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# Type EP Series

**Key Features**

**Power up to 10W in Extra Small Size**

**22 Size/Power Options**

**Specially Designed and Tested for Surge Immunity**

**RoHS Compliant with no exemptions**

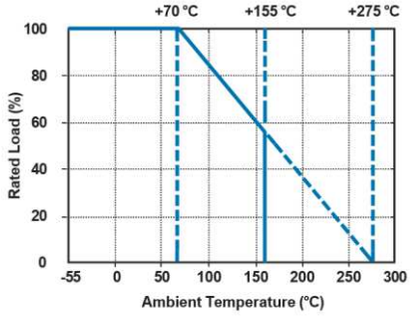


TE Connectivity is pleased to offer this wire wound axial leaded resistor. Robustly manufactured with high quality materials this resistor offers flame proof coating, and is designed and tested to withstand power surges of up to 12KV. In line with our commitment to increasing power to size ratio we are now also able to offer this series in extra-small size.

## Characteristics – Electrical

| | Type | Rated Power at 70° C | Max. Working Voltage | Max. Overload Voltage | Dielectric Withstanding Voltage | Resistance Range | Operating Temp. Range |
|---|---|---|---|---|---|---|---|
| Normal size | EP05W | 1/2W (0.50W) | 500 V | 1,000 V | 350 V | 10Ω – 560Ω | -55°C – +155°C |
| | EP1W | 1W | 500 V | 1,000 V | 500 V | 10Ω– 1KΩ | |
| | EP2W | 2W | 500 V | 1,000 V | 500 V | 10Ω – 2KΩ | |
| | EP3W | 3W | 500 V | 1,000 V | 500 V | 10Ω – 3KΩ | |
| | EP5W | 5W | 500 V | 1,000 V | 500 V | 10Ω – 5KΩ | |
| | EP7W | 7W | 500 V | 1,000 V | 500 V | 10Ω – 6KΩ | |
| | EP8W | 8W | 500 V | 1,000 V | 500 V | 10Ω – 10KΩ | |
| | EP9W | 9W | 500 V | 1,000 V | 500 V | 10Ω – 15KΩ | |
| Small size | EP1WS | 1W | 500 V | 1,000 V | 350 V | 10Ω – 560Ω | -55°C – +155°C |
| | EP2WS | 2W | 500 V | 1,000 V | 500 V | 10Ω – 1KΩ | |
| | EP3WS | 3W | 500 V | 1,000 V | 500 V | 10Ω – 2KΩ | |
| | EP5WS | 5W | 500 V | 1,000 V | 500 V | 10Ω – 3KΩ | |
| | EP7WS | 7W | 500 V | 1,000 V | 500 V | 10Ω – 5KΩ | |
| | EP8WS | 8W | 500 V | 1,000 V | 500 V | 10Ω – 6KΩ | |
| | EP9WS | 9W | 500 V | 1,000 V | 500 V | 10Ω – 10KΩ | |
| | EP10WS | 10W | 500 V | 1,000 V | 500 V | 10Ω – 15KΩ | |
| Extra Small size | EP1WSSS | 1W | 500 V | 1,000 V | 350 V | 1Ω – 560Ω | -55°C – +155°C |
| | EP1WSS | 1W | 500 V | 1,000 V | 350 V | 1Ω – 750Ω | |
| | EP2WSS | 2W | 500 V | 1,000 V | 350 V | 1Ω – 910Ω | |
| | EP3WSS | 3W | 500 V | 1,000 V | 500 V | 1Ω – 2.2KΩ | |
| | EP4WSS | 4W | 500 V | 1,000 V | 500 V | 1Ω – 2.2KΩ | |
| | EP10WSS | 10W | 500 V | 1,000 V | 500 V | 1Ω – 10KΩ | |

## Derating Curve




For resistors operated in ambient temperatures above 70°C, power rating must be derated in accordance with this curve.



