP-100

❶

1W

❷

10R

❸

J

❹

P

❺

❶ Part Number: KNP

❷ Rated Power (W)

❸ Resistance Value (Ω)

| Code | Resistance Value |
|------|------------------|
| 0R1  | 0.1Ω             |
| 1R   | 1RΩ              |
| 10R  | 10RΩ             |
| 100R | 100RΩ            |
| 1K   | 1000Ω            |

❹ Resistance Tolerance (%)

| Code | Resistance Tolerance |
|------|----------------------|
| F    | ±1%                  |
| G    | ±2%                  |
| J    | ±5%                  |

❺ Package

| Code | Package    |
|------|------------|
| TB   | Taping Box |
| P    | Bulk       |

www.DataSheet4U.com

[Back to 1st Page - Wirewound Resistors \(KNP\)](#)

# Non-inductive Wirewound Resistors

## Non-inductive Wirewound Resistors Improves Inductance for High Frequency Applications

### ▶ Preview

Token Electronics has introduced a non-inductive version KNPN Series of conformal coated, leaded wire-wound resistors.

The KNPN series offers the expected performance of a wire wound resistor with the added characteristic of vastly improved inductance, making it suitable for high-switching applications.

Wirewound technology has long been known as a leading technology for power resistor needs though it is inherently inductive. Known as Ayrton Perry winding, a non-inductively wound wirewound has one winding in one direction and one in the other direction.

By using a non-inductively wound version this greatly reduces the inductance of any given resistor size and value combination; however, it does not completely eliminate the inductance.

This non-inductive winding is available in all standard KNPN sizes from 0.5 watts up to 6 watts with options 1%, 2% and 5% tolerance. The KNPN series is RoHS compliant and also can be supplied with radial, goalpost or lancet preformed leads.

To address your need for technical and economic success in a timely manner, our custom solutions are available. Contact us with your specific needs.

### ▶ Applications

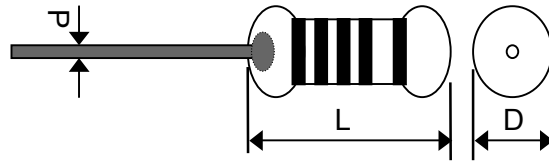
- Power tools
- Current sensing
- Consumer applications
- Power supplies, Welders
- High voltage applications
- High-switching applications
- Home entertainment, appliances

### ▶ Features

- Low cost
- Excellent pulse load capability
- Non-inductive Ayrton Perry winding
- A wide resistance range 0.1Ω to 50Ω
- Operating temperature range -55°C ~ 155°C
- A wide range of power ratings 0.5W to 6W
- Products with Pb-free Terminations and RoHS compliant



## General Specifications



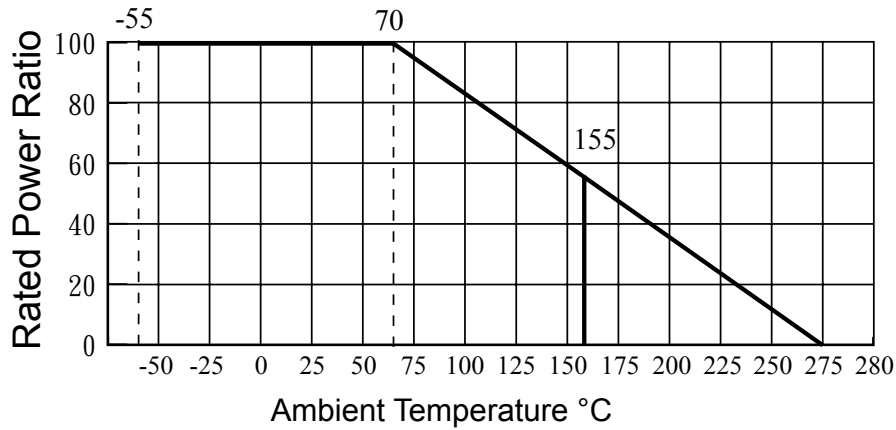
| Type     | Rated Watts | Dimensions (mm) |           |           |              | Resistance Range ( $\Omega$ ) | Tolerance       |                                     |
|----------|-------------|-----------------|-----------|-----------|--------------|-------------------------------|-----------------|-------------------------------------|
|          |             | $D \pm 0.5$     | $L \pm 1$ | $H \pm 3$ | $d \pm 0.05$ |                               |                 |                                     |
| KNPN     | KNPN-50     | 1/2W            | 4         | 9.0       | 26           | 0.50~0.55                     | 0.1-10 $\Omega$ | $\pm 1\%$<br>$\pm 2\%$<br>$\pm 5\%$ |
|          | KNPN-100    | 1W              | 4         | 9.0       | 26           | 0.50~0.55                     | 0.1-10 $\Omega$ |                                     |
|          | KNPN-100B   | 1W              | 4.5       | 11.5      | 26           | 0.75~0.80                     | 0.1-10 $\Omega$ |                                     |
|          | KNPN-200    | 2W              | 4.5       | 11.5      | 26           | 0.75~0.80                     | 0.1-10 $\Omega$ |                                     |
|          | KNPN-200B   | 2W              | 5.5       | 15.5      | 35           | 0.75~0.80                     | 0.1-20 $\Omega$ |                                     |
|          | KNPN-300    | 3W              | 5.5       | 15.5      | 35           | 0.75~0.80                     | 0.1-20 $\Omega$ |                                     |
|          | KNPN-400    | 4W              | 6.5       | 17.5      | 35           | 0.75~0.80                     | 0.1-30 $\Omega$ |                                     |
|          | KNPN-500    | 5W              | 6.5       | 17.5      | 35           | 0.75~0.80                     | 0.1-30 $\Omega$ |                                     |
|          | KNPN-500B   | 5W              | 8.5       | 24.5      | 38           | 0.75~0.80                     | 0.1-50 $\Omega$ |                                     |
| KNPN-600 | 6W          | 8.5             | 24.5      | 38        | 0.75~0.80    | 0.1-50 $\Omega$               |                 |                                     |

## Application Notes

### Wire-wound Resistors Application Notes:

- When being used in AC circuits, some wirewound structures give inductance ingredients or parasitic capacity, so they may cause unusual phenomena such as oscillations etc. Quorum deviations of other components should be carefully taken into account for use.
- Application and Placement: Wire wound resistors use different gauges of wire as resistance elements. Sometimes the gauge is extremely thin (finer than a strand of human hair) and very susceptible to breakage in environments containing salts, ash, dust and corrosives. Avoid utilization in such environments.
- Do not install in dusty areas because the accumulation will cause shorts and poor conductance.

## Electrical Performance



| TEST ITEMS                  | CONDITION                            | SPEC           |
|-----------------------------|--------------------------------------|----------------|
| Operating Temperature Range | -55 °C ~ 275 °C (0W)                 |                |
| Resistance Temp. Coeff.     | Room temperature/100 °C up           | ± 300 PPM / °C |
| Short Time Overload         | 10 times of rated wattage for 5 sec. | ± 2 %          |
| Rated Load                  | Rated wattage 30 min.                | ± 1 %          |
| Voltage Withstanding        | 500VAC 1 min                         | ± 1 %          |
| Temperature Cycling         | -20 °C ~ 85 °C 5 cycles              | ± 1 %          |

## How to Order

KNPN-100
1W
10R
J
P

❶ Part Number: KNPN

❷ Rated Power (W)

❸ Resistance Value (Ω)

| Code | Resistance Value |
|------|------------------|
| 0R1  | 0.1Ω             |
| 1R   | 1Ω               |
| 10R2 | 1.2Ω             |
| 10R  | 10Ω              |
| 12R  | 12MΩ             |

❹ Resistance Tolerance (%)

| Code | Resistance Tolerance |
|------|----------------------|
| F    | ±5%                  |
| G    | ±5%                  |
| J    | ±5%                  |

❺ Package

| Code | Package    |
|------|------------|
| TB   | Taping Box |
| P    | Bulk       |

*Back to 1st Page - Non-inductive Wirewound Resistors (KNPN)*

## Fusible Resistors

**Fusible Resistors - FRN, FKN, FSQ Series**

### Fusible Resistor Features Best of Both Worlds

#### ▶ Preview

Designers of small power supplies and battery chargers for consumer products can benefit from a fusible resistor with superior lightning strike and pulse abilities in a cost effective package.

Token Electronics offers a combination resistor/fuses series of metal/carbon film fusible resistor (FRN), wirewound fusible resistor (FKN) and cement encased fusible resistors (FSQ). Token offers fusible FRN series a low-cost alternative to traditional solutions for applications that require surge protection.



The robust cement-coated wire-wound FSQ resistors and wirewound fusible FKN resistors are ideal for power supply applications across the telecomms, military and industrial markets which require a replacement for carbon composition resistors within the circuit design.

As part of the Token input protection range, this resistor provides a key fusible solution and is completely customisable to suit the individual application design requirements. Key design engineers with a need for a robust resistor, will find the FRN, FKN and FSQ series are a multifaceted product, providing comparable pulse performance with added fusing capabilities.

Our custom solutions are designed to address your need for technical and economic success in a timely manner. Contact us with your specific needs.

#### ▶ Features

- Low Cost
- Low Noise
- Reduced numbers of parts used in circuits
- Products with Pb-free Terminations and RoHS compliant

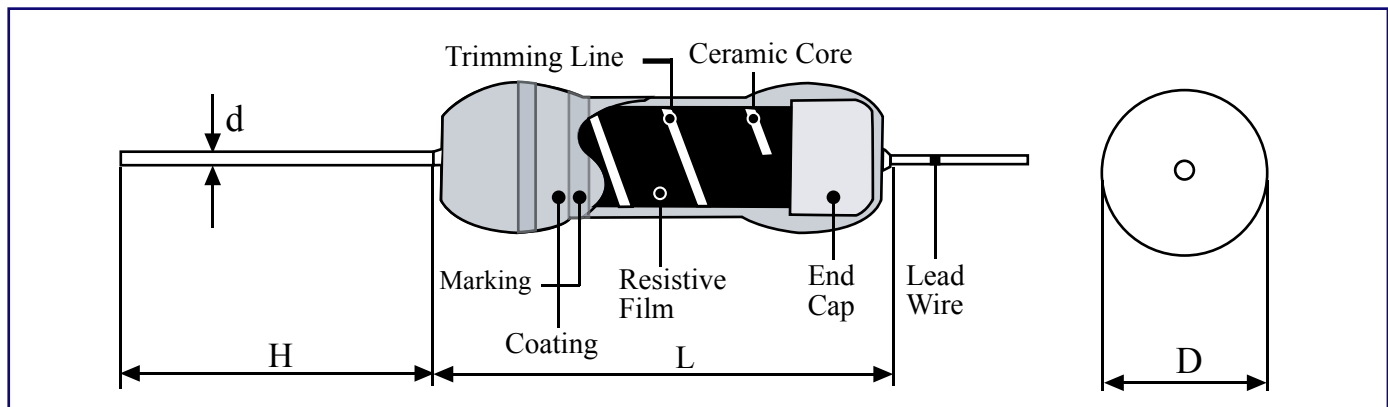
#### ▶ Applications

[www.DataSheet4U.com](http://www.DataSheet4U.com)

- Telecommunications
- Household appliances
- Inrush Pulse protection
- Lightning strike protection
- Input protection for small power supplies and battery chargers

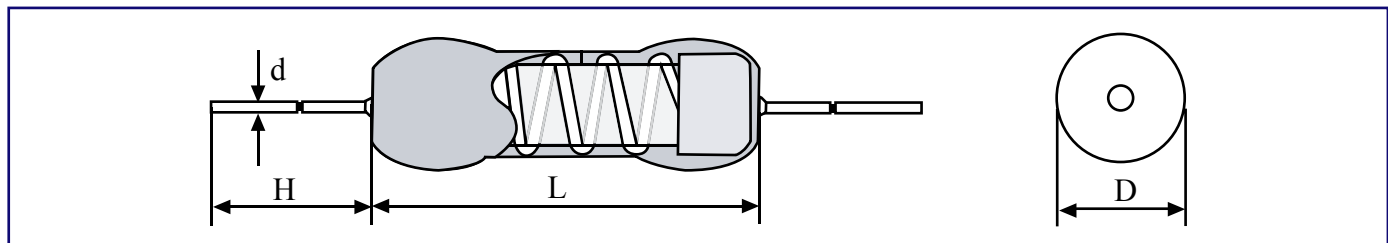


## ▶ Metal Film Fusible (FRN) - Specifications & Dimensions (Unit: mm)



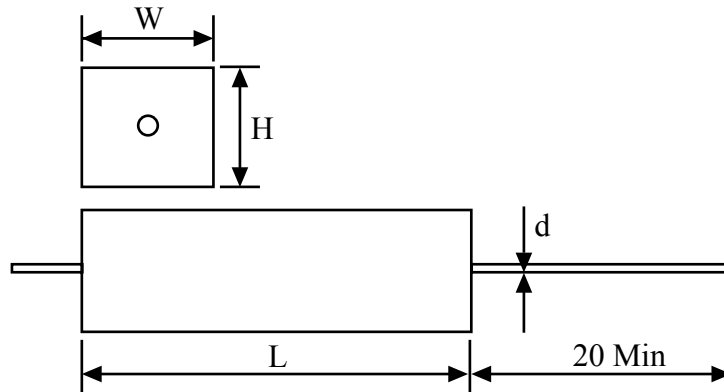
| Type | Rated Wattage | Dimension (mm) |           |             |             |           |              | Resistance Range | Dielectric Withstanding Voltage |
|------|---------------|----------------|-----------|-------------|-------------|-----------|--------------|------------------|---------------------------------|
|      |               | $L \pm 1.5$    | $D \pm 1$ | $H \pm 0.5$ | $W \pm 0.5$ | $H \pm 3$ | $d \pm 0.05$ |                  |                                 |
| FRN  | 1/4W          | 6              | 2.3       |             |             | 26        | 0.40~0.50    | 0.22Ω~100KΩ      | 300V                            |
|      | 1/2W          | 6              | 2.3       |             |             | 26        | 0.50~0.55    | 0.22Ω~100KΩ      | 300V                            |
|      | 1W            | 9              | 3.0       |             |             | 26        | 0.50~0.55    | 0.22Ω~100KΩ      | 350V                            |
|      | 2W            | 11             | 4.0       |             |             | 26        | 0.75~0.80    | 0.3Ω~100KΩ       | 500V                            |
|      | 3W            | 15             | 5.0       |             |             | 35        | 0.75~0.80    | 0.3Ω~100KΩ       | 500V                            |

