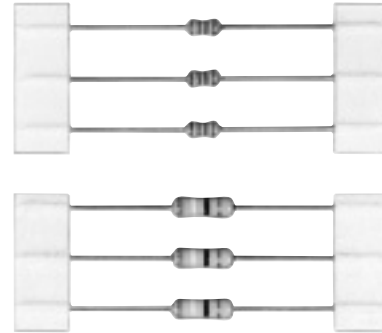


### Carbon Film Resistors

Discontinued

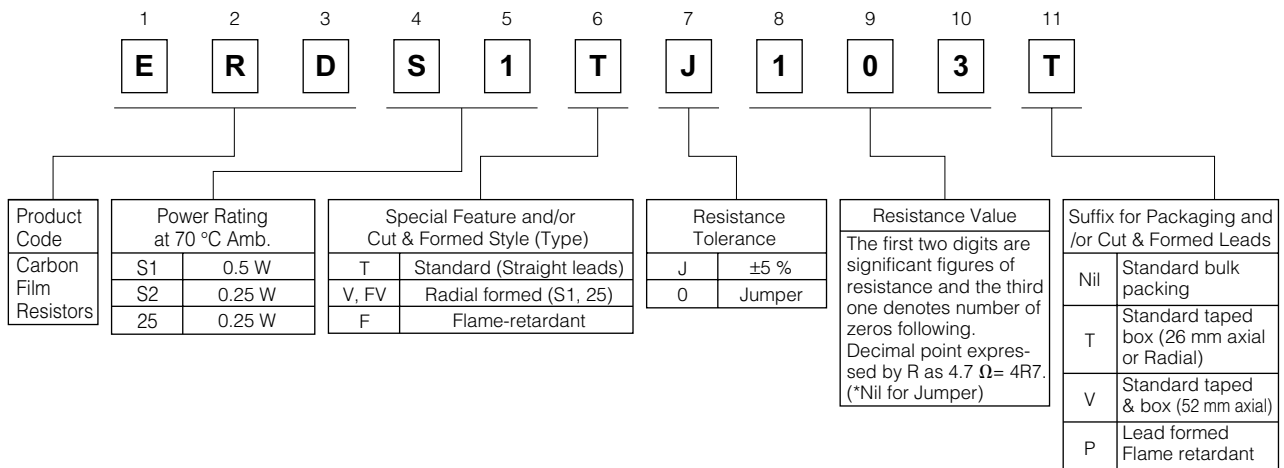
Type: **ERDS1 (0.5 W)**  
**ERDS2 (0.25 W)**  
**ERD25 (0.25 W)**



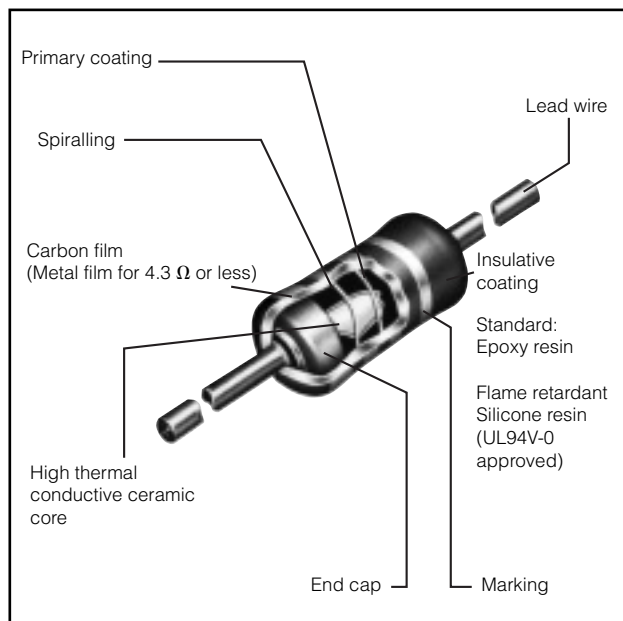
#### ■ Features

- Reliability ..... High reliability by using carbon film
- Automatic insertion .... Taping style for automatic inserting machines
- Marking ..... 4 color code marking
- Flame Retardant ..... Using UL 94 V-0 approved coating for flame retardant type
- Reference Standard ... IEC 60115-2, JIS C 5201-2

