

# Carbon film resistors

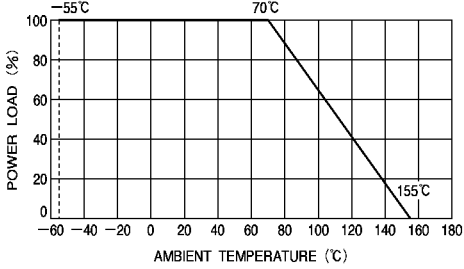
## R20 (3.2 × 1.9 φ size: 1 / 4W)

ROHM resistors are produced using an integrated production system for parts and materials, and state of the art technology to ensure high precision productivity, and quality. ROHM resistors are ISO-9001 approved. The design and specifications are subject to change without prior notice. Before ordering or use, please check the technical specification sheets.

### ●Features

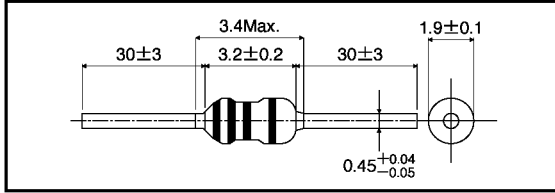
- 1) All ceramic rods are made from the same material to yield consistent quality.
- 2) Unique production methods provide outstanding mechanical strength characteristics.
- 3) Superb accuracy of axial taping means excellent high-speed automatic insertion.
- 4) Though miniaturized, the R20 retains the high pulse resistance of its predecessor chips.
- 5) Soft copper wire with solder plating offers superior solderability.
- 6) Both insulator coating and its color codes are highly resistant to solvents, and steam cleaning is no problem.
- 7) Highly nonflammable insulation coating (UL94V-0).

## ● Ratings

| Item                                  | R20  |                                    |
|---------------------------------------|--|------------------------------------|
| Rated power (70°C)                    | 1 / 4W (0.25W)   |                                    |
| Power derating curve                  |  <p>Power must be derated according to the power derating curve in the accompanying figure when ambient temperature exceeds 70 °C.</p> |                                    |
| Rated voltage                         | Rated voltage is equal to the lesser of the value obtained by the formula $\sqrt{\text{rated voltage} \times \text{nominal resistance}}$ or maximum operating voltage.   |                                    |
| Maximum operating voltage             | 250V   |                                    |
| Resistance tolerance                  | J ( $\pm 5\%$ )  |                                    |
| Resistance temperature coefficient    | Nominal resistance   | Resistance temperature coefficient |
|                                       | Less than 10 $\Omega$  | 0 to +300ppm / °C                  |
|                                       | 10 $\Omega$ to 33k $\Omega$  | 0 to -350ppm / °C                  |
|                                       | 36k $\Omega$ to 220k $\Omega$  | 0 to -500ppm / °C                  |
|                                       | 240k $\Omega$ to 470k $\Omega$   | 0 to -700ppm / °C                  |
|                                       | 510k $\Omega$ to 1.0M $\Omega$   | 0 to -1000ppm / °C                 |
|                                       | 1.1M $\Omega$ to 2.2M $\Omega$   | 0 to -1500ppm / °C                 |
| Resistance range                      | 0.47 $\Omega$ to 2.2M $\Omega$   |                                    |
| Nominal resistance                    | E24 series   |                                    |
| Maximum overload voltage              | 500V   |                                    |
| Maximum intermittent overload voltage | 600V   |                                    |
| Operating temperature                 | -55°C to 155°C   |                                    |
| Weight                                | 130mg  |                                    |

Note: This product meets the specifications given in this specification sheet, but it is influenced by the applied voltage and ambient conditions. For this reason, if the product is to be used in equipment that must be extremely reliable, pay careful consideration to the load rate on the component when designing the equipment. In cases such as this, we recommend that you design the circuit so that the voltage on the component is no more than half of its rated value. In particular, when the component is used in AC circuits, take steps to ensure that the peak voltage applied to the component is less than the maximum operating voltage.