## ▶ Wirewound Fusible (FKN) - Specifications & Dimensions (Unit: mm)



| Type | Rated Wattage | Dimension (mm) |           |             |             |           |              | Resistance Range | Dielectric Withstanding Voltage |
|------|---------------|----------------|-----------|-------------|-------------|-----------|--------------|------------------|---------------------------------|
|      |               | $L \pm 1.5$    | $D \pm 1$ | $H \pm 0.5$ | $W \pm 0.5$ | $H \pm 3$ | $d \pm 0.05$ |                  |                                 |
| FKN  | 1W            | 9              | 4.5       |             |             | 26        | 0.50~0.55    | 0.1Ω~22Ω         | 500V                            |
|      | 2W            | 11             | 5.0       |             |             | 26        | 0.75~0.80    | 0.1Ω~60Ω         | 500V                            |
|      | 3W            | 15             | 5.5       |             |             | 35        | 0.75~0.80    | 0.1Ω~100Ω        | 500V                            |
|      | 5W            | 17             | 6.5       |             |             | 35        | 0.75~0.80    | 0.2Ω~200Ω        | 500V                            |
|      | 6W            | 24             | 8.5       |             |             | 38        | 0.75~0.80    | 0.3Ω~250Ω        | 500V                            |

## Ceramic Cement Fusible (FSQ) - Specifications & Dimensions (Unit: mm)



| Type | Rated Wattage | Dimension (mm) |       |         |         |       |           | Resistance Range | Dielectric Withstanding Voltage |
|------|---------------|----------------|-------|---------|---------|-------|-----------|------------------|---------------------------------|
|      |               | L ± 1.5        | D ± 1 | H ± 0.5 | W ± 0.5 | H ± 3 | d ± 0.05  |                  |                                 |
| FSQ  | 2W            | 18             |       | 7       | 7       | 35    | 0.50~0.55 | 0.1Ω~22Ω         | 1000V                           |
|      | 3W            | 22             |       | 8       | 8       | 35    | 0.75~0.80 | 0.1Ω~120Ω        | 1000V                           |
|      | 5W            | 22             |       | 9       | 10      | 35    | 0.75~0.80 | 0.2Ω~120Ω        | 1000V                           |
|      | 7W            | 35             |       | 9       | 10      | 35    | 0.75~0.80 | 0.3Ω~250Ω        | 1000V                           |
|      | 10W           | 48             |       | 9       | 10      | 35    | 0.75~0.80 | 0.3Ω~500Ω        | 1000V                           |

## FRN, FKN, FSQ - Electrical Characteristics

| Test Items               | Condition                            | Spec.         |
|--------------------------|--------------------------------------|---------------|
| Operating Temp.          | -30°C~155°C                          |               |
| Resistance Temp. Coeff.  | -30°C~150°C                          | ± 200PPM / °C |
| Short Time Overload      | 2 times of rated voltage for 5 sec.  | ± 2 %         |
| Temp. Cycle              | -30°C~85°C for 5 cycles              | ± 1 %         |
| Load Life                | 25°C on-off cycle 1,000 hrs.         | ± 5 %         |
| Moisture-Proof Load Life | 40°C 95°C RH on-off cycle 1,000 hrs. | ± 5 %         |
| Solder Pot               | 270°C for 3 sec.                     | ± 1 %         |
| Incombustibility         | 16 times of rated wattage for 5 min. | not flamed    |

## FRN, FKN, FSQ - Electrical Characteristics

| POWER WATTAGE      | FUSING TIME    |
|--------------------|----------------|
| 16 X Rated Wattage | Within 2 min   |
| 24 X Rated Wattage | Within 1 min   |
| 32 X Rated Wattage | Within 30 sec. |

## ▶ FRN, FKN, FSQ - Application Notes

For fusible resistors, unlike fuses, fusing performance is given in terms of power rather than current. The power can be calculated:

**Power = Amperes 2 × Ohms**

### Fusing Device Application Notes

- When using, it shall be made sure that the overload conditions at unusual moments lie within the fusing territory.
- Consult with Token in advance when overloaded higher than the rated voltage under an ordinary situation since such an overload may store up damages on resistors.
- Use at the maximum open-circuit voltage or lower as an arc phenomenon may arise when high voltage is applied again after fusing by an over current.
- Consult with us for the maximum open- circuit voltage because it varies with applications.

## ▶ How to Order

FRN

❶

1/2W

❷

0.47R

❸

J

❹

TB

❺

❶ Part Number: FRN, FKN, FSQ

❷ Rated Power (W)

❸ Resistance Value (Ω)

| Code | Resistance Value |
|------|------------------|
| R47  | 0.47Ω            |
| 47R  | 47Ω              |
| 470R | 470Ω             |
| 4K7  | 4.7KΩ            |
| 47K  | 47KΩ             |

❹ Resistance Tolerance (%)

| Code | Resistance Tolerance |
|------|----------------------|
| J    | ±5%                  |

❺ Package

| Code | Package    |
|------|------------|
| TB   | Taping Box |
| P    | Bulk       |

# Thermal Cut-offs Resistors

**Cement Resistors with Thermal Cut-offs - FKU/FRU Series**

## Ultimate Protection Thermal Cutoffs for High Power Applications

### ▶ Preview

Fast-acting protection device for high-power applications combines thermal fuse element and resistor on a single substrate.

Token offers FKU (Wirewound Resistor + Thermal Cut-offs) and FRU (Metal Oxide Film Resistor + Thermal Cut-offs) two Series, both are a new concept in thermal fuse technology and are designed to protect against overheating in electrical products.

The two active components, a thermal cutoff is a fusible alloy and a resistor is a voltage divider, both are surrounded by a ceramic cement with special resin. Under normal operating temperatures the fusible alloy joins the two lead wires within the body of the cutoff and the power resistor acts as a normal function resistor. When the preset temperature of the cutoff is reached, the fusible alloy melts and with the aid of the special resin, complete cutoff is ensured.

By combining a thermal fuse element and resistor on a single substrate, Token has created a fast-acting ultimate protection device for high power applications up to 10A/250V.

Resistance range of FKU Wirewound Type Thermal Cut-offs is 1Ω~100Ω and FRU Metal Oxide Film Type Thermal Cut-offs is 110Ω~10KΩ. Both standard precision tolerance is J(±5%).

Our custom solutions are designed to address your need for technical and economic success in a timely manner. Contact us with your specific needs.

### ▶ Features

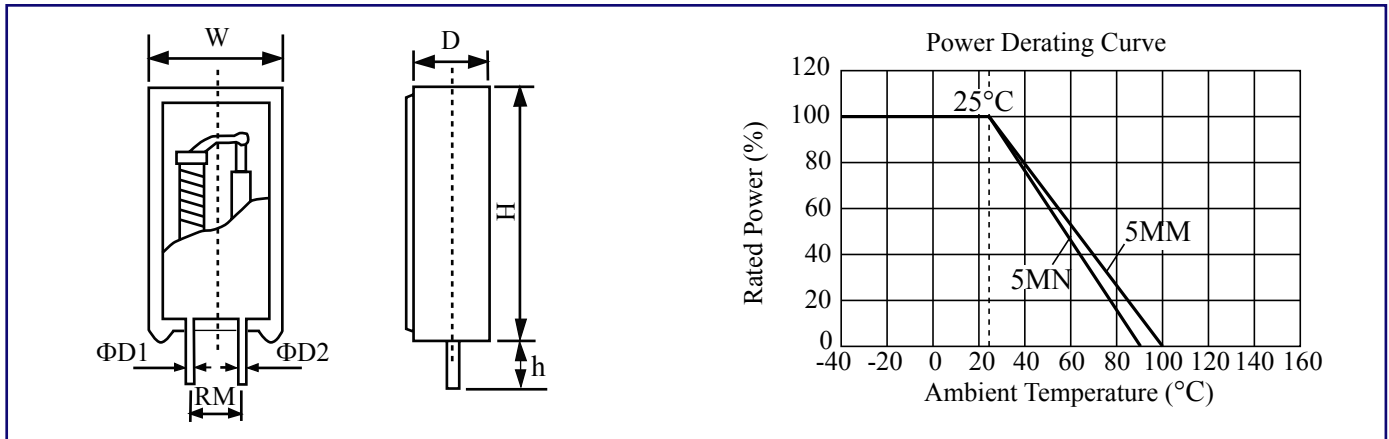
- Miniature size
- Radial leaded form
- Accurate fusing temperature
- Various temperature settings
- Current Rating: Up to 10Amp
- Products with Pb-free Terminations and RoHS compliant
- Economical by combining both function of a thermal fuse and a pulse resistor



### ▶ Applications

- Motors - fans, copiers, washing machines, air conditioners, compressors.
- Electronics - TVs, tape recorders, stereos, video recorders, fluorescent lamps, transformers, surge suppressors, computers, telecommunication equipment.
- Appliances - electric blankets, space heaters, stoves, irons, hair dryers, cookers, toaster ovens, clothes dryers, toasters, mixers, microwave ovens, crock pots.

## General Specifications (Unit: mm)



| Type        | Dimension (mm) |       |         |         |         |                |                |
|-------------|----------------|-------|---------|---------|---------|----------------|----------------|
|             | W ± 1          | D ± 1 | H ± 1.5 | RM+2/-1 | h       | D1(R terminal) | D2(F terminal) |
| FKU/FRU-5M  | 13             | 9     | 25      | 5       | 4.5 ± 1 | 0.8±0.1        | 2A:0.6         |
| FKU/FRU-7M  | 13             | 9     | 38      | 5       |         |                | ±0.110A:1.0    |
| FKU/FRU-10M | 16             | 12    | 35      | 7.5     |         |                | ±0.1           |

## Electrical Performance

| Fusing Temperature Protector |                        |                     |                     | Rated Power at 25°C (W) |     |     | Resistance Range(Ω) |         | Tolerance(%)    |       |
|------------------------------|------------------------|---------------------|---------------------|-------------------------|-----|-----|---------------------|---------|-----------------|-------|
| MARK                         | Fusing Temperature(°C) | Standard Current(A) | Standard Voltage(V) | 5M                      | 7M  | 10M | FKU                 | FRU     | FKU             | FRU   |
| A                            | 109+1/-3               | 10                  | 250                 | 1.2                     | 1.4 | 2.0 | 1~100               | 110~10K | J(±5)<br>K(±10) | J(±5) |
| B                            | 129±4                  |                     |                     | 1.6                     | 2.0 | 2.5 |                     |         |                 |       |
| C                            | 152±4                  |                     |                     | 1.6                     | 2.0 | 2.5 |                     |         |                 |       |
| D                            | 188+3/-1               |                     |                     | 2.0                     | 2.4 | 3.5 |                     |         |                 |       |
| E                            | 226+1/-3               |                     |                     | 2.0                     | 2.4 | 3.5 |                     |         |                 |       |
| F                            | 95+3/-0                | 2                   |                     | 0.8                     | 1.2 |     |                     |         |                 |       |
| G                            | 110±4                  |                     |                     | 1.2                     | 1.4 |     |                     |         |                 |       |
| H                            | 126±4                  |                     |                     | 1.4                     | 1.6 |     |                     |         |                 |       |
| N                            | 130±4                  |                     |                     | 1.6                     | 2.0 |     |                     |         |                 |       |
| M                            | 145±4                  |                     |                     | 2.1                     | 2.4 |     |                     |         |                 |       |

## How to Order

FRU

①

5M

②

A

③

10R

④

K

⑤

P

⑥

### ① Part Number

| Code | Resistance Value                  |
|------|-----------------------------------|
| FRU  | Metal Oxide type Thermal Cut-offs |
| FKU  | Wirewound type Thermal Cut-offs   |

### ② Rated Power (W): 5M, 7M, 10M

### ③ Thermal Cut-offs (Ω)

| Code | Thermal Cut-offs |
|------|------------------|
| A    | 109+1/-3°C       |
| B    | 129±4°C          |
| C    | 152±4°C          |
| D    | 188+3/-1°C       |
| E    | 226+1/-3°C       |
| F    | 95+3/-0°C        |
| G    | 110±4°C          |
| H    | 126±4°C          |
| N    | 130±4°C          |
| M    | 145±4°C          |

### ④ Resistance Value (Ω)

| Code | Resistance Value (Ω) |
|------|----------------------|
| 1R   | 1Ω                   |
| 10R  | 10Ω                  |
| 100R | 100RΩ                |
| 1K   | 1000Ω                |

### ④ Resistance Tolerance (%)

| Code | Resistance Tolerance (%) |
|------|--------------------------|
| J    | ±5%                      |
| K    | ±10%                     |

### ⑤ Package

| Code | Package |
|------|---------|
| P    | Bulk    |

# CDS Light-Dependent Photoresistors

## Light-Dependent Photoresistors for Sensor Applications

### ▶ Preview

The cadmium sulfide (CdS) or light dependent resistor (LDR) whose resistance is inversely dependent on the amount of light falling on it, is known by many names including the photo resistor, photoresistor, photoconductor, photoconductive cell, or simply the photocell.

A typical structure for a photoresistor uses an active semiconductor layer that is deposited on an insulating substrate. The semiconductor is normally lightly doped to enable it to have the required level of conductivity. Contacts are then placed either side of the exposed area.

The photo-resistor, CdS, or LDR finds many uses as a low cost photo sensitive element and was used for many years in photographic light meters as well as in other applications such as smoke, flame and burglar detectors, card readers and lighting controls for street lamps.

Providing design engineers with an economical CdS or LDR with high quality performance, Token Electronics now offers commercial grade PGM photoresistor. Designated the PGM Series, the photoresistors are available in 5mm, 12mm and 20mm sizes, the conformally epoxy or hermetical package offer high quality performance for applications that require quick response and good characteristic of spectrum.

Token has been designing and manufacturing high performance light dependent resistors for decades. Our product offerings are extensive and our experience with custom photoresistor is equally extensive. Contact us with your specific needs.

### ▶ Features

- Quick Response
- Reliable Performance
- Epoxy or hermetical package
- Good Characteristic of Spectrum

### ▶ Applications

- Photoswitch
- Photoelectric Control
- Auto Flash for Camera
- Electronic Toys, Industrial Control



www.DataSheet4U.com

## Terminology

- **Light Resistance :**

Measured at 10 lux with standard light A (2854K-color temperature) and 2hr. preillumination at 400-600 lux prior testing.