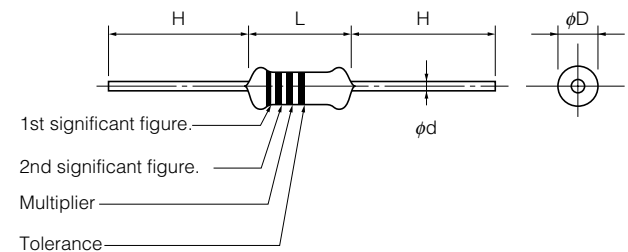
#### ■ Explanation of Part Numbers



#### ■ Construction



#### ■ Dimensions in mm (not to scale)



See Page ER131 for color code indication  
 Standard Quantity : 2000 pcs.

| Type             | Dimensions (mm)                        |  |                       |         | Mass (Weight) [mg/pc.] |
|------------------|--|--|-----------------------|---------|------------------------|
|                  | L                                      | φD                                     | φd                    | H       |                        |
| ERDS1T<br>ERDS1F | 6.35 <sup>+0.65</sup> <sub>-0.35</sub> | 2.30 <sup>+0.50</sup> <sub>-0.30</sub> | 0.60 <sup>±0.05</sup> | 20 min. | 228                    |
| ERDS2T<br>ERDS2F | 3.20 <sup>±0.20</sup>                  | 1.70 <sup>+0.20</sup> <sub>-0.10</sub> | 0.45 <sup>±0.05</sup> | 20 min. | 107                    |
| ERD25T<br>ERD25F | 6.35 <sup>+0.65</sup> <sub>-0.35</sub> | 2.30 <sup>+0.50</sup> <sub>-0.30</sub> | 0.60 <sup>±0.05</sup> | 20 min. | 228                    |

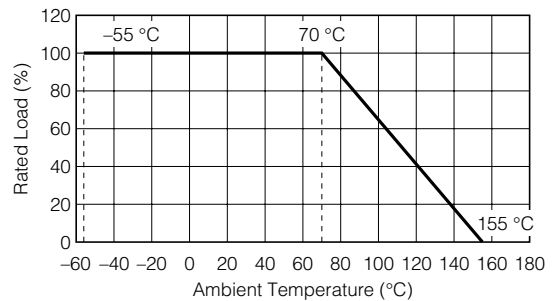
■ Ratings

| Type                        | Power Rating at 70 °C (W)                        | Limiting Element Voltage (Maximum RCWV) <sup>(1)</sup> (V) | Maximum Overload Voltage <sup>(2)</sup> (V) | Maximum Intermittent Overload Voltage <sup>(3)</sup> (V) | Dielectric Withstanding Voltage (VAC) | Standard Resistance Value | Resistance Tolerance (%) | Resistance Range (Ω) |       |
|-----------------------------|--|--|---|--|---------------------------------------|---------------------------|--------------------------|----------------------|-------|
|                             |  |  |   |  |                                       |                           |                          | min.                 | max.  |
| ERDS1T                      | 0.5  | 300  | 600   | 750  | 500                                   | E24                       | ±5(J)                    | 1                    | 3.3 M |
| ERDS1F<br>(Flame Retardant) |  |  |   |  | 350                                   |                           |                          |                      | 1 M   |
| ERDS2T                      | 0.25   | 250  | 500   | 750  | 300                                   | E24                       | ±5(J)                    | 1                    | 2.2 M |
| ERDS2F<br>(Flame Retardant) |  |  |   |  | 200                                   |                           |                          |                      | 1 M   |
| ERDS2T0                     | Jumper Rated Current : 2 A, Resistance : < 50 mΩ |  |   |  |                                       |                           |                          |                      |       |
| ERD25T                      | 0.25   | 300  | 600   | 750  | 500                                   | E24                       | ±5(J)                    | 1                    | 3.3 M |
| ERD25F<br>(Flame Retardant) |  |  |   |  | 350                                   |                           |                          |                      | 1 M   |
| ERD25T0                     | Jumper Rated Current : 2 A, Resistance : < 50 mΩ |  |   |  |                                       |                           |                          |                      |       |

(1) Rated Voltage= $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$  or Limiting Element Voltage (max. RCWV), whichever is less.  
 (RCWV: Rated Continuous working Voltage).  
 (2) Overload (Short-time Overload) Test Voltage (SOTV) shall be determined from  $\text{SOTV}=2.5 \times \text{Power Rating}$  or max. Overload Voltage listed above whichever less.  
 (3) Intermittent Overload Test Voltage (IOTV) shall be determined from  $\text{IOTV}=4 \times \text{Power Rating}$  (IOTV=3×Power Rating for ERDS2 type) or max. Intermittent Overload Voltage listed above whichever less.