● External dimensions (Units: mm)



● Structure and materials

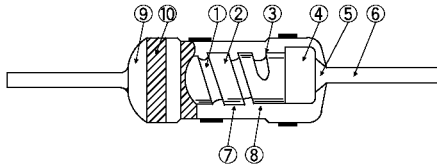


Fig.1

- (1) Substrate: Alumina magnetic rod  
Alumina is superior to regular mullite or forsterite with respect to mechanical strength, thermal conductivity, and thermal stability.
- (2) Resistive elements  
0Ω: Copper film  
Less than 10Ω: Nickel film. In addition to their high stability, these resistors are designed to cut off safely in the event of a voltage spike.  
10Ω and above: Carbon film. This type of film offers superior uniformity and stability.
- (3) Cutting groove  
The groove is cut to a uniform depth and width across the whole element, and there are no chips or cracks in the finished product.
- (4) Terminals: Tin-plated copper, steel cap  
This material provides a solid physical and electrical connection.
- (5) Connections: Spot-welded  
Spot welding ensures a solid, durable connection between the terminal and the terminal wire.
- (6) Terminal wires: Solder-plated copper wire  
Can be soldered effectively even after a long time.
- (7) Protective film  
For resistors of 10Ω or more, a special inorganic material guarantees the long-term stability of the dielectric film.
- (8) Under coating: Phenolic resin  
The dielectric film is protected by a coat of high-purity phenolic resin.

- (9) Outer coating: Epoxy resin (color: light brown)  
This coating offers superior resistance to heat, the elements, and solvents, and is a good insulator. It is also very safe, meeting the UL94V-0 standard for nonflammability.
- (10) Markings: Color coding using thermo-hardened paint  
Markings offer outstanding resistance to solvents and chemicals, and do not fade.

● Reference standards

ROHM's pioneering products meet the following domestic and international standards.

- JIS C 5202: Regulations on test methods for fixed resistors
- JIS C 5003: Regulations on test methods for malfunction rates
- JIS C 6402: Resistors, fixed, carbon film
- MIL-R-11: Resistors, fixed, composition (insulated)
- MIL-R-10509: Resistors, fixed, film (high stability)
- MIL-R-22684: Resistors, fixed, film, insulated
- EIA-RS-196: Fixed film resistors--precision and semi-precision
- DIN-44052: Resistors, fixed, lacquered, cracked carbonfilm, high stability, with axial leads

● Pulse voltage limits

The pulse voltage rating (1) is determined by the following formula. However, if the value obtained from the formula exceeds the maximum pulse voltage (2) or the resistance-limited voltage peak value (3), the lowest value must be taken as the pulse voltage rating.

(1) Pulse voltage rating

$$V_p = \sqrt{\frac{P \times R}{f \times t}}$$

P: Rated power(W) f: repetition frequency (Hz)

R: nominal resistance (Ω) t: pulse width (s)

(2) Maximum pulse voltage R20 × 600V

R25X × 750V

(3) Resistance-limited voltage peak

Less than 10Ω

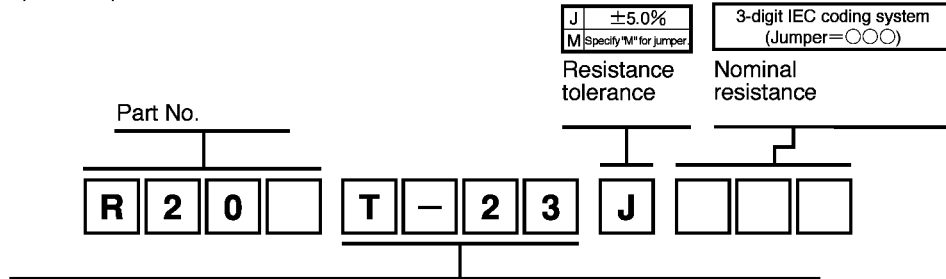
Up to four times the rated DC voltage

10Ω or more

Up to seven times the rated DC voltage

It is assumed that the pulse width is less than 10ms.