- **Dark Resistance :**

Measured at 10th seconds after closing 10 lux.

- **Gamma characteristic :**

Under 10 lux and 100 lux and given by  $\gamma = \log(R_{10}/R_{100}) / \log(100/10) = \log(R_{10}/R_{100})$

R10, R100: resistance at 10 lux and 100 lux.

The tolerance of  $\gamma$  is  $\pm 0.1$ .

- **Pmax :**

Max. power dissipation at ambient temperature of 25°C. At higher ambient temperature, the maximum power permissible may be lowered.

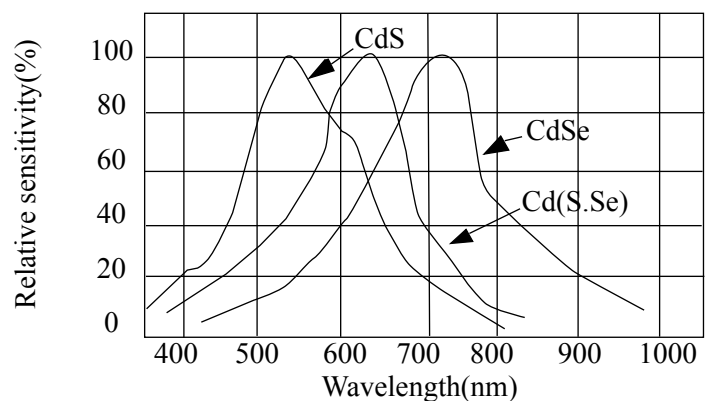
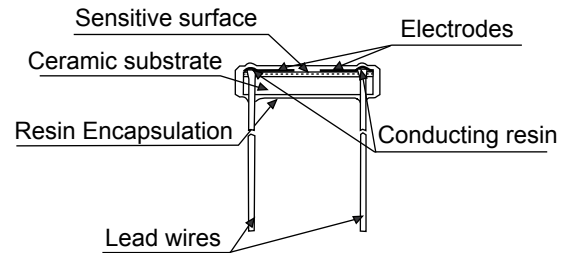
- **Vmax :**

Max. voltage in darkness that may be applied to the device continuously.

- **Spectral peak :**

Spectral sensitivity of photoresistors depends on the wavelength of light they are exposed to and in accordance with figure 'Spectral Response'.

The tolerance of spectral peak is  $\pm 50\text{nm}$ .



## Physical and Environmental Characteristics

| ITEM                       | CONDITIONS   | PERFORMANCE                               |
|----------------------------|--|---|
| Solderability              | Put the terminals into welding tank at temp. 230±5°C for 2±0.5s (terminal roots are 5mm away from the tin surface).  | wetting>95%                               |
| Temperature Changing       | Change of temperature in accordance with: TA: -40°C<br>TB: +60°C Number of cycles: 5 Exposure duration: 30min  | Drift of R10 = ± 20%<br>No visible damage |
| Constant humidity and heat | 1. Put the device in test box at Temperature: 60±5°<br>CHumidity: 90-95% Illumination: 0lux Duration: 100h<br>2. Take the device and measure after 24h at normal temperature and humidity. | Drift of R10= ± 30%<br>No visible damage  |
| Constant load Temperature  | At 25±5°C<br>Illumination: 150lux at rated power<br>Duration: 600h   | No visible damage                         |
| Wire Terminals Strength    | Bend the wire terminal at its root to 90 degree, and then bend it to a opposite direction.   | No visible damage                         |
| Vibration                  | Frequency: 50Hz<br>Swing: 1.5mm with<br>Directions: parallel to ceramic substrate normal to ceramic substrate. Duration: 2h  | No visible dam                            |



▶ **How to Order**

PGM5516

❶

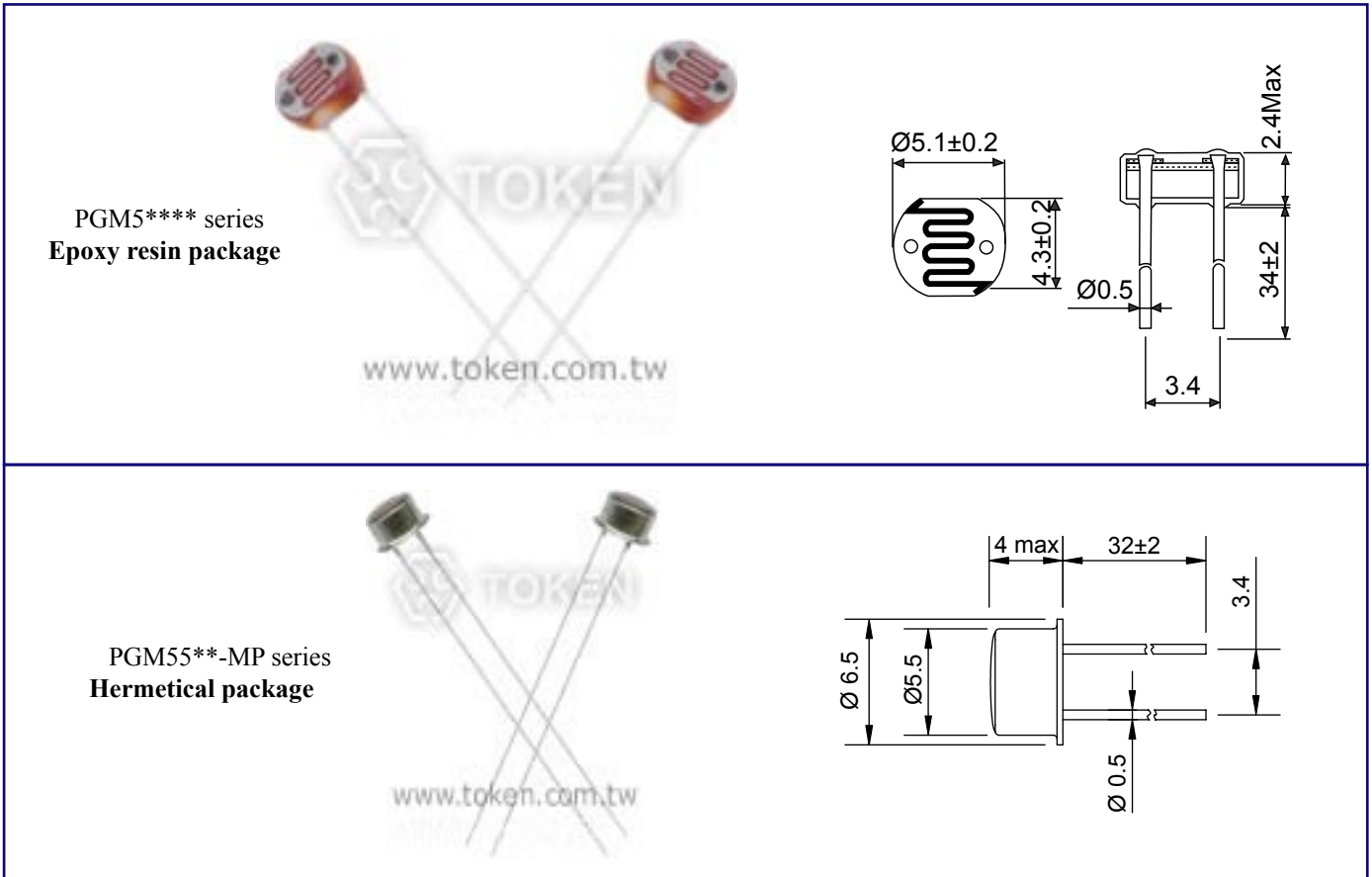
p

❷

❶ Part Number

❷ Package

## Configurations & Dimensions



**Note:** All dimensions are in mm and NTS.

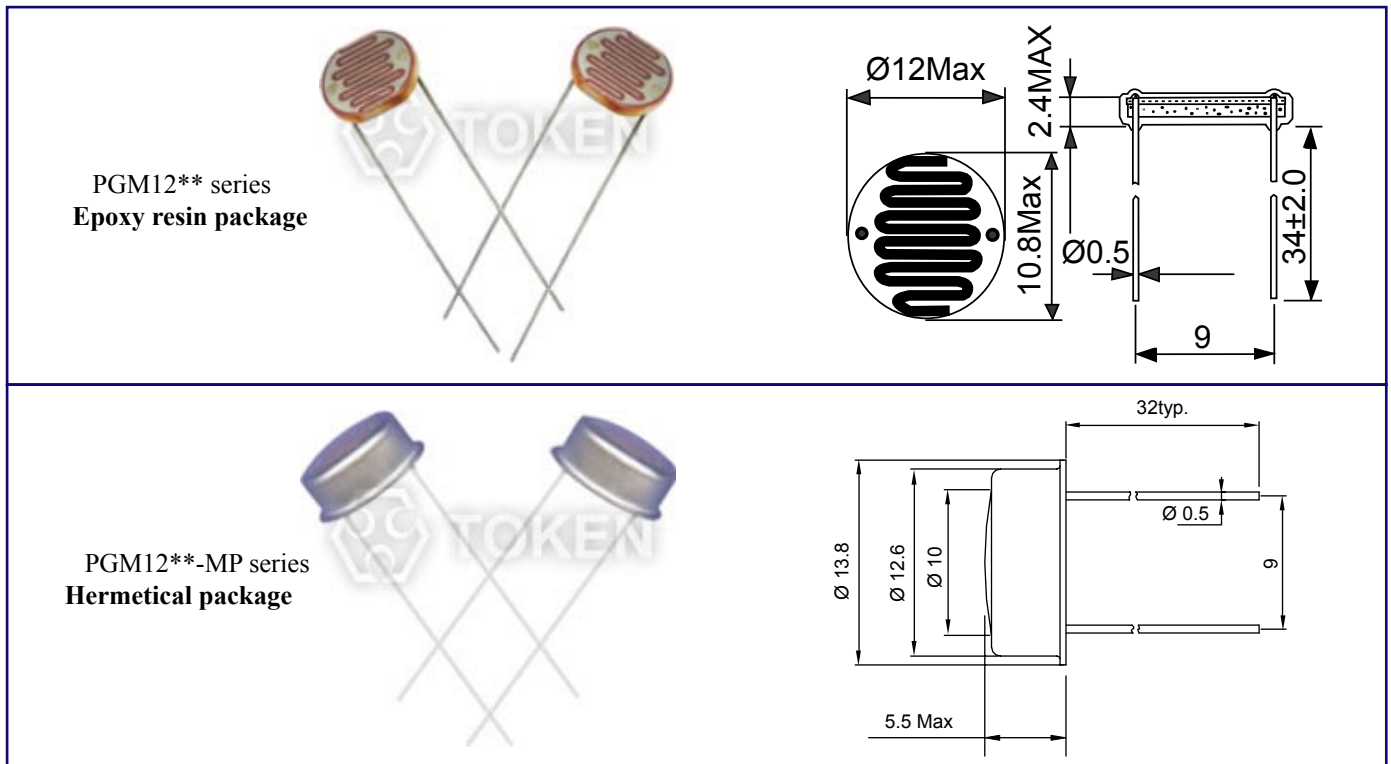
## ▶ Electronics Characteristics

| Model    | Vmax (VDC) | Pmax (mW) | Ambient Temp (°C) | Spectral Peak (nm) | Photo Resistance (10Lx) (KΩ) | Dark Resistance (MΩ)min | γ <sub>min</sub> | Response Time (ms) |       |
|----------|------------|-----------|-------------------|--------------------|------------------------------|-------------------------|------------------|--------------------|-------|
|          |            |           |                   |                    |                              |                         |                  | Rise               | Decay |
| PGM5506  | 100        | 90        | -30 ~ +70         | 540                | 2 ~ 6                        | 0.15                    | 0.6              | 30                 | 40    |
| PGM5516  | 100        | 90        | -30 ~ +70         | 540                | 5 ~ 10                       | 0.2                     | 0.6              | 30                 | 40    |
| PGM5526  | 150        | 100       | -30 ~ +70         | 540                | 8 ~ 20                       | 1.0                     | 0.6              | 20                 | 30    |
| PGM5537  | 150        | 100       | -30 ~ +70         | 540                | 16 ~ 50                      | 2.0                     | 0.7              | 20                 | 30    |
| PGM5539  | 150        | 100       | -30 ~ +70         | 540                | 30 ~ 90                      | 5.0                     | 0.8              | 20                 | 30    |
| PGM5549  | 150        | 100       | -30 ~ +70         | 540                | 45 ~ 140                     | 10.0                    | 0.8              | 20                 | 30    |
| PGM5616D | 150        | 100       | -30 ~ +70         | 560                | 5 ~ 10                       | 1.0                     | 0.6              | 20                 | 30    |
| PGM5626D | 150        | 100       | -30 ~ +70         | 560                | 8 ~ 20                       | 2.0                     | 0.6              | 20                 | 30    |
| PGM5637D | 150        | 100       | -30 ~ +70         | 560                | 16 ~ 50                      | 5.0                     | 0.7              | 20                 | 30    |
| PGM5639D | 150        | 100       | -30 ~ +70         | 560                | 30 ~ 90                      | 10.0                    | 0.8              | 20                 | 30    |
| PGM5649D | 150        | 100       | -30 ~ +70         | 560                | 50 ~ 160                     | 20.0                    | 0.8              | 20                 | 30    |
| PGM5659D | 150        | 100       | -30 ~ +70         | 560                | 150 ~ 300                    | 20.0                    | 0.8              | 20                 | 30    |

## ▶ Electronics Characteristics

| Model      | Vmax (VDC) | Pmax (mW) | Ambient Temp (°C) | Spectral Peak (nm) | Photo Resistance (10Lx) (KΩ) | Dark Resistance (MΩ)min | γ <sub>min</sub> | Response Time (ms) |       |
|------------|------------|-----------|-------------------|--------------------|------------------------------|-------------------------|------------------|--------------------|-------|
|            |            |           |                   |                    |                              |                         |                  | Rise               | Decay |
| PGM5506-MP | 100        | 90        | -30 ~ +70         | 540                | 2 ~ 6                        | 0.15                    | 0.6              | 30                 | 40    |
| PGM5516-MP | 100        | 90        | -30 ~ +70         | 540                | 5 ~ 10                       | 0.2                     | 0.6              | 30                 | 40    |
| PGM5526-MP | 150        | 100       | -30 ~ +70         | 540                | 8 ~ 20                       | 1.0                     | 0.6              | 20                 | 30    |
| PGM5537-MP | 150        | 100       | -30 ~ +70         | 540                | 16 ~ 50                      | 2.0                     | 0.7              | 20                 | 30    |
| PGM5539-MP | 150        | 100       | -30 ~ +70         | 540                | 30 ~ 90                      | 5.0                     | 0.8              | 20                 | 30    |
| PGM5549-MP | 150        | 100       | -30 ~ +70         | 540                | 45 ~ 140                     | 10.0                    | 0.8              | 20                 | 30    |