Power Derating Curve

For resistors operated in ambient temperatures above 70 °C, power rating shall be derated in accordance with the figure on the right.



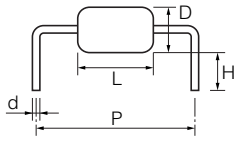
■ Performance Specifications

| Characteristics | Specifications         |                  | Test Methods  |  |
|-----------------|------------------------|------------------|---|--|
| T.C.R.          | Resistance Value range |                  | Resistance value at room temperature and room temperature +100 °C |  |
|                 | ERDS2                  | ERDS1, 25        |   | Temperature coefficient $\times 10^{-6}/^{\circ}\text{C}$ (ppm/°C) |
|                 | 4.3 Ω or less          | 4.3 Ω or less    |   | ±350   |
|                 | 4.7 Ω to 62 kΩ         | 4.7 Ω to 51 kΩ   |   | -150 to -350   |
|                 | 68 kΩ to 200 kΩ        | 56 kΩ to 430 kΩ  |   | -150 to -500   |
|                 | 220 kΩ to 510 kΩ       | 470 kΩ to 910 kΩ | -150 to -700  |  |
|                 | 560 kΩ or over         | 1 MΩ or over     | -150 to -1000   |  |

### ■ Shape and Packaging

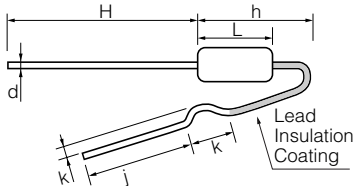
#### ● Bulk type (Lead forming)

##### Standard forming



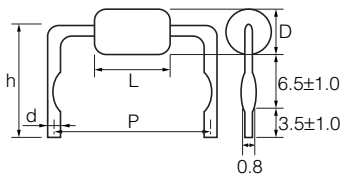
| Type          | Part Numbers | Std. Qty. (PCS) | L                                      | $\phi D$                            | P        | H                                   | d    |
|---------------|--------------|-----------------|--|-------------------------------------|----------|-------------------------------------|------|
| Carbon Film R | ERDS2TJ□□□A  | 2000            | 3.2±0.2                                | 1.7 <sup>+0.2</sup> <sub>-0.1</sub> | 5.0±0.5  | 4.5 <sup>+1.5</sup> <sub>-0.5</sub> | 0.45 |
|               | ERD25TJ□□□B  |                 | 6.35 <sup>+0.65</sup> <sub>-0.35</sub> | 2.3 <sup>+0.5</sup> <sub>-0.3</sub> | 10.0±0.5 | 4.5 <sup>+1.5</sup> <sub>-0.5</sub> | 0.6  |
|               | ERDS1TJ□□□B  |                 |  |                                     |          |                                     |      |

##### Radial forming



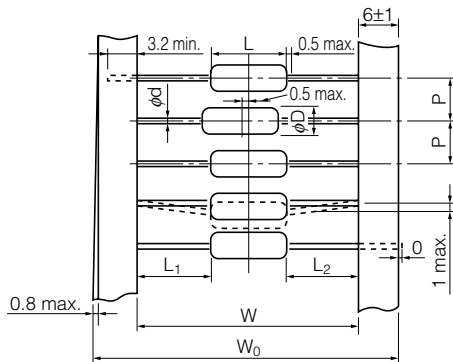
| Type          | Part Numbers | Std. Qty. (PCS) | L                                      | $\phi D$                            | H       | h        | k                   | j                                   | d   |
|---------------|--------------|-----------------|--|-------------------------------------|---------|----------|---------------------|-------------------------------------|-----|
| Carbon Film R | ERD25VJ□□□□  | 2000            | 6.35 <sup>+0.65</sup> <sub>-0.35</sub> | 2.3 <sup>+0.5</sup> <sub>-0.3</sub> | 20 min. | 9.5 min. | 2.0 <sup>+0.5</sup> | 6.0 <sup>+2.0</sup> <sub>-1.0</sub> | 0.6 |
|               | ERD25FVJ□□□□ |                 |  |                                     |         |          |                     |                                     |     |
|               | ERDS1VJ□□□□  |                 |  |                                     |         |          |                     |                                     |     |
|               | ERDS1FVJ□□□□ |                 |  |                                     |         |          |                     |                                     |     |