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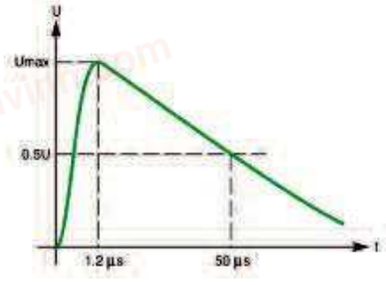
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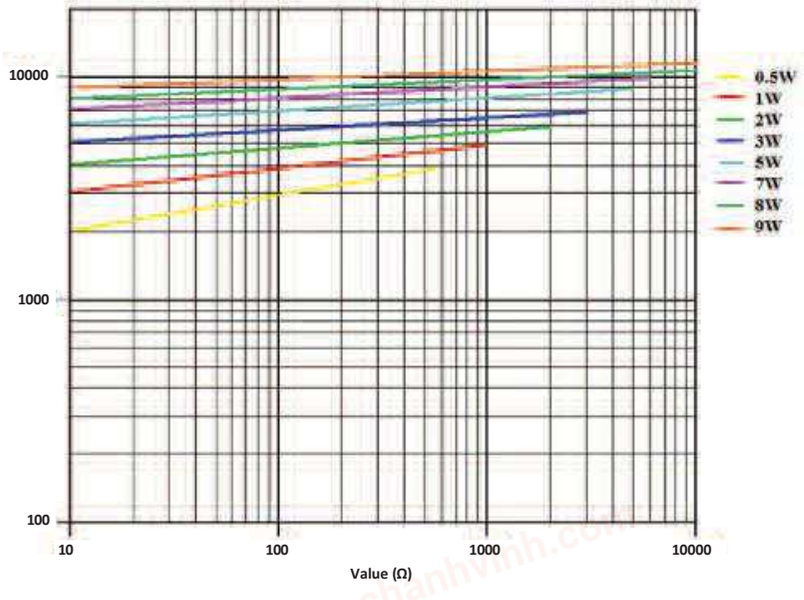
## Surge Rating

| Type | Low Resistance Range | Maximum Surge Voltage | Medium Resistance Range | Maximum Surge Voltage | High Resistance Range | Maximum Surge Voltage |
|---|---|---|---|---|---|---|
| EP05W | 10Ω – 40Ω | 3KV | 43Ω – 240Ω | 4KV | 270Ω – 560Ω | 4KV |
| EP1W | 10Ω – 50Ω | 4KV | 51Ω – 240 Ω | 5KV | 270Ω – 1kΩ | 5KV |
| EP2W | 10Ω – 100Ω | 5KV | 110Ω – 240Ω | 6KV | 270Ω – 2kΩ | 6KV |
| EP3W | 10Ω – 100Ω | 7KV | 110Ω – 680Ω | 8KV | 750Ω – 3kΩ | 8KV |
| EP5W | 10Ω – 160Ω | 8KV | 180Ω – 680Ω | 9KV | 750Ω – 5kΩ | 9KV |
| EP7W | 10Ω – 160Ω | 9KV | 180Ω – 680Ω | 10KV | 750Ω – 6kΩ | 10KV |
| EP8W | 10Ω – 160Ω | 10KV | 180Ω – 680Ω | 11KV | 750Ω – 10kΩ | 11KV |
| EP9W | 10Ω – 160Ω | 10KV | 180Ω – 680Ω | 11KV | 750Ω – 15kΩ | 12KV |
| **Small Size** | | | | | | |
| EP1WS | 10Ω – 40Ω | 3KV | 43Ω – 240Ω | 4KV | 270Ω – 560Ω | 4KV |
| EP2WS | 10Ω – 50Ω | 4KV | 51Ω – 240 Ω | 5KV | 270Ω – 1kΩ | 5KV |
| EP3WS | 10Ω – 100Ω | 5KV | 110Ω – 240Ω | 6KV | 270Ω – 2kΩ | 6KV |
| EP5WS | 10Ω – 100Ω | 7KV | 110Ω – 680Ω | 8KV | 750Ω – 3kΩ | 8KV |
| EP7WS | 10Ω – 160Ω | 8KV | 180Ω – 680Ω | 9KV | 750Ω – 5kΩ | 9KV |
| EP8WS | 10Ω – 160Ω | 9KV | 180Ω – 680Ω | 10KV | 750Ω – 6kΩ | 10KV |
| EP9WS | 10Ω – 160Ω | 10KV | 180Ω – 680Ω | 11KV | 750Ω – 10kΩ | 11KV |
| EP10WS | 10Ω – 160Ω | 10KV | 180Ω – 680Ω | 11KV | 750Ω – 15kΩ | 12KV |
| **Extra Small Size** | | | | | | |
| EP1WSSS | 1Ω – 40Ω | 1.5KV | 43Ω – 240Ω | 2KV | 270Ω – 560Ω | 2.5KV |
| EP1WSS | 1Ω – 40Ω | 1.8KV | 43Ω – 240Ω | 3KV | 270Ω – 750Ω | 4KV |
| EP2WSS | 1Ω – 40Ω | 2KV | 43Ω – 240Ω | 3KV | 270Ω – 910Ω | 4KV |
| EP3WSS | 1Ω – 100Ω | 3KV | 110Ω – 240Ω | 4KV | 270Ω – 2k2Ω | 5KV |
| EP4WSS | 1Ω – 100Ω | 4KV | 110Ω – 240Ω | 5KV | 270Ω – 2k2Ω | 6KV |
| EP10WSS | 1Ω – 160Ω | 9KV | 180Ω – 680Ω | 10KV | 750Ω – 10kΩ | 10KV |