## Configurations & Dimensions



**Note:** All dimensions are in mm and NTS.

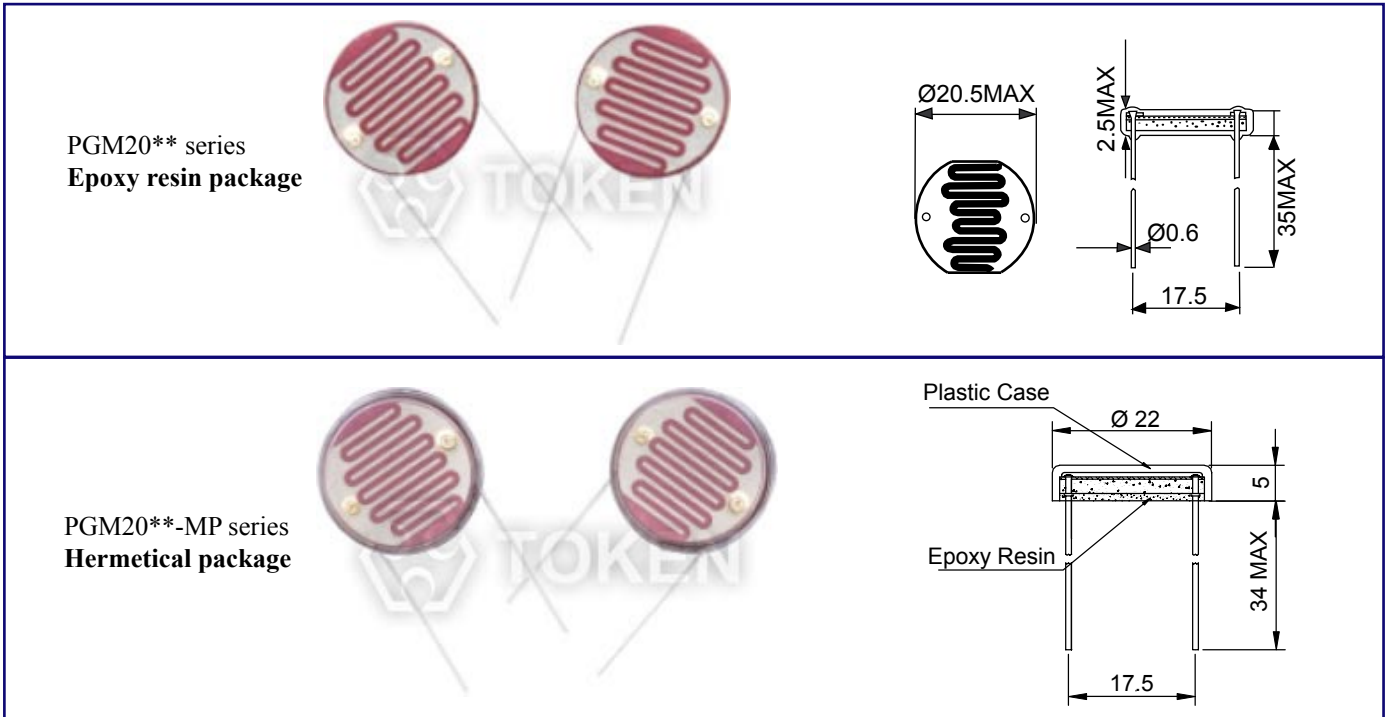
## (PGM12\*\*) Electronics Characteristics

| Model   | Vmax (VDC) | Pmax (mW) | Ambient Temp (°C) | Spectral Peak (nm) | Photo Resistance (10Lx) (KΩ) | Dark Resistance (MΩ)min | γ <sub>min</sub> | Response Time (ms) |       |
|---------|------------|-----------|-------------------|--------------------|------------------------------|-------------------------|------------------|--------------------|-------|
|         |            |           |                   |                    |                              |                         |                  | Rise               | Decay |
| PGM1200 | 250        | 250       | -30 ~ +70         | 560                | 2~5                          | 1.0                     | 0.6              | 30                 | 40    |
| PGM1201 | 250        | 250       | -30 ~ +70         | 560                | 4~10                         | 2.0                     | 0.7              | 30                 | 30    |
| PGM1202 | 250        | 250       | -30 ~ +70         | 560                | 8~20                         | 5.0                     | 0.7              | 30                 | 30    |
| PGM1203 | 250        | 250       | -30 ~ +70         | 560                | 18~50                        | 10                      | 0.8              | 30                 | 30    |
| PGM1204 | 250        | 250       | -30 ~ +70         | 560                | 45~150                       | 20                      | 0.8              | 30                 | 30    |
| PGM1205 | 250        | 250       | -30 ~ +70         | 560                | 140~300                      | 20                      | 0.8              | 30                 | 30    |

## (PGM12\*\*-MP) Electronics Characteristics

| Model      | Vmax (VDC) | Pmax (mW) | Ambient Temp (°C) | Spectral Peak (nm) | Photo Resistance (10Lx) (KΩ) | Dark Resistance (MΩ)min | γ <sub>min</sub> | Response Time (ms) |       |
|------------|------------|-----------|-------------------|--------------------|------------------------------|-------------------------|------------------|--------------------|-------|
|            |            |           |                   |                    |                              |                         |                  | Rise               | Decay |
| PGM1200-MP | 250        | 250       | -30 ~ +70         | 560                | 2~5                          | 1.0                     | 0.6              | 30                 | 40    |
| PGM1201-MP | 250        | 250       | -30 ~ +70         | 560                | 4~10                         | 2.0                     | 0.7              | 30                 | 30    |
| PGM1202-MP | 250        | 250       | -30 ~ +70         | 560                | 8~20                         | 5.0                     | 0.7              | 30                 | 30    |
| PGM1203-MP | 250        | 250       | -30 ~ +70         | 560                | 18~50                        | 10                      | 0.8              | 30                 | 30    |
| PGM1204-MP | 250        | 250       | -30 ~ +70         | 560                | 45~150                       | 20                      | 0.8              | 30                 | 30    |
| PGM1205-MP | 250        | 250       | -30 ~ +70         | 560                | 140~300                      | 20                      | 0.8              | 30                 | 30    |

## ▶ Electronics Characteristics



**Note:** All dimensions are in mm and NTS.

## ▶ (PGM20\*\*) Electronics Characteristics

| Model   | Vmax (VDC) | Pmax (mW) | Ambient Temp (°C) | Spectral Peak (nm) | Photo Resistance (10Lx) (KΩ) | Dark Resistance (MΩ)min | γ <sub>min</sub> | ResponseTime (ms) |       |
|---------|------------|-----------|-------------------|--------------------|------------------------------|-------------------------|------------------|-------------------|-------|
|         |            |           |                   |                    |                              |                         |                  | Rise              | Decay |
| PGM2000 | 500        | 500       | -30 ~ +70         | 560                | 2~5                          | 1.0                     | 0.6              | 30                | 40    |
| PGM2001 | 500        | 500       | -30 ~ +70         | 560                | 4~10                         | 2.0                     | 0.7              | 30                | 30    |
| PGM2002 | 500        | 500       | -30 ~ +70         | 560                | 8~20                         | 5.0                     | 0.7              | 30                | 30    |
| PGM2003 | 500        | 500       | -30 ~ +70         | 560                | 18~50                        | 10                      | 0.8              | 30                | 30    |
| PGM2004 | 500        | 500       | -30 ~ +70         | 560                | 45~150                       | 20                      | 0.8              | 30                | 30    |
| PGM2005 | 500        | 500       | -30 ~ +70         | 560                | 140~300                      | 20                      | 0.8              | 30                | 30    |

## ▶ (PGM20\*\*-PP) Electronics Characteristics

| Model      | Vmax (VDC) | Pmax (mW) | Ambient Temp (°C) | Spectral Peak (nm) | Photo Resistance (10Lx) (KΩ) | Dark Resistance (MΩ)min | γ <sub>min</sub> | Response Time (ms) |       |
|------------|------------|-----------|-------------------|--------------------|------------------------------|-------------------------|------------------|--------------------|-------|
|            |            |           |                   |                    |                              |                         |                  | Rise               | Decay |
| PGM2000-PP | 500        | 500       | -30 ~ +70         | 560                | 2~5                          | 1.0                     | 0.6              | 30                 | 40    |
| PGM2001-PP | 500        | 500       | -30 ~ +70         | 560                | 4~10                         | 2.0                     | 0.7              | 30                 | 30    |
| PGM2002-PP | 500        | 500       | -30 ~ +70         | 560                | 8~20                         | 5.0                     | 0.7              | 30                 | 30    |
| PGM2003-PP | 500        | 500       | -30 ~ +70         | 560                | 18~50                        | 10                      | 0.8              | 30                 | 30    |
| PGM2004-PP | 500        | 500       | -30 ~ +70         | 560                | 45~150                       | 20                      | 0.8              | 30                 | 30    |
| PGM2005-PP | 500        | 500       | -30 ~ +70         | 560                | 140~300                      | 20                      | 0.8              | 30                 | 30    |

*Back to 1st Page - CdS Photo Resistors (PGM)*

## Anti-Surge Resistors

### Thick-Film Power Resistors Handles Large Surges

#### ▶ Preview

A new range of Antisurge axial leaded power resistors, metal glaze resistive element on ceramic substrates, from Token Electronics.

A carbon film resistor replacement, the new RCR series thick-film style resistors offer numerous benefits over the previous style devices, namely reduced costs, excellent thermal compliance, optimised a variety of surge capabilities and better solder joint reliability against temperature cycles.

Token succeeded in commercialising the compact thick-film type leaded resistors with high power and high antisurge characteristics, meeting latest design engineer requirements and making the parts suitable for industrial, measurement and telecommunication applications as well as for automotive circuits, like Electrical Control Units (ECU) and Air-Bag Systems.

The antisurge characteristics of Token's latest metal glaze power film style resistors are superior to standard metal film resistors. The power film types of RCR resistors are available: 0.25W to 10W power rating, max working voltage up to 3000V and max overload voltage 5000V. The resistance range is 1Ω ~ 100MΩ at operating temperature range -20°C~+155°C.

All RCR series devices are RoHS-compliant, and compatible with high temperature soldering processes normally employed for lead free solders. Resistors are also available in various forming styles and different leads for different applications. Contact us with your specific needs.information.



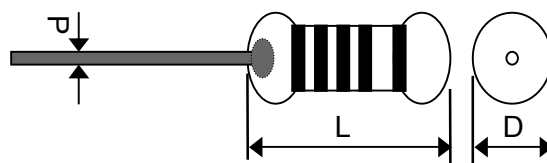
#### ▶ Applications

- Ballasts
- Amplifiers
- Industrial power supplies
- Telecommunications
- Household appliances
- Automotive circuits, Computer, Instrumentation

#### ▶ Features

- High power at small sizes
- Max working voltage up to 3000V
- Lead (Pb)-free and RoHS compliant
- Operating temperature range: -20°C~+155°C
- Metal glaze power film, axial leaded type
- Max overload voltage 5000V, Tolerances: J (±5%)

## ► Specifications & Dimensions (Unit: mm)

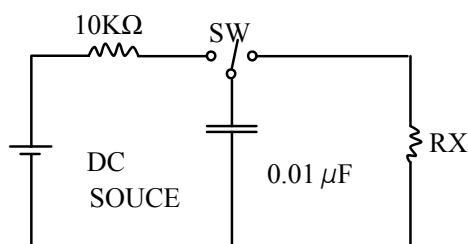


| Type    | Power Rating | L      | D       | d ± 0.05  | H    |
|---------|--------------|--------|---------|-----------|------|
| RCR25   | 1/4W         | 6.5±1  | 2.3±0.5 | 0.5 ~ 0.6 | 26±3 |
| RCR50   | 1/2W         | 9.5±1  | 3.4±0.5 |           |      |
| RCR100  | 1W           | 12.0±1 | 4.0±0.5 | 0.7 ~ 0.8 |      |
| RCR200  | 2W           | 16.0±1 | 6.1±0.5 |           |      |
| RCR300  | 3W           | 17.0±1 | 7.0±0.5 |           |      |
| RCR500  | 5W           | 24.0±1 | 8.0±0.5 |           |      |
| RCR1000 | 10W          | max.50 | max.10  |           |      |

## ► Power Rating

| Type   | Power Rating | Max Working Voltage | Max Overload Voltage | Dielectric With-standing Voltage | TCP. (ppm/°C) | Resistance Range E24. J(±5%)(Ω) | Operating Temp.range |
|--------|--------------|---------------------|----------------------|----------------------------------|---------------|---------------------------------|----------------------|
| RCR25  | 1/4W         | 500V                | 700V                 | 500V                             | ±350          | 1 ~ 33M                         | -20°C~+155°C         |
| RCR50  | 1/2W         | 1000V               | 1500V                | 600V                             | ±350          | 1 ~ 68M                         |                      |
| RCR100 | 1W           | 1500V               | 2500V                | 800V                             | ±350          | 1 ~ 100M                        |                      |
| RCR200 | 2W           | 2000V               | 3000V                | 800V                             | ±350          | 1 ~ 100M                        |                      |
| RCR300 | 3W           | 2500V               | 4000V                | 1000V                            | ±350          | 1 ~ 100M                        |                      |
| RCR500 | 5W           | 3000V               | 5000V                | 1000V                            | ±350          | 1 ~ 100M                        |                      |

## ► Power Rating



Test Circuit

| Power  | Resistance Range (Ω) | Surge Voltage | Anti-Surge Characteristics                                    | Surge Test Condition                           |
|--------|----------------------|---------------|---|--|
| 0.25 W | 50K < R              | 3KV           | (2.5 Sec. ON + 2.5 Sec. Off) × 10 Cycles<br>ΔR ≤ ±(50%R+0.1Ω) | In accordance with IEC65 Safety specification. |
| 0.5 W  | 10K ≤ R < 100K       | 3KV           |   |  |
|        | 100K ≤ R < 360K      | 5KV           |   |  |
|        | 360K ≤ R < 1M        | 7KV           |   |  |
|        | 1M ≤ R               | 10KV          |   |  |

## How to Order

RCR50

❶

1/2W

❷

220KR

❸

J

❹

TB

❺

❶ Part Number: RCR

❷ Rated Power (W)

❸ Resistance Value ( $\Omega$ )

| Code | Resistance Value ( $\Omega$ ) |
|------|-------------------------------|
| 1R0  | 1.0 $\Omega$                  |
| 100R | 100 $\Omega$                  |
| 220K | 220K $\Omega$                 |
| 22M  | 22M $\Omega$                  |

❹ Resistance Tolerance (%)

| Code | Resistance Tolerance |
|------|----------------------|
| J    | $\pm 5\%$            |

❺ Package

| Code | Package    |
|------|------------|
| P    | Bulk       |
| TB   | Taping Box |



# Carbon Composition Resistors

## The High Pulse Withstanding Carbon Composition Resistors Handle Big Peaks and Pulses

### ▶ Preview

The high pulse withstanding capability of the CCR series of carbon composition resistors from Token Electronics offers designers a compact solution for applications involving high voltages and high-energy pulses.