##### Self standing form



| Type          | Part Numbers | Std. Qty. (PCS) | L                                      | $\phi D$                            | P        | h        | d    |
|---------------|--------------|-----------------|--|-------------------------------------|----------|----------|------|
| Carbon Film R | ERD25FJ□□□□P | 2000            | 6.35 <sup>+0.65</sup> <sub>-0.35</sub> | 2.3 <sup>+0.5</sup> <sub>-0.3</sub> | 10.0±1.5 | 11.5±1.0 | 0.65 |
|               | ERDS1FJ□□□□P |                 |  |                                     |          |          |      |

#### ● Axial taping type

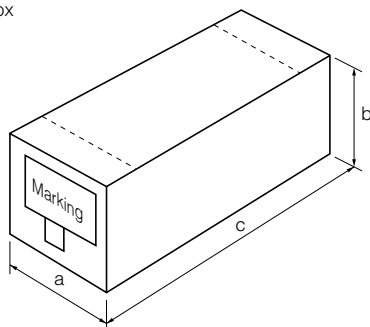


| Shape | L max. | $\phi D$ max. | $\phi d$ | P ±0.3 | W                              | W <sub>0</sub> |
|-------|--------|---------------|----------|--------|--------------------------------|----------------|
| ①     | 3.4    | 1.9           | 0.45     | 5.0    | 26 <sup>+1</sup> <sub>-0</sub> | 41.5 max.      |
| ②     | 3.4    | 1.9           | 0.45     | 5.0    | 52±1                           | 64.5±0.5       |
| ③     | 6.5    | 2.5           | 0.6      | 5.0    | 26 <sup>+1</sup> <sub>-0</sub> | 41.5 max.      |
| ④     | 6.5    | 2.5           | 0.6      | 5.0    | 52±1                           | 64.5±0.5       |

①  $|L_1 - L_2| \leq 1.0$

② Cumulative 250±2mm by 50 pitch

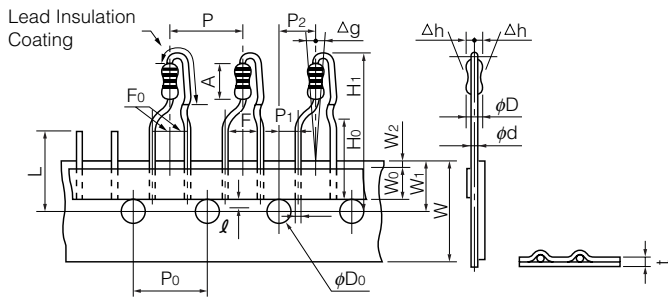
##### Flat box



| Packaging          | Shape | Type          | Part Numbers | Std. Qty. (pcs./box) | Size of box a×b×c (mm) |
|--------------------|-------|---------------|--------------|----------------------|------------------------|
| 26 mm Axial taping | ①     | Carbon Film R | ERDS2TJ□□□□T | 5000                 | 52×85×255              |
|                    |       |               | ERDS2FJ□□□□T |                      |                        |
| 52 mm Axial taping | ②     | Carbon Film R | ERDS2TJ□□□□V | 5000                 | 78×85×255              |
|                    |       |               | ERDS2FJ□□□□V |                      |                        |
| 26 mm Axial taping | ③     | Carbon Film R | ERD25TJ□□□□T | 4000                 | 52×95×255              |
|                    |       |               | ERD25FJ□□□□T |                      |                        |
|                    |       |               | ERDS1TJ□□□□T |                      |                        |
| 52 mm Axial taping | ④     | Carbon Film R | ERD25TJ□□□□V | 2000                 | 78×58×255              |
|                    |       |               | ERD25FJ□□□□V |                      |                        |
|                    |       |               | ERDS1TJ□□□□V |                      |                        |