## Surge Waveform (1.2 /50 µs)




## 1.2 / 50 µs Voltage Capability



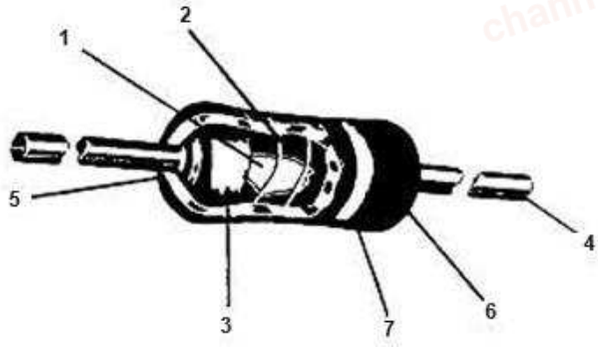



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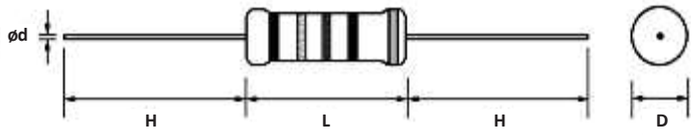


## Construction




| No. | Name | Material |
|---|---|---|
| 1 | Basic Body | Rod Type Ceramics |
| 2 | Resistance Wire | Resistance Wire Alloy |
| 3 | End Cap | Steel (Tin plated iron surface) |
| 4 | Lead Wire | Annealed copper wire coated with tin |
| 5 | Joint | By welding |
| 6 | Coating | Insulated & Non-Flame paint (colour: Light Green) |
| 7 | Colour Code | Non-Flame epoxy resin |

## Dimensions and Resistance Range




| Type | Power Rating at 70 ℃ | Dimensions (mm) | | | |
|---|---|---|---|---|---|
| | | D ± 1 | L ± 1 | d ± 0.05 | H ± 3 |
| EP05W | 1/2W (0.50W) | 3.5 | 10.0 | 0.54 | 28 |
| EP1W | 1W | 5.0 | 12.0 | 0.70 | 28 |
| EP2W | 2W | 5.5 | 16.0 | 0.70 | 28 |
| EP3W | 3W | 6.5 | 17.5 | 0.75 | 28 |
| EP5W | 5W | 8.5 | 25.0 | 0.75 | 38 |
| EP7W | 7W | 8.5 | 30.0 | 0.75 | 38 |
| EP8W | 8W | 8.5 | 40.0 | 0.75 | 38 |
| EP9W | 9W | 8.5 | 53.0 | 0.75 | 38 |
| EP1WS | 1W-S | 3.5 | 10.0 | 0.54 | 28 |
| EP2WS | 2W-S | 5.0 | 12.0 | 0.70 | 28 |
| EP3WS | 3W-S | 5.5 | 16.0 | 0.70 | 28 |
| EP5WS | 5W-S | 6.5 | 17.5 | 0.75 | 28 |
| EP7WS | 7W-S | 8.5 | 25.0 | 0.75 | 38 |
| EP8WS | 8W-S | 8.5 | 30.0 | 0.75 | 38 |
| EP9WS | 9W-S | 8.5 | 40.0 | 0.75 | 38 |
| EP10WS | 10W-S | 8.5 | 53.0 | 0.75 | 38 |
| EP1WSSS | 1W-SSS | 2.5 | 6.8 | 0.54 | 28 |
| EP1WSS | 1W-SS | 3.0 | 9.0 | 0.54 | 28 |
| EP2WSS | 2W-SS | 3.5 | 9.5 | 0.54 | 28 |
| EP3WSS | 3W-SS | 5.0 | 11.5 | 0.70 | 28 |
| EP4WSS | 4W-SS | 5.5 | 15.5 | 0.70 | 28 |
| EP10WSS | 10W-SS | 8.5 | 39.5 | 0.75 | 38 |