Though, many resistor manufacturers claim to offer carbon composition replacements. However, these wirewound or thick film alternatives do not fully match the pulse performance and low inductance of carbon composition.

Token's CCR series now offers the industry a carbon composition resistor made up of a solid rod of conductive composite material, the chemical composition of which is altered to produce different resistance values.

The main advantage of carbon composition is their pulse handling capability. This is due to the fact that the entire rod conducts and so the thermal mass is far higher, which results in a higher energy capability. Due to the need for higher peak voltages, the CCR range is perfect for vehicle ignition system applications, medical monitoring equipment and as output resistors in defibrillators.

The standard carbon composition CCR resistor offers a power rating of 1/4W and 1/2W at 25°C and is made up of a solid rod of conductive composition material, which can be altered to produce different resistance values. With a typical resistance range of 2.2Ω ~ 22MΩ, resistance tolerance is J(±5%) and K(±10%). Resistors with 5% and 10% tolerance have four bands indicating value and tolerance in accordance with IEC62.

Our custom solutions are designed to address your need for technical and economic success in a timely manner. Contact us with your specific needs.



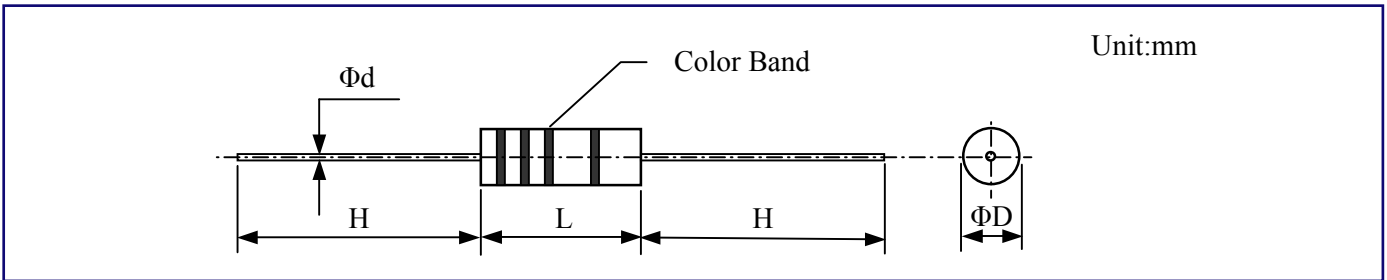
### ▶ Features

- Low inductance
- Solid rod carbon composition
- Power rating 1/4W and 1/2W
- Resistance range 2.2Ω ~ 22MΩ
- Resistance tolerance J(±5%) and K(±10%)
- High pulse withstanding and high energy capability
- Products with Pb-free Terminations and RoHS compliant

### ▶ Applications

- Strobe Lighting
- High Power Lighting
- Medical defibrillators
- Welding, Automotive
- Inrush Current Limiting
- High Voltage Power Supplies
- Protection (e.g. Discharge Circuits, Surge Protection)

## ► Dimensions (Unit: mm)



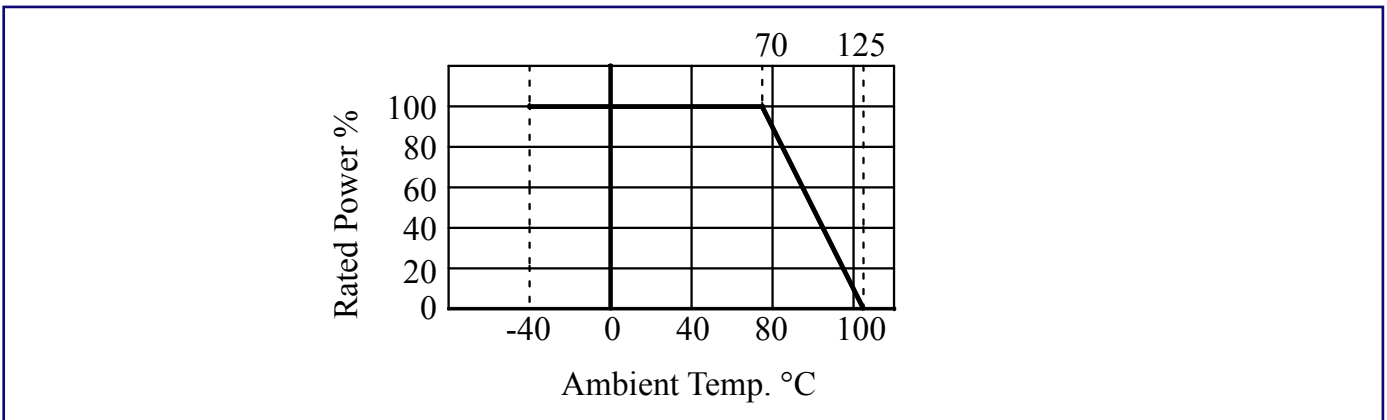
| Type | Power Rating | L   |      | Φ D     | H    | Φ d       |
|------|--------------|-----|------|---------|------|-----------|
| CCR  | 1/4W         | 6.3 | +1.0 | 2.3±0.3 | 27±3 | 0.60±0.05 |
|      |              |     | -1.5 |         |      |           |
| CCR  | 1/2W         | 10  | +0.5 | 3.5±0.3 | 27±3 | 0.68±0.05 |
|      |              |     | -1.5 |         |      |           |

## ► Ratings Specifications

| Type | Power Rating | Resistance Range | Tolerance E12,E24 | Max Working voltage | Max overload Voltage | Rated Ambient Temp. | Operating Temp. Range |
|------|--------------|------------------|-------------------|---------------------|----------------------|---------------------|-----------------------|
| CCR  | 1/4W         | 2.2Ω ~12MΩ       | J(±5%)K±10%       | 250V                | 350V                 | +70°C               | -40°C~+125°C          |
| CCR  | 1/2W         | 2.2Ω ~22MΩ       |                   | 400V                | 700V                 | +70°C               | -40°C~+125°C          |

Rated Voltage =  $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$  or Max. working voltage, whichever is lower.

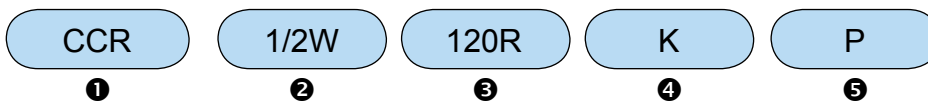
## ► Derating Curve



## ► Performance

| Description                        |                  | Performance Requirements   |            | Test Method  |
|------------------------------------|------------------|--|------------|--|
| Resistance Temperature Coefficient | Resistance Range | Maximum Resistance Value Change %  |            | Test Temperature<br>+20°C /-40°C /+20°C /+100°C /+20°C                                 |
|                                    |                  | -40~+20°C  | +20~+100°C |  |
|                                    | <1KΩ             | ±6.5%  | ±5.0%      |  |
|                                    | 1.1KΩ ~10KΩ      | ±10%   | ±6.0%      |  |
|                                    | 11KΩ ~100KΩ      | ±13%   | ±7.5%      |  |
|                                    | 11KΩ ~1MΩ        | ±15%   | ±10%       |  |
|                                    | 1.1MΩ ~10MΩ      | ±20%   | ±15%       |  |
|                                    | >11MΩ            | ±25%   | ±20%       |  |
| Short-time Overload                |                  | ΔR≤±2.5%   |            | Rate Voltage*2.5 or maximum overload voltage (the lower)5sec.                          |
| With Standing Voltage              |                  | No flashover or breakdown  |            | 2times maximum working voltage 1 minute  |
| Terminal Strength                  | Pulled           | ΔR≤±2% No visible damage   |            | Load 10N 10s   |
|                                    | Winded           |  |            | Load 10N 4*90°   |
|                                    | Twisted          |  |            | 3*360° in opposite direction   |
| Resistance to vibration            |                  | No visible damage  |            | 10~50Hz 3 direction 2 hours each   |
| Solder-heat Resistance             |                  | ΔR≤±5% Marks legible,no visible damage   |            | 350°C 4mm from the body,3 seconds  |
| Solderability                      |                  | At least 95% if the dipping surface must be covered by new solder,no flaws gathered. |            | 235°C 2mm from the body,2 seconds  |
| Temperature Cycle                  |                  | ΔR≤±2% No visible damage   |            | -40°C(30min.)/85°C(30min.)5 cycles   |
| Humidity                           |                  | ΔR≤±10% No visible damage  |            | 40°C 95% RH 240 hours  |
| Load Life                          |                  | ΔR≤±10% No visible damage,marks legible  |            | Rated voltage or maximum working voltage, 1.5 hours on, 0.5 hours off, 40°C 1000 hours |

## ► How to Order



❶ Part Number: CCR

❷ Rated Power (W)

❸ Resistance Value (Ω)

| Code | Resistance Value |
|------|------------------|
| 2R2  | 2.2Ω             |
| 120R | 120Ω             |
| 1M2  | 1.2MΩ            |
| 22M  | 22MΩ             |

❹ Resistance Tolerance (%)

| Code | Resistance Tolerance |
|------|----------------------|
| J    | ±5%                  |
| K    | ±10%                 |

❺ Package

| Code | Package |
|------|---------|
| P    | Bulk    |

[Back to 1st Page - Carbon Composition Resistors \(CCR\)](#)

# Metal Film Precision Resistors

## Precision Metal-Film Resistors for Low-Cost Uses

### ▶ Preview

Token offers a low-cost alternative commercial metal film resistor for precision applications. The MF series offers tight tolerances and low TCRs over a wide resistance range and are suitable for applications where long-term stability is paramount.

The MF is available in a resistance range of  $10\Omega$  to  $1M\Omega$  with a standard resistance tolerance of  $\pm 1\%$  and a temperature coefficient of resistance (TCR) of  $+15/-25\text{ppm}/^\circ\text{C}$ , although other tolerances and TCRs are available.

The resistance element in these devices is a precisely controlled thin film of metal alloy deposited on a high quality alumina rod. Plated caps are force-fitted before the assembly is trimmed using advanced trimming techniques to ensure excellent performance and low electrical noise.

Leads are welded to the end caps prior to the resistor being coated with epoxy, and colour band marking applied. A variety of standard lead forms are available for use where auto-insertion is not available or practical. This gives the advantage of the value being shown, even if the resistor is machine preformed or auto-inserted.

The MF is RoHS compliant with 100% lead free, Contact us with your specific needs.



### ▶ Features

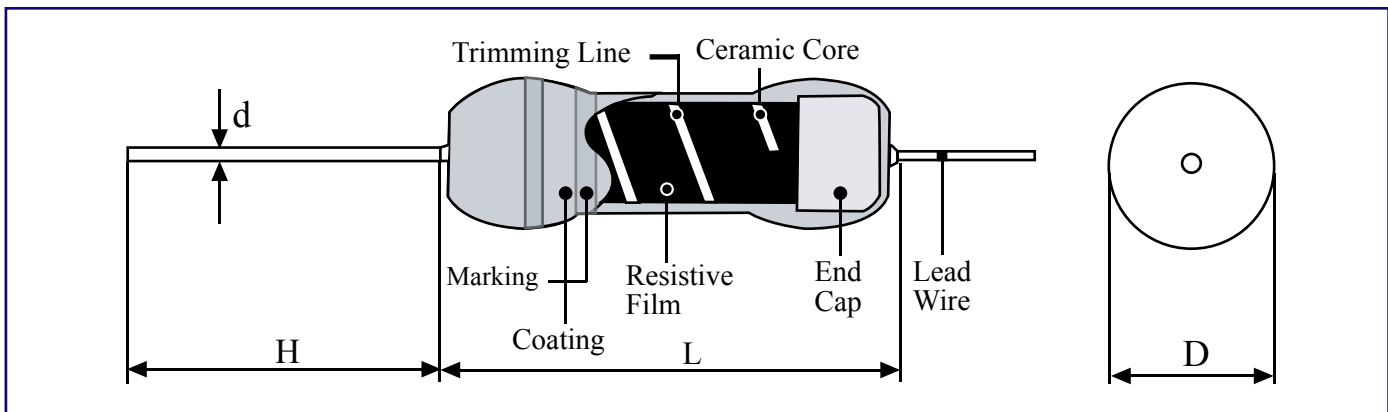
- Low cost, low noise, operating temperature range  $-55^\circ\text{C} \sim 155^\circ\text{C}$
- Precision tight tolerance available in  $\pm 0.1\%$ ,  $\pm 0.25\%$ ,  $\pm 0.5\%$ ,  $\pm 1\%$
- Pure tin plating provides compatibility with lead (Pb)-free and lead containing soldering processes