● Radial Taping type

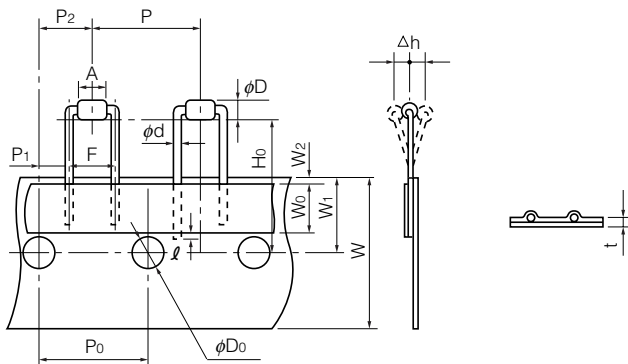
Radial Taping



| Type          | Part Numbers  | Std. Qty. (pcs.) |
|---------------|---------------|------------------|
| Carbon Film R | ERDS1VJ□□□□T  | 2000             |
|               | ERD25VJ□□□□T  |                  |
|               | ERDS1FVJ□□□□T |                  |
|               | ERD25FVJ□□□□T |                  |

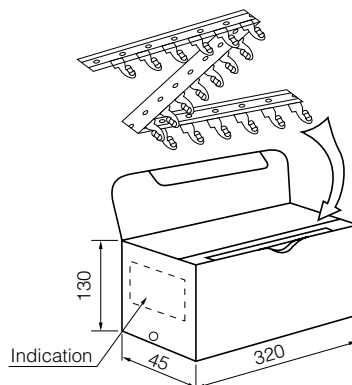
| Dimensions (mm) |           | Dimensions (mm) |          | Dimensions (mm) |  |
|-----------------|-----------|-----------------|----------|-----------------|--|
| P               | 12.7±1.0  | W <sub>0</sub>  | 5 min.   | l               | 0 max.                                 |
| P <sub>0</sub>  | 12.7±0.3  | W <sub>1</sub>  | 9.0±0.5  | t               | 0.7±0.2                                |
| P <sub>1</sub>  | 3.85±0.70 | W <sub>2</sub>  | 3 max.   | Δg              | 0±2.5 °                                |
| P <sub>2</sub>  | 6.35±1.00 | H <sub>1</sub>  | 32 max.  | Δh              | 0±2                                    |
| F               | 5.0±0.5   | H <sub>0</sub>  | 16.0±0.5 | A               | 6.35 <sup>+0.65</sup> <sub>-0.35</sub> |
| F <sub>0</sub>  | 2.5±0.5   | φD <sub>0</sub> | 4.0±0.2  | φD              | 2.3 <sup>+0.5</sup> <sub>-0.3</sub>    |
| W               | 18.0±0.5  | L               | 11 max.  | φd              | 0.60±0.05                              |

Radial Taping for small type



| Type          | Part Numbers  | Std. Qty. (pcs.) |
|---------------|---------------|------------------|
| Carbon Film R | ERDS2TYJ□□□□T | 2000             |

| Dimensions (mm) |           | Dimensions (mm) |                                      | Dimensions (mm) |                                     |
|-----------------|-----------|-----------------|--------------------------------------|-----------------|-------------------------------------|
| P               | 12.7±1.0  | W <sub>0</sub>  | 5 min.                               | Δh              | 0±2                                 |
| P <sub>0</sub>  | 12.7±0.3  | W <sub>1</sub>  | 9.0±0.5                              | t               | 0.7±0.2                             |
| P <sub>1</sub>  | 3.85±0.70 | W <sub>2</sub>  | 3 max.                               | A               | 3.2±0.2                             |
| P <sub>2</sub>  | 6.35±1.00 | H <sub>0</sub>  | 19.0 <sup>+1.0</sup> <sub>-0.5</sub> | φD              | 1.7 <sup>+0.2</sup> <sub>-0.1</sub> |
| F               | 5.0±0.5   | φD <sub>0</sub> | 4.0±0.2                              | φd              | 0.45±0.05                           |
| W               | 18.0±0.5  | l               | 0 max.                               |                 |                                     |



**⚠ Safety Precautions**

The following are precautions for individual products. Please also refer to the precautions common to Fixed Resistors shown on page ER3 of this catalog.