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## Performance Specification

| Characteristics | Limits | Test Methods (JIS C 5201-1) |
|---|---|---|
| DC. resistance | Must be within the specified tolerance | The limit of error of measuring apparatus shall not exceed allowable range or 5% of resistance tolerance.<br>(Sub-clause 4.5) |
| Temperature coefficient | <20Ω : ± 400 PPM/℃<br>≥20Ω : ± 300PPM/℃ | Natural resistance change per temp. degree centigrade.<br>$\frac{R2-R1}{R1(t2-t1)} \times 10^6$ (PPM/℃)<br>$R_1$: Resistance value at room temperature ($t_1$)<br>$R_2$: Resistance value at room temp. plus 100 ℃ ($t_2$)<br>(Sub-clause 4.8) |
| Short time overload | Resistance change rate is ± (2% + 0.05Ω) Max. with no evidence of mechanical damage | Permanent resistance change after application of a potential of 2.5 times RCWV for 5 seconds.<br>(Sub-clause 4.13) |
| Terminal Strength | No evidence of mechanical damage | **Direct load:**<br>Resistance to a 2.5 kgs direct load for 10 secs. In the direction of the axis of the terminal leads<br>**Twist test:**<br>Terminal leads shall be bent through 90°at a point of about 6mm from the body of the resistor and shall be rotated through 360°about the original axis of the bent terminal in alternating direction for a total of3 rotations<br>(Sub-clause 4.16) |
| Solderability | 95% coverage Min. | The area covered with a new, smooth, clean, shiny and continuous surface free from concentrated pinholes.<br>Test temp. of solder 245℃ ± 3℃<br>Dwell time in solder : 2 ~ 3 seconds<br>(Sub-clause 4.17) |
| Soldering temp. reference | Electrical characteristics shall be satisfied. Without distinct deformation in appearance. (95% coverage Min.) | The leads immersed into solder bath to 3.2 to 4.8 mm. from the body. Permanent resistance change shall be checked.<br><u>Wave soldering conditions: (2 cycles Max.)</u><br>Pre-heat : 100 ~ 120 ℃, 30 ± 5 sec.<br>Suggestion solder temp.: 235 ~ 255 ℃, 10 sec. (Max.)<br>Peak temp.: 260 ℃<br><u>Hand soldering condition:</u><br>Hand soldering bit temp.: 380 ± 10 ℃<br>Dwell time in solder : 3 +1/-0 sec. |
| Resistance to soldering heat | Resistance change rate is ± (1% + 0.05Ω) Max. with no evidence of mechanical damage. | Permanent resistance change when leads immersed to 3.2 to 4.8 mm from the body in 350℃ ± 10 ℃ solder for 3 ± 0.5 seconds.<br>(Sub-clause 4.18) |