### ▶ Applications

- Telecom
- Test and measurement
- All general purpose applications

www.DataSheet4U.com

## ► Dimensions & Specifications (Unit: mm)



| STYLE    | MIL STYLE | POWER RATING(W) |      | DIMENSION (mm) |           |          |           | MAX WORKING VOLTAGE |     | MAX OVERLOAD VOLTAGE |     |
|----------|-----------|-----------------|------|----------------|-----------|----------|-----------|---------------------|-----|----------------------|-----|
|          |           | RN              | RNS  | L              | D         | H        | d ± 0.05  | RN                  | RNS | RN                   | RNS |
| MF - 12  | RN-50     | 1/8W            | 1/4W | 3.2 ± 0.2      | 1.5 ± 0.2 | 26 ± 1.0 | 0.40~0.45 | 200                 | 150 | 400                  | 300 |
| MF - 25  | RN-55     | 1/4W            | 1/2W | 6.0 ± 0.3      | 2.3 ± 0.3 | 26 ± 1.0 | 0.40~0.50 | 250                 | 200 | 500                  | 400 |
| MF - 50  | RN-60     | 1/2W            | 1W   | 9.0 ± 0.5      | 3.0 ± 0.5 | 26 ± 1.0 | 0.50~0.55 | 350                 | 250 | 700                  | 500 |
| MF - 100 | RN-65     | 1W              | 2W   | 11 ± 1.0       | 4.0 ± 0.5 | 35 ± 3.0 | 0.75~0.80 | 500                 | 300 | 1000                 | 600 |
| MF - 200 | RN-70     | 2W              | 3W   | 15 ± 1.0       | 5.0 ± 0.5 | 35 ± 3.0 | 0.75~0.80 | 500                 | 350 | 1000                 | 700 |

## ► Resistance Range

| STYLE  | MIL STYLE | TOLERANCE                       | TC+15-25PPM  | TC+50PPM | TC+100PPM | REMARK   |
|--------|-----------|---------------------------------|--|----------|-----------|--|
| MF-12  | RN-50     | ±1%<br>±0.5%<br>±0.25%          | 100Ω-100KΩ<br>100Ω-100KΩ<br>100Ω-100KΩ                 | 10Ω-1MΩ  | 10Ω-1MΩ   | *Standard resistance is 10Ω-1MΩ, below or over this resistance on request. |
| MF-25  | RN-55     | ±1%<br>±0.5%<br>±0.25%<br>±0.1% | 51.1Ω-511KΩ<br>51.1Ω-511KΩ<br>100Ω-300KΩ<br>100Ω-300KΩ | 10Ω-1MΩ  | 10Ω-1MΩ   |  |
| MF-50  | RN-60     | ±1%<br>±0.5%<br>±0.25%<br>±0.1% | 51.1Ω-1KΩ<br>51.1Ω-1KΩ<br>100Ω-551KΩ<br>100Ω-330KΩ     | 10Ω-1MΩ  | 10Ω-1MΩ   |  |
| MF-100 | RN-65     | ±1%<br>±0.5%<br>±0.25%<br>±0.1% | 51.1Ω-1KΩ<br>51.1Ω-1KΩ<br>100Ω-551KΩ<br>100Ω-330KΩ     | 10Ω-1MΩ  | 10Ω-1MΩ   |  |
| MF-200 | RN-70     | ±1%<br>±0.5%<br>±0.25%<br>±0.1% | 51.1Ω-1KΩ<br>51.1Ω-1KΩ<br>100Ω-551KΩ<br>100Ω-330KΩ     | 10Ω-1MΩ  | 10Ω-1MΩ   |  |

www.DataSheet4U.com

## Electrical Performance

| REQUIREMENTS              | CHARACTERISTICS | JIS C 5202  | MIL-R-10509F       |
|---------------------------|-----------------|---|--------------------|
| Operating Temp.Range      | -55°C ~ 155°C   |   |                    |
| Temp Coefficient (°C )    | ±25 ±50 ±100    | 5.2   | 4.6.12             |
| Short Time Overload       | ±(0.5%+0.05Ω)   | 5.5 A   | 4.6.6              |
| Dielectric Withstanding V | ±(0.5%+0.05Ω)   | 5.7 A   | 4.6.8              |
| Effect of Soldering       | ±(0.5%+0.05Ω)   | 6.4 350°C 3 sec   | 4.6.10             |
| Temperature Cycling       | ±(0.5%+0.05Ω)   | 7.4   | 4.6.4              |
| Low Temp Operation        | ±(0.5%+0.05Ω)   |   | 4.6.5              |
| Terminal Strength         | ±(0.5%+0.05Ω)   | 6.1   | 4.6.7              |
| Moisture Resistance       | ±(1%+0.05Ω)     | 7.9 1,000hr   | MIL R-22684 4.6.10 |
| Load Life                 | ±(1%+0.05Ω)     | 7.10 1,000hr  | 4.6.13             |
| Storage                   | ±(0.2%+0.05Ω)   | Shelved one year in a room of normal temperature and humidity |                    |

## How to Order

MF-25 1/4W 100R J TB  
① ② ③ ④ ⑤

① Part Number: MF

② Rated Power (W)

③ Resistance Value (Ω)

| Code | Resistance Value |
|------|------------------|
| 10R  | 10Ω              |
| 100R | 100Ω             |
| 1K   | 1KΩ              |
| 1M   | 1MΩ              |

④ Resistance Tolerance (%)

| Code | Resistance Tolerance |
|------|----------------------|
| J    | ±5%                  |

⑤ Package

| Code | Package |
|------|---------|
| P    | Bulk    |

## Metal Oxide Resistors

### Metal Oxide Resistors on The Pulse in Various Forming Styles for Different Applications

#### ▶ Preview

Now available from Token Electronics is a new range of highly stable and reliable metal oxide resistors providing high power in a small package with various forming styles and different leads for different applications.

New RS series resistors are ideal for pulse applications in adverse conditions and are available in different sizes with power ratings of 0.5W to 10W for a power voltage range from 200V to 850V. Highly temperature resistant the devices feature a resistance range from 10Ω to 47KΩ.

RS series resistors are available in various forming styles and different leads for different applications like power supplies, amplifiers, household appliances and ballasts.

Manufactured by depositing a homogeneous oxide film of metal alloy onto a high-grade ceramic body, the metal oxide resistors are coated with a nonflammable lacquer providing mechanical, electrical and climatic protection.

The devices come packaged in ammo pack boxed or tape and reel format. All RS Series devices are RoHS-compliant, and compatible with high temperature soldering processes normally employed for lead free solders.

Contact us with your specific needs.

#### ▶ Applications

- Ballasts
- Amplifiers
- Power supplies
- Telecommunications
- Household appliances
- Automotive, Computer, Instrumentation

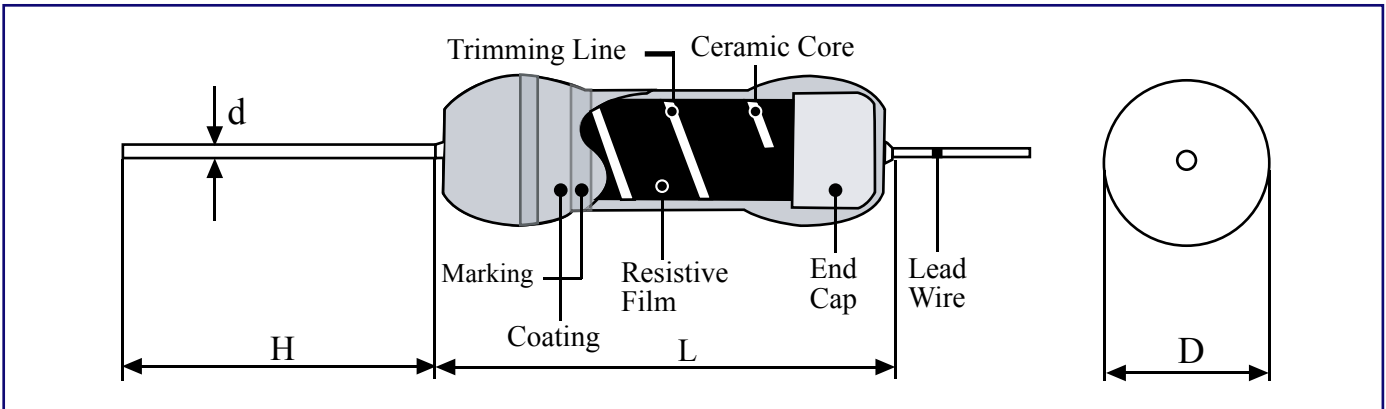
#### ▶ Features

- Tolerances: G (±2%), J (±5%)
- Lead (Pb)-free and RoHS compliant
- Power wattages up to 10W at + 25 °C
- Operating temperature range: -55°C~200°C
- Axial leaded type, high power at compact sizes
- Replace carbon composition components in some applications





## ► Specifications & Dimensions (Unit: mm)



| Type |      | L         | D         | H      | d ± 0.05  | MAX Working Voltage |      | Dielectric Withstanding Voltage |       |
|------|------|-----------|-----------|--------|-----------|---------------------|------|---------------------------------|-------|
| RSS  | RSN  |           |           |        |           | RSS                 | RSN  | RSS                             | RSN   |
| 1/2W | 1/4W | 6.0 ± 0.3 | 2.3 ± 0.3 | 26 ± 1 | 0.40~0.50 | 200V                | 300V | 400V                            | 500V  |
| 1W   | 1/2W | 9.0 ± 0.5 | 3.0 ± 0.5 | 26 ± 1 | 0.50~0.55 | 250V                | 350V | 500V                            | 600V  |
| 2W   | 1W   | 11 ± 1.0  | 4.0 ± 0.5 | 26 ± 3 | 0.75~0.80 | 300V                | 350V | 600V                            | 700V  |
| 3W   | 2W   | 15 ± 1.0  | 5.0 ± 0.5 | 35 ± 3 | 0.75~0.80 | 350V                | 350V | 700V                            | 700V  |
| 5W   | 3W   | 17 ± 1.0  | 6.0 ± 0.5 | 35 ± 3 | 0.75~0.80 | 350V                | 500V | 700V                            | 1000V |
| 6W   | 5W   | 24 ± 1.0  | 8.0 ± 0.5 | 38 ± 3 | 0.75~0.80 | 500V                | 700V | 800V                            | 1000V |
| 7W   | 6W   | 24 ± 1.0  | 8.0 ± 0.5 | 38 ± 3 | 0.75~0.80 | 500V                | 700V | 800V                            | 1000V |
| 10W  | 7W   | 41 ± 1.0  | 8.0 ± 0.5 | 38 ± 3 | 0.75~0.80 | 750V                | 850V | 850V                            | 1000V |
|      | 10W  | 53 ± 1.0  | 8.0 ± 0.5 | 38 ± 3 | 0.75~0.80 | 750V                | 850V | 850V                            | 1000V |

## ► Electrical Performance

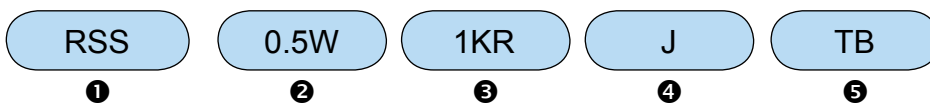
| Requirements                    |                     | Characteristics   | Test Method     |              |
|---------------------------------|---------------------|---|-----------------|--------------|
|                                 |                     |   | JIS C 5202      | MIL-R-22684B |
| Operating Temp.Range            |                     | -55°C~200°C   |                 |              |
| Temp.Coefficient (ppm C)        |                     | ± 300   | 5.2             | 4.6.11       |
| Max. Resistance Changes         | Short Time Overload | ± (1%+0.05Ω)  | 5.2A            | 4.6.5        |
|                                 | Effect of Soldering | ± (1%+0.05Ω)  | 6.4 350°C 2Sec  | 4.6.9        |
|                                 | Temp.Cycling        | ± (1%+0.05Ω)  | 7.4-55°C / 85°C | 4.6.3        |
|                                 | Moisture Resistance | ± 5%  | 7.9 1,000hr     | 4.6.10       |
|                                 | Load Life           | ± 5%  | 7.10 1,000hr    | 4.6.12       |
| Dielectric Withstanding Voltage |                     | ± (0.5%+0.05Ω)  | 5.7A            | 4.6.7        |
| Non-Combustibility              |                     | The resistor shall withstand Overload test in accordance with Article UL492.2 13 without producing a fire hazard. |                 |              |
| Resistance to Solvents          |                     | No damage on the appearance,co.or bands.  |                 |              |



## ▶ Application Notes

- Never use organic solvents to clean non-flammable resistors.
- Maintaining a surface temperature of 200°C or less will extend resistors service life.
- Although the hardness exceeds that of a 3H pencil lead, do not nick the coating with screwdrivers or other pointed objects.
- Smoke emitted from non-flammable resistors on initial use in powered circuits is a normal phenomenon and the component can be safely utilized.
- Non-flammable resistors cannot be utilized in oil. Non-flammable resistors cannot be used in high frequency machinery because of the inductance produced by the grooving.
- Avoid touching non-flammable resistors in operation; the surface temperature ranges from approximately 350 °C to 400°C when utilized at the full rated value.
- All metal oxide film resistors (RSS, RSN) manufactured by Token Electronics Co., Ltd. comply with the U.S. UL-94 non-flammability test, Class V-0, a continuous combustion period of zero seconds.
- Less resistant against external shocks than ordinary resistors due to special flame retardant coating. So, never give shocks or vibrations on the resistors. Also never damage them by picking up the coated films with pliers, tweezers, etc.
- After cleaning, no external power should be put on the coated films before they are well dried.

## ▶ How to Order



❶ Part Number: RSS, RSN

❷ Rated Power (W)

❸ Resistance Value (Ω)

| Code | Resistance Value |
|------|------------------|
| 10R  | 10Ω              |
| 100R | 100Ω             |
| 1K   | 1KΩ              |
| 10K  | 10KΩ             |

❹ Resistance Tolerance (%)

| Code | Resistance Tolerance |
|------|----------------------|
| J    | ±5%                  |

❺ Package

| Code | Package    |
|------|------------|
| TB   | Taping Box |

*Back to 1st Page - Metal Oxide Resistors (RSS, RSN)*

# Carbon Film Resistors

## Carbon Film Resistors are Cost-Effective Option

### ▶ Preview

Providing design engineers with an economical power resistor with high quality performance, Token Electronics now offers commercial grade low power carbon film resistors.

Designated the CF series, the resistors are available in both standard CFN and miniature CFS sizes, the conformally coated resistors offer high quality performance for applications that do not require surge protection or precision tolerances.