1. Keep the rated power and ambient temperature within the specified derating curve.
  - \* When positioning and mounting Carbon Film Resistors (hereafter called the resistors), make allowance for the effect of heat generated through close contact between the resistors and neighboring components and for the temperature rise of adjacent heat-generating components.
2. If a transient load (heavy load in a short time) like a pulse is expected to be applied, check and evaluate the operations of the resistors when installed in your products before use.

When applying pulses to the resistors, keep the pulse peak within the rated voltage.
3. When the resistors' protective coatings are chipped, flawed, or removed, the characteristics of the resistors may be impaired. Take special care not to apply mechanical shock during automatic mounting or cause damage during handling of the boards with the resistors mounted.
4. Ultrasonic cleaning may cut the lead wire due to resonance. Try and check it before use.
5. Flame-retardant type
  - 1) Take special care in handling the flame-retardant type because it is covered with a special coating and is therefore by more susceptible to external shock and solvent damage than other regular types of the resistors.
  - 2) The external coating used for the flame-retardant type is not resistant to solvent. Take great care in using solvent. If problems are anticipated, then take appropriate preventive measures, such as mounting the resistors after solvent is used.

## ⚠ Safety Precautions (Common precautions for Fixed Resistors)

- When using our products, no matter what sort of equipment they might be used for, be sure to make a written agreement on the specifications with us in advance. The design and specifications in this catalog are subject to change without prior notice.
- Do not use the products beyond the specifications described in this catalog.
- This catalog explains the quality and performance of the products as individual components. Before use, check and evaluate their operations when installed in your products.
- Install the following systems for a failsafe design to ensure safety if these products are to be used in equipment where a defect in these products may cause the loss of human life or other significant damage, such as damage to vehicles (automobile, train, vessel), traffic lights, medical equipment, aerospace equipment, electric heating appliances, combustion/gas equipment, rotating equipment, and disaster/crime prevention equipment.
- \* Systems equipped with a protection circuit and a protection device
- \* Systems equipped with a redundant circuit or other system to prevent an unsafe status in the event of a single fault

### (1) Precautions for use

- These products are designed and manufactured for general and standard use in general electronic equipment (e.g. AV equipment, home electric appliances, office equipment, information and communication equipment)
- These products are not intended for use in the following special conditions. Before using the products, carefully check the effects on their quality and performance, and determine whether or not they can be used.
  1. In liquid, such as water, oil, chemicals, or organic solvent
  2. In direct sunlight, outdoors, or in dust
  3. In salty air or air with a high concentration of corrosive gas, such as Cl<sub>2</sub>, H<sub>2</sub>S, NH<sub>3</sub>, SO<sub>2</sub>, or NO<sub>2</sub>
  4. Electric Static Discharge (ESD) Environment
    - These components are sensitive to static electricity and can be damaged under static shock (ESD). Please take measures to avoid any of these environments.
    - Smaller components are more sensitive to ESD environment.
  5. Electromagnetic Environment
    - Avoid any environment where strong electromagnetic waves exist.
  6. In an environment where these products cause dew condensation
  7. Sealing or coating of these products or a printed circuit board on which these products are mounted, with resin or other materials
- These products generate Joule heat when energized. Carefully position these products so that their heat will not affect the other components.
- Carefully position these products so that their temperatures will not exceed the category temperature range due to the effects of neighboring heat-generating components. Do not mount or place heat-generating components or inflammables, such as vinyl-coated wires, near these products .
- Note that non-cleaning solder, halogen-based highly active flux, or water-soluble flux may deteriorate the performance or reliability of the products.
- Carefully select a flux cleaning agent for use after soldering. An unsuitable agent may deteriorate the performance or reliability. In particular, when using water or a water-soluble cleaning agent, be careful not to leave water residues. Otherwise, the insulation performance may be deteriorated.

### (2) Precautions for storage

The performance of these products, including the solderability, is guaranteed for a year from the date of arrival at your company, provided that they remain packed as they were when delivered and stored at a temperature of 5 °C to 35 °C and a relative humidity of 45 % to 85 %.