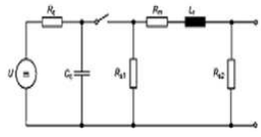


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## Performance Specification (continued)

| Characteristics | Limits | Test Methods (JIS C 5201-1) | |
|---|---|---|---|
| Temperature cycling | Resistance change rate is ± (2% + 0.05Ω) Max. with no evidence of mechanical damage | Resistance change after continuous 100 cycles for duty shown below: | |
| | | Step / Temperature / Time | |
| | | 1 / -55℃ ± 3℃ / 30 mins | |
| | | 2 / Room temp. / 10～15 mins | |
| | | 3 / +155℃ ± 2℃ / 30mins | |
| | | 4 / Room temp. / 10～15 mins | |
| | | (Sub-clause 4.19) | |
| Vibration | Resistance change rate is ± (1% + 0.05Ω) Max. | 55Hz, 3 planes 2hrs each<br>Total amplitude = 1.5mm<br>(Sub-clause 4.22) | |
| Load life in humidity | Resistance change rate is ±(5% + 0.05Ω) Max. with no evidence of mechanical damage | Resistance change after 1000 hrs (1.5 hrs “on”, 0.5 hr “off”) at RCWV in a humidity test chamber controlled at 40℃ ± 2℃ and 90 to 95% relative humidity<br><br>(Sub-clause 4.24.2.1) | |
| Load life | Resistance change rate is ±(5% + 0.05Ω) Max. with no evidence of mechanical damage | Permanent resistance change after 1000 hrs operating at RCWV with duty cycle of (1.5 hours "on", 0.5 hour "off") at 70℃ ± 2℃ ambient<br><br>(Sub-clause 4.25.1) | |
| Resistance to solvent | No deterioration of protective coatings and markings | Specimens shall be immersed in a bath of Isopropyl alcohol completely for 3 minutes with ultrasonic<br>(Sub-clause 4.30) | |
| Surge immunity test (Resistor stand alone-Not sync to phase angle and polarity) | Resistance change rate is ±(5% + 0.05Ω) Max. | Refer to IEC61000-4-5<br><br>1.2µsec rising time and 50µsec discharge;<br>10 cycles every 1 minute | **Max Surge Voltage**<br><br>Refer to surge rating chart. |

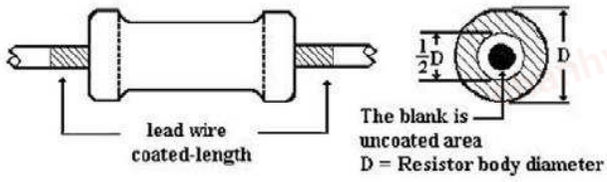


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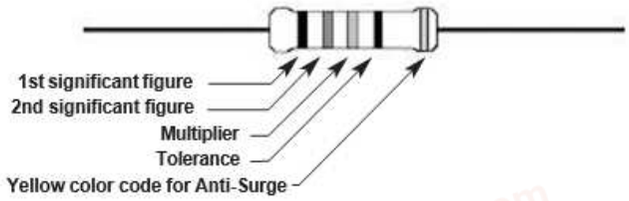
## Painting Method




Welding point, terminal and lead wire, is permissible to be exposed without the outer coated cover. The extent should be within ½ of the angle.

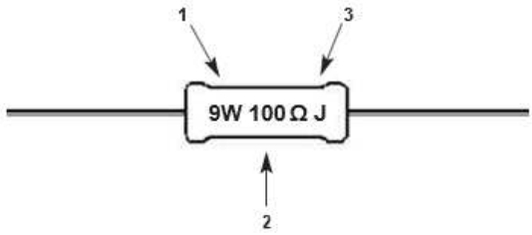
## Marking

For EP Normal Size 1/2W, 1W, 2W, 3W and EP Small Size 1WS, 2WS, 3WS, 5WS and EP Extra Small Size 1WSSS, 1WSS, 2WSS, 3WSS. Resistors shall be marked with colour coding in accordance with JIS C 0802.




For EP Normal Size 5W, 7W, 8W 9W and EP Small Size 7WS, 8WS, 9WS, 10WS and EP Extra Small Size 10WSS. Resistors will be marked with:

1 . Power Rating,
2. Nominal Resistance
3. Resistance Tolerance Code.




## Label

Label shall be marked with the following items:

1. Type and style
2. Resistance Tolerance
3. Nominal Resistance
4. Quantity
5. PPM
6. Lot Number

Example:

| | | | |