The commercial grade carbon CF series is available in flame retardant packaging and have ideal specifications for consumer electronic or electrical devices. The CF devices offer a wide resistance range for devices with power ratings up to 3W in standard CFN size, and 5W in miniature CFS sizes, delivering high quality performance for general purpose applications.

The CF series resistors are ideal for general use applications including electrical equipment, small appliances and consumer electronics, such as televisions and other high-volume products. The CF series feature standard tolerances is G ( $\pm 2\%$ ) and J ( $\pm 5\%$ ), with a resistance range from  $0.5\Omega$  to  $22M\Omega$ .

All CF series devices are RoHS-compliant, and compatible with high temperature soldering processes normally employed for lead free solders. Also, CF resistors are available in various forming styles and different leads for different applications. Contact us with your specific needs.

### ▶ Features

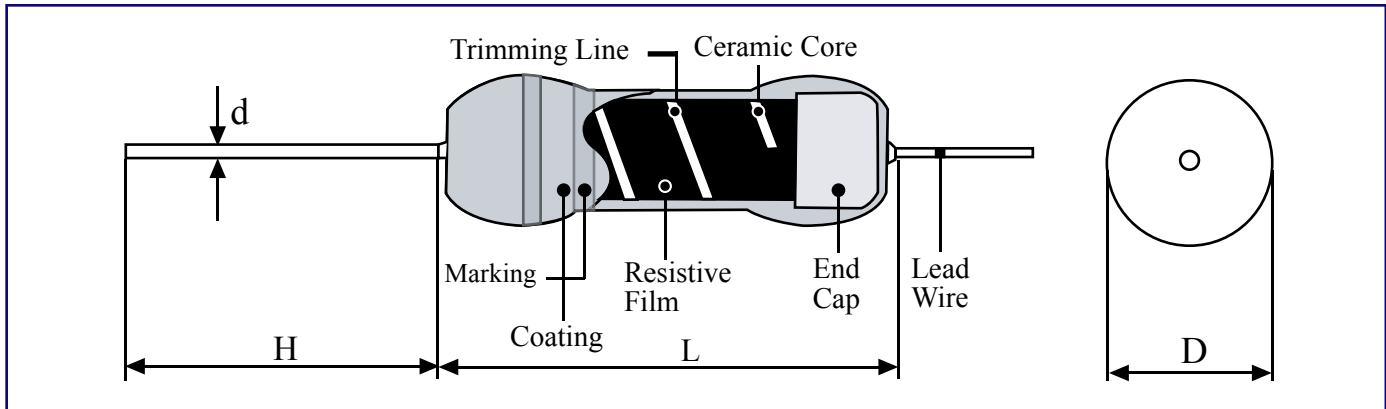
- Tolerances: G ( $\pm 2\%$ ), J ( $\pm 5\%$ )
- Power wattages up to 5W at  $+25^\circ\text{C}$
- Lead (Pb)-free and RoHS compliant
- Operating temperature range:  $-55^\circ\text{C}\sim+155^\circ\text{C}$
- Axial leaded type, high power at small sizes

### ▶ Applications

- www.DataSheet4U.com
- Consumer Electronic
  - Telecommunications
  - Household Appliances
  - Automotive, Computer, Instrumentation



## ► Dimensions & Specifications (Unit: mm)



| Type  |       | Dimension (mm) |         |      |           | Maximum Working Voltage | Maximum Overload Voltage | Resistance Tolerance |          |
|-------|-------|----------------|---------|------|-----------|-------------------------|--------------------------|----------------------|----------|
| CFN   | CFS   | L              | D       | H    | d±0.05    |                         |                          | ± 2%(G)              | ± 5%(J)  |
| 1/8 W | .     | 3.2±0.2        | 1.5±0.2 | 26±1 | 0.40~0.45 | 200                     | 400                      | 10Ω-470K             | 1Ω-4.7M  |
| 1/6 W | 1/4 W | 3.2±0.2        | 1.5±0.2 | 26±1 | 0.40~0.45 | 200                     | 400                      | 1Ω-10M               | 0.5Ω-22M |
| 1/4 W | 1/2 W | 6.2±0.5        | 2.3±0.3 | 26±1 | 0.40~0.50 | 250                     | 500                      | 1Ω-10M               | 0.5Ω-22M |
| 1/3 W | 1/2 W | 8.5±0.5        | 2.8±0.3 | 26±1 | 0.50~0.55 | 250                     | 500                      | 1Ω-10M               | 0.5Ω-22M |
| 1/2 W | 1 W   | 9.0±0.5        | 3.0±0.5 | 26±1 | 0.50~0.55 | 350                     | 700                      | 1Ω-10M               | 0.5Ω-22M |
| 1 W   | 2 W   | 11±1.0         | 4.0±0.5 | 35±3 | 0.75~0.80 | 500                     | 1000                     | 1Ω-10M               | 0.5Ω-22M |
| 2 W   | 3 W   | 15±1.0         | 5.0±0.5 | 35±3 | 0.75~0.80 | 500                     | 1000                     | 1Ω-10M               | 0.5Ω-22M |
| 3 W   | 5 W   | 17±1.0         | 6.0±0.5 | 35±3 | 0.75~0.80 | 500                     | 1000                     | 1Ω-10M               | 0.5Ω-22M |

## ► Electrical Performance

| Test Items                         | Condition  | Spec  |
|------------------------------------|--|---|
| Operating Temp.range               | -55°C ~ +155°C   |   |
| Short Time Over Load               | 2.5 Times of rated voltage for 5sec.                           | ± 1%  |
| Load Life                          | 70 °C on-off cycle 1,000hrs.                                   | ± 5%  |
| Moisture-Proof Load Life           | 40 °C 95% RH on-off cycle 1,000hrs                             | ± 5%  |
| Soldering After Resistance         | 350 °C for 3sec.   | ± 0.5%  |
| Temperature Cycle                  | -30 °C~85 °C 5cycles   | ± 2%  |
| Resistance Temperature Coefficient | 1Ω~22KΩ<br>22KΩ~510KΩ<br>510KΩ~1MΩ<br>1MΩ~2.2MΩ<br>2.2MΩ~5.1MΩ | ± 300PPM / °C<br>± 450PPM / °C<br>± 800PPM / °C<br>± 1000PPM / °C<br>± 1400PPM / °C |

## How to Order

CFN

0.125W

100R

J

TB

❶
❷
❸
❹
❺

❶ Part Number: CFN, CFS

❷ Rated Power (W)

❸ Resistance Value ( $\Omega$ )

| Code | Resistance Value |
|------|------------------|
| 1R   | 1 $\Omega$       |
| 10R  | 10 $\Omega$      |
| 100R | 100 $\Omega$     |
| 10K  | 10K $\Omega$     |
| 10M  | 10M $\Omega$     |
| 22M  | 22M $\Omega$     |

❹ Resistance Tolerance (%)

| Code | Resistance Tolerance |
|------|----------------------|
| G    | $\pm 2\%$            |
| J    | $\pm 5\%$            |

❺ Package

| Code | Package    |
|------|------------|
| TB   | Taping Box |

# Zero Ohm Jumper Wire Resistors

## A Quick Solution to PCB Board Connections

### ▶ Preview

Jumper Wire (JW series a zero-ohm link) and zero-ohm resistor (ZO series) are a link used to connect traces on a printed circuit board that is packaged in the same format as a resistor.

The resistance of JW and ZO series is only approximately zero; only a maximum  $0.05\Omega$  is specified. Thus, a fractional tolerance (as a percentage of the zero-ohm ideal value) would be infinite and is not specified.

Axial through-hole zero-ohm resistors are especially suited for automatic machine insertion and generally marked with a single black band.

Token's JW and ZO Series offer a quick solution to the following problems:

1. Circuit tuning by changing point connections.
2. An "after the fact design" the requires new point connections.
3. Inability to connect two points on a PCB board due to other circuit paths which must be crossed over.

Allowing customers to standardise on the PCB layout and use jumper wire and zero ohm resistor for required model variations, Token has developed a wider version for the interconnection device between points on a PCB board as jumper wires or crossovers. Contact us with your specific needs.

### ▶ Applications

- Interrupt processing
- Input and output distribution
- Ideal connection for circuit boards
- Dummy components on a PCB test board

### ▶ Features

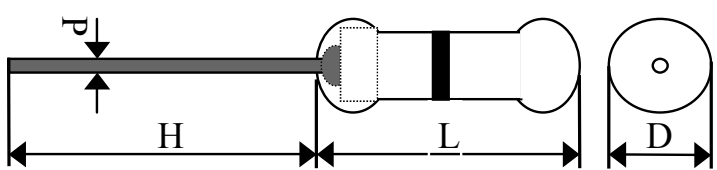
- Maximum resistance  $0.05\Omega$
- Packing: Tape/Reeled or Bulk
- RoHS compliant with 100% lead free
- Lead Material: Tin-plated copper lead
- Ideal straight - through between point on PC Boards



# TOKEN ZO, JW Zero Ohm Jumper Wire Resistors

## Zero Ohm Resistors (ZO) General Specification (Unit: mm)

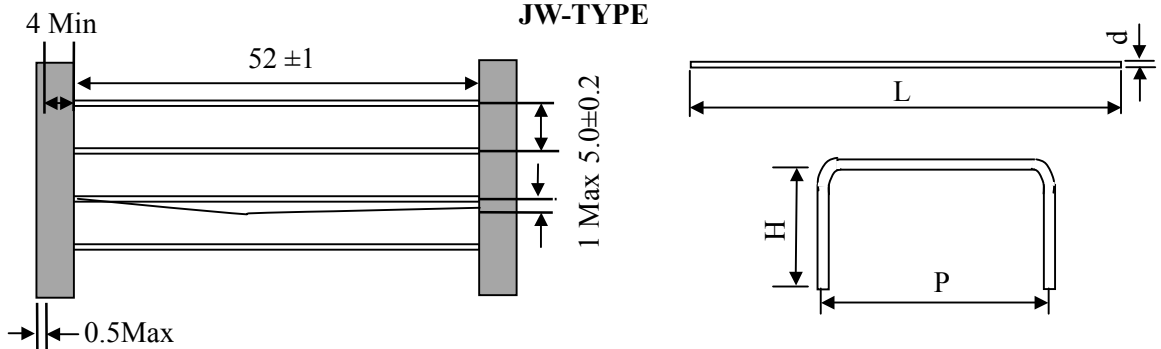
**ZO-TYPE**



| Type     | Rating | Dimension (mm) |        |       |             |
|----------|--------|----------------|--------|-------|-------------|
|          |        | L Max.         | D Max. | H ± 3 | d+0.02-0.04 |
| ZO - 1/8 | 0.125W | 4.2            | 2.0    | 28    | 0.5         |
| ZO- 1/4  | 0.25W  | 6.8            | 2.5    | 28    | 0.5         |

## Jumper Wire Resistors (JW) General Specification (Unit: mm)

**JW-TYPE**



| Type | L±1  | d+0.02 -0.04 | H      | P      |
|------|------|--------------|--------|--------|
| ZW-A | 61.5 | 0.5          | 3 - 10 | 5 - 30 |
| ZW-B | 61.5 | 0.6          | 3 - 10 | 5 - 30 |

## Electrical Performance

| Requirements                    | Characteristics  |
|---------------------------------|--|
| Maximum Resistance              | 0.05Ω  |
| Lead Material                   | tin-plead copper   |
| Body Material                   | Electrical grade, high performance molding compound  |
| Dielectric Withstanding Voltage | Atomspheric-500V RMS, Reduced-325V RMS   |
| Insulation Flammability         | Resistor Insulation is self extinguishing within 10 seconds after externally applied flame is removed. |
| Current Rating                  | 25 AMPS at 25°C, dreading to 0 AMPS at 150°C   |

www.DataSheet4U.com

## ▶ How to Order

ZO-1/4

❶

0.25W

❷

TB

❸

❶ Part Number: ZO-1/4, ZO-1/8, ZW-A, ZW-B

❷ Rated Power (W): 0.25W, 0.125W

❸ Package

| Code | Package    |
|------|------------|
| p    | Bulk       |
| TB   | Taping Box |

# Ceramic Housed Cement Resistors

Cement Resistors - SQP, SQM, SQT, SQH, SQZ Series

**Low-cost Ceramic Cased Resistors  
Suit High Volumes and High Temperatures**

## ▶ Preview

Token electronics offers commercial grade ceramic-housed power wirewound and film resistors. For medium to high rated power (2W...50W), SQ resistors provide full electrical insulation mounted in a ceramic case.

Axial, radial, vertical styles and several mounting techniques of wire leads or quick disconnects are available from Token's SQP, SQM, SQZ, and SQH.

The SQ series power resistors feature ideal specifications for high volume and high-temperature applications. Frequently used in power supplies, motor controllers, and automotive applications, these products can be custom tailored to individual needs.

With the extended resistance range and high-temperature rating, the resistors can be specified for operation in harsh environments. The SQ series wirewound resistors feature a resistance range from 0.1Ω to 3KΩ, while the SQ series power film resistors have a resistance range of 80Ω to 150KΩ.

Standard tolerances for both devices are to ±5%, with TCRs of ±300ppm/°C and above. Token is equipped to design and produce custom components to meet many design and reliability demands. Contact us with your specific needs.