Even within the above guarantee periods, do not store these products in the following conditions. Otherwise, their electrical performance and/or solderability may be deteriorated, and the packaging materials (e.g. taping materials) may be deformed or deteriorated, resulting in mounting failures.

1. In salty air or in air with a high concentration of corrosive gas, such as Cl<sub>2</sub>, H<sub>2</sub>S, NH<sub>3</sub>, SO<sub>2</sub>, or NO<sub>2</sub>
2. In direct sunlight

### <Package markings>

Package markings include the product number, quantity, and country of origin. In principle, the country of origin should be indicated in English.

## ■ How to express the resistance tolerance with a Matsushita part number

The resistance tolerance is identified by a single letter in accordance with the following table and the code is placed just before the resistance code in the following examples.

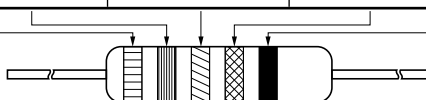
| Tolerance Code | Tolerance (%) | Examples              |
|----------------|---------------|-----------------------|
| W              | ±0.05         | W1001 : 1000 Ω±0.05 % |
| B              | ±0.1          | B1001 : 1000 Ω±0.1 %  |
| C              | ±0.25         | C1001 : 1000 Ω±0.25 % |
| D              | ±0.5          | D1001 : 1000 Ω±0.5 %  |
| F              | ±1            | F1001 : 1000 Ω±1 %    |
| G              | ±2            | G1001 : 1000 Ω±2 %    |
| J              | ±5            | J101 : 100 Ω±5 %      |
| K              | ±10           | K101 : 100 Ω±10 %     |
| M              | ±20           | M101 : 100 Ω±20 %     |

## ■ Color code indication for the resistance value and the tolerance

Fixed resistors whose resistance value and tolerance are indicated by color code follow the standard below.

Color code

| Color  | First digit | Second digit | Third digit | Multiplier       | Resistance tolerance |      |
|--------|-------------|--------------|-------------|------------------|----------------------|------|
|        |             |              |             |                  | %                    | Code |
| Black  | 0           | 0            | 0           | 1                |                      |      |
| Brown  | 1           | 1            | 1           | 10               | ±1                   | F    |
| Red    | 2           | 2            | 2           | 10 <sup>2</sup>  | ±2                   | G    |
| Orange | 3           | 3            | 3           | 10 <sup>3</sup>  | ±0.05                | W    |
| Yellow | 4           | 4            | 4           | 10 <sup>4</sup>  |                      |      |
| Green  | 5           | 5            | 5           | 10 <sup>5</sup>  | ±0.5                 | D    |
| Blue   | 6           | 6            | 6           | 10 <sup>6</sup>  | ±0.25                | C    |
| Violet | 7           | 7            | 7           | 10 <sup>7</sup>  | ±0.1                 | B    |
| Gray   | 8           | 8            | 8           |                  |                      |      |
| White  | 9           | 9            | 9           |                  |                      |      |
| Gold   |             |              |             | 10 <sup>-1</sup> | ±5                   | J    |
| Silver |             |              |             | 10 <sup>-2</sup> | ±10                  | K    |
| None   |             |              |             |                  | ±20                  | M    |



### Indication example

#### Color code of 5 color bands

When the standard resistance value follows E48 series or 96 series, color code of the resistors are indicated by five color bands. Example below is 154 kΩ.

#### Example 1

| 1st Color    | 2nd Color    | 3rd Color     | 4th Color        | 5th Color       |
|--------------|--------------|---------------|------------------|-----------------|
| Brown<br>(1) | Green<br>(5) | Yellow<br>(4) | Orange<br>(1000) | Brown<br>(±1 %) |

#### Color code of 4 color bands

When the standard resistance value follows E6 series, 12 series or 24 series, color code of the resistors are indicated by four color bands. Example below is 15 kΩ.

#### Example 2

| 1st Color    | 2nd Color    | 3rd Color        | 4th Color      |
|--------------|--------------|------------------|----------------|
| Brown<br>(1) | Green<br>(5) | Orange<br>(1000) | Gold<br>(±5 %) |