● Makeup of the part number



Packaging specifications (carbon film resistors)

| Part No. | Code | Package style | Tape inner width | Case     | Standard ordering unit(pcs) | Shipped to               |
|----------|------|---------------|------------------|----------|-----------------------------|--------------------------|
| R20      | T-24 | Axial taping  | 26mm             | Ammo box | 2000                        | JPN, ASIA (except KOREA) |
|          | T-23 | Axial taping  | 26mm             | Ammo box | 5000                        | JPN, ASIA, BRAZIL        |
|          | T-29 | Axial taping  | 52mm             | Ammo box | 2000                        | JPN, KOREA               |
|          | T-04 | Axial taping  | 52mm             | Ammo box | 5000                        | EUROPE, ASIA, BRAZIL     |

● Electrical characteristics

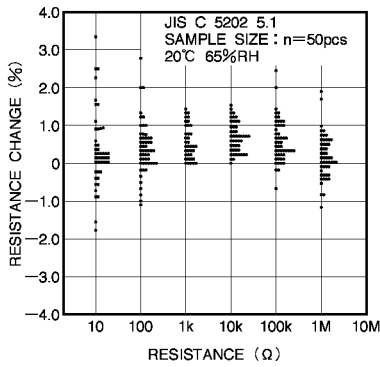


Fig.2 DC resistance

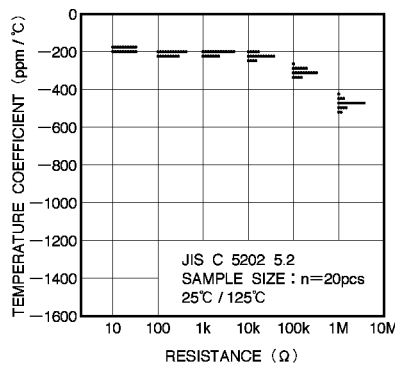


Fig.3 Resistance temperature characteristics

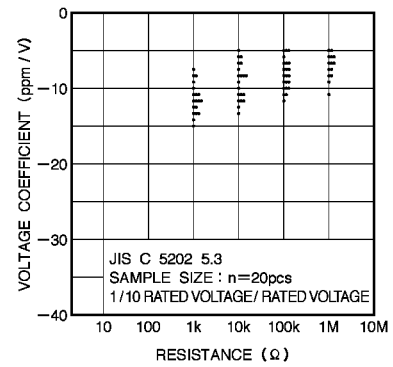


Fig.4 Voltage coefficient

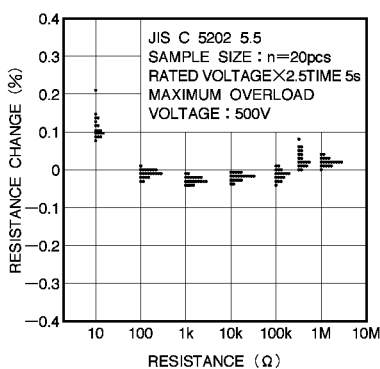


Fig.5 Short time overload

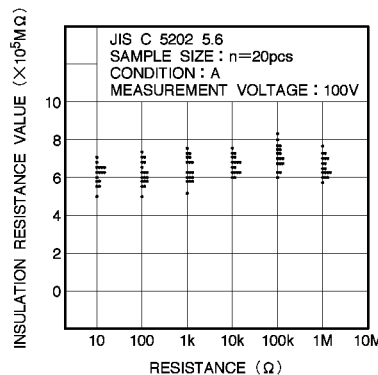


Fig.6 Insulation resistance

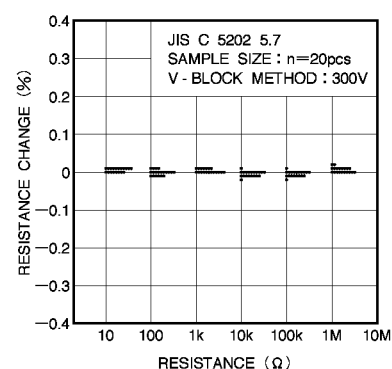


Fig.7 Withstand voltage