## ▶ Applications

- Power supplies
- Voltage dividers
- Motor controllers
- Automotive applications
- Power electronics circuits

## ▶ Features

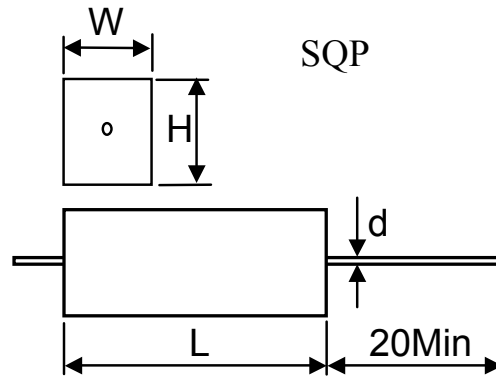
- Low cost, space saving
- RoHS compliant with 100% lead free
- Direct mounting on printed circuit board
- Circuit board lock-in mounting tabs available
- High performance for power required applications
- High power to size ratio, Special inorganic potting compound
- Ceramic case provide high thermal conductivity in a fireproof package



www.DataSheet4U.com

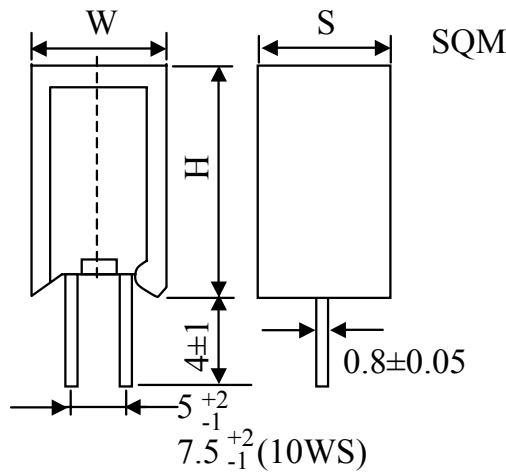


## ► SQP - Dimensions



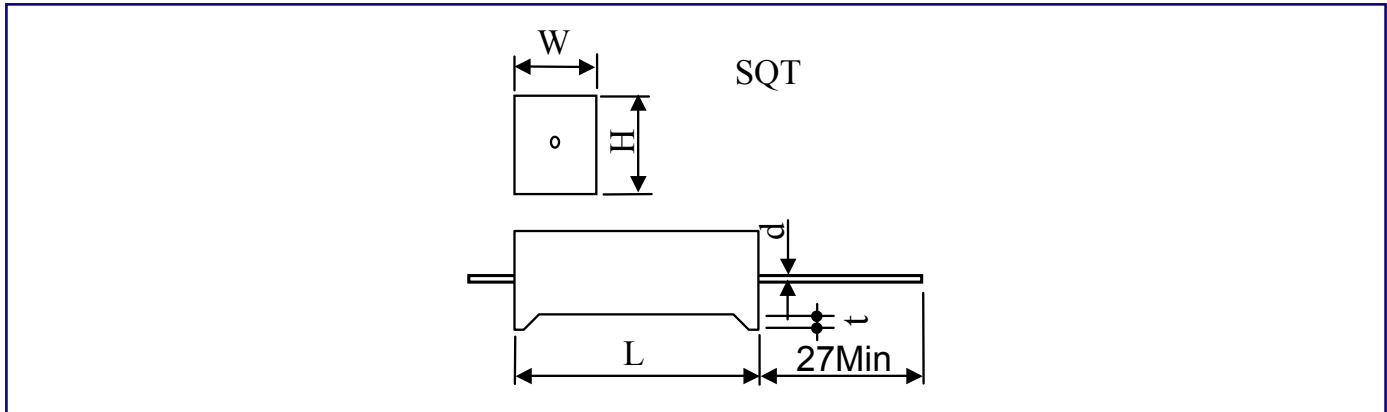
| Type    | Dimension (mm) |           |             |              | Resistance Range ( $\Omega$ ) |          |
|---------|----------------|-----------|-------------|--------------|-------------------------------|----------|
| SQP     | $W \pm 1$      | $H \pm 1$ | $L \pm 1.5$ | $d \pm 0.05$ | SQP                           | RS+SQP   |
| 2W      | 7              | 7         | 18          | 0.5~0.6      | 0.1~82                        |          |
| 3W      | 8              | 8         | 22          | 0.7~0.8      | 0.1~180                       | 181~33K  |
| 5W      | 10             | 9         | 22          | 0.7~0.8      | 0.1~180                       | 181~50K  |
| 7W      | 10             | 9         | 35          | 0.7~0.8      | 0.1~430                       | 431~50K  |
| 10W     | 10             | 9         | 48          | 0.7~0.8      | 0.1~470                       | 471~50K  |
| 15W     | 12.5           | 11.5      | 48          | 0.7~0.8      | 0.5~600                       | 601~150K |
| 20W-25W | 14             | 13.5      | 60          | 0.7~0.8      | 0.8~1K                        | 1.1~150K |

## ► SQM - Dimensions



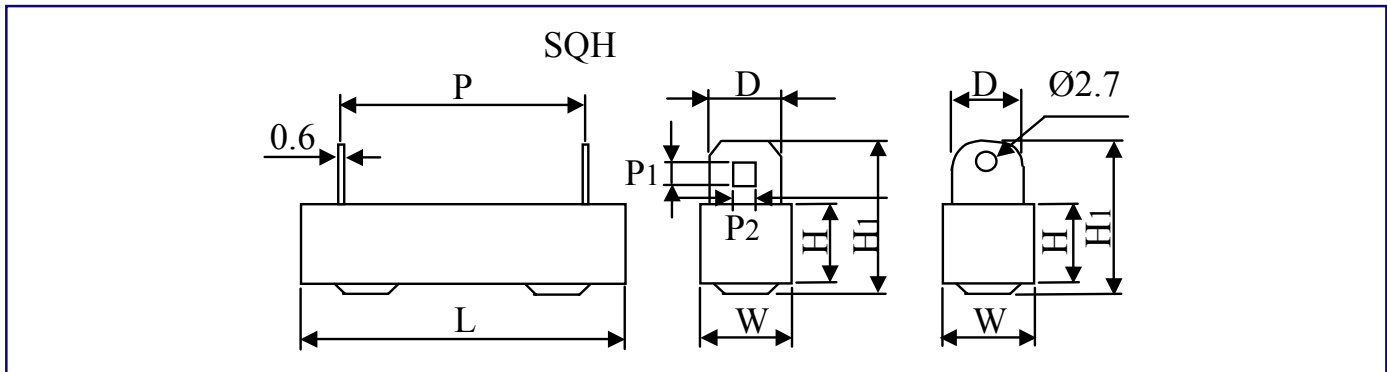
| Type | Dimension (mm) |           |           | Resistance Range ( $\Omega$ ) |         |
|------|----------------|-----------|-----------|-------------------------------|---------|
| SQM  | $H \pm 1.5$    | $W \pm 1$ | $S \pm 1$ | SQM                           | RS+SQM  |
| 2W   | 20             | 12        | 8         | 0.1-8.0                       | 81-50K  |
| 3W   | 25             | 12        | 8         | 0.1-180                       | 181-50K |
| 5W   | 25             | 13        | 9         | 0.1-180                       | 181-50K |
| 7W   | 39             | 13        | 9         | 0.1-430                       | 431-47K |
| 10W  | 51             | 13        | 12        | 0.1-470                       | 471-47K |
| 10WS | 35             | 16        | 12        | 0.1-430                       | 431-47K |

## SQT - Dimensions



| Type | Dimension (mm) |           |           |           | Resistance Range ( $\Omega$ ) |         |
|------|----------------|-----------|-----------|-----------|-------------------------------|---------|
|      | H $\pm 1.5$    | W $\pm 1$ | L $\pm 1$ | t $\pm 1$ | SQT                           | RS+SQM  |
| 3W   | 9              | 10        | 22        | 1.5       | 0.1-180                       | 181-50K |
| 5W   | 9              | 10        | 22        | 1.5       | 0.1-180                       | 181-50K |
| 7W   | 9              | 10        | 35        | 3.0       | 0.1-430                       | 431-47K |
| 10W  | 9              | 10        | 48        | 3.0       | 0.1-470                       | 471-47K |

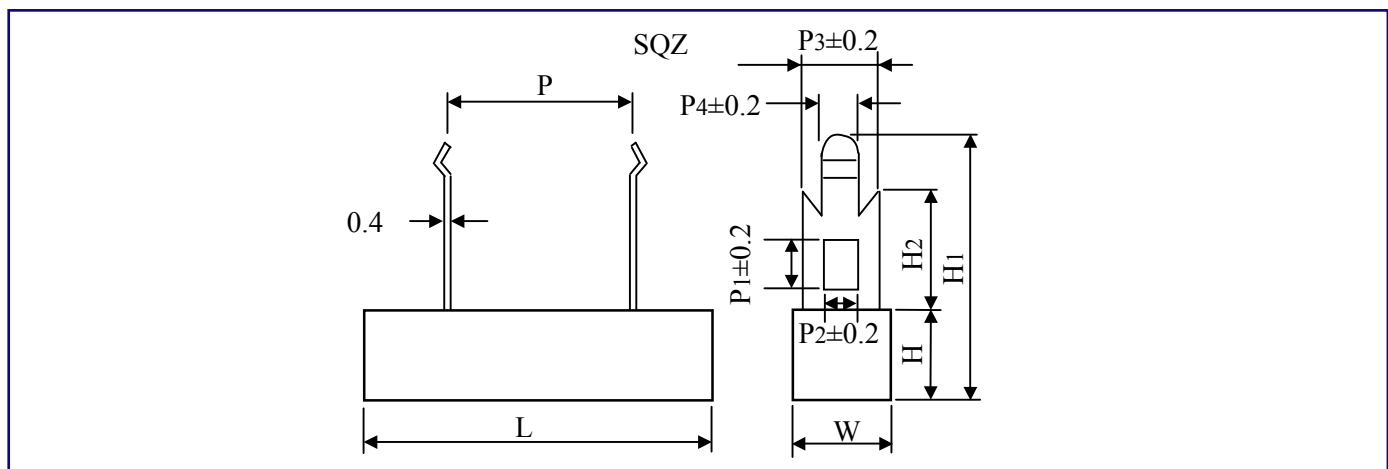
## SQH - Dimensions



| Type | Dimension (mm) |           |             |           |            |             |              |              | Resistance Range ( $\Omega$ ) |         | MaxWorkingVoltage |
|------|----------------|-----------|-------------|-----------|------------|-------------|--------------|--------------|-------------------------------|---------|-------------------|
|      | W $\pm 1$      | H $\pm 1$ | L $\pm 1.5$ | P $\pm 1$ | H1 $\pm 1$ | D $\pm 0.5$ | P1 $\pm 0.2$ | P2 $\pm 0.2$ | SQH                           | RS+SQH  |                   |
| 10W  | 10             | 9         | 48          | 32        | 21         | 5           | 2.5          | 2            | 0.1~500                       | 500~50K | 500V              |
| 15W  | 12.5           | 11.5      | 48          | 32        | 21         | 5           | 2.5          | 2            | 1~1K                          | 1K~150K | 600V              |
| 20W  | 14.5           | 13.5      | 60          | 43        | 24         | 6           | 3.0          | 2.5          | 1~2K                          | 2K~150K | 700V              |
| 30W  | 19             | 19        | 75          | 56        | 29         | 6           | 3.0          | 2.5          | 1~2K                          |         | 700V              |
| 40W  | 19             | 19        | 90          | 67        | 29         | 6           | 3.0          | 2.5          | 2~3K                          |         | 700V              |
| 50W  | 19             | 19        | 90          | 67        | 29         | 6           | 3.0          | 2.5          | 2~3K                          |         | 700V              |

www.DataSheet4U.com

## ► SQZ - Dimensions



| Type   |             | Dimension (mm) |           |             |       |       |       |       |             |             | Resistance Range ( $\Omega$ ) |           |
|--------|-------------|----------------|-----------|-------------|-------|-------|-------|-------|-------------|-------------|-------------------------------|-----------|
| SQZ    | $L \pm 1.5$ | $W \pm 1$      | $H \pm 1$ | $P \pm 1.5$ | $P_1$ | $P_2$ | $P_3$ | $P_4$ | $H_1 \pm 1$ | $H_2 \pm 1$ | SQZ                           | RS+SQZ    |
| 5W     | 25(28)      | 10             | 10        | 9.5(15)     | 4.2   | 2     | 5     | 1.5   | 25          | 10.5        | 0.1-130                       | 131-50K   |
| 7W     | 36          | 10             | 10        | 20          | 4.2   | 2     | 5     | 1.5   | 25          | 10.5        | 0.1-430                       | 431-50K   |
| 10W    | 48          | 10             | 10        | 32          | 4.2   | 2     | 5     | 1.5   | 25          | 10.5        | 0.2-470                       | 471-50K   |
| 15W    | 48          | 12.5           | 12        | 32          | 4.2   | 2     | 5     | 1.5   | 26          | 10.5        | 1-600                         | 601-150K  |
| 20.25W | 60          | 15             | 13        | 42          | 7     | 6     | 10    | 2.7   | 36          | 15.0        | 1-1K                          | 1.1K-150K |

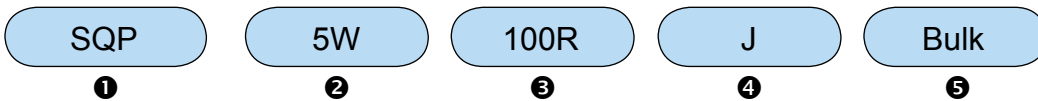
## ► SQP, SQM, SQT, SQH, SQZ - Electrical Performance

| TEST ITEMS               | CONDITION                             | SPEC.              |
|--------------------------|---------------------------------------|--------------------|
| Resistance Temp Coeff.   | -30°C~ 200°C                          | $\pm 300$ ppm / °C |
| Short Time Over Load     | 2.5 times of rated wattage for 5 sec. | $\pm 2$ %          |
| Rated Load               | Rated wattage for 30 min.             | $\pm 1$ %          |
| Voltage Withstanding     | 800 v AC 1 min.                       | no charge          |
| Temp. Cycle              | -30°C~ 85°C for 5 cycles              | $\pm 1$ %          |
| Load Life                | 70°C on-off cycle 1000hrs.            | $\pm 5$ %          |
| Moisture-proof Load Life | 40°C 95% RH on-off cycle 500 hrs.     | $\pm 5$ %          |
| Incombustibility         | 16 times of rated wattage for 5 min.  | not flammed        |

## ▶ SQP, SQM, SQT, SQH, SQZ - Material Specifications

- Core :  
High purity grade alumina ceramic rod.
- Terminals :  
Tin/lead plated (Lead (Pb)-free will be 100 % tin).
- Body :  
Steatite ceramic case with inorganic potting compound.
- Element :  
Copper-nickel alloy, nickel-chrome alloy, resistive wirewound or power film depending on resistance value.

## ▶ How to Order



- ❶ Part Number: SQP, SQM, SQT, SQH, SQZ
- ❷ Rated Power (W)
- ❸ Resistance Value ( $\Omega$ )

| Code | Resistance Value |
|------|------------------|
| 0R1  | 0.1 $\Omega$     |
| 100R | 100 $\Omega$     |
| 1K   | 1K $\Omega$      |
| 100K | 100K $\Omega$    |

- ❹ Resistance Tolerance (%)

| Code | Resistance Value |
|------|------------------|
| J    | $\pm 5\%$        |

- ❺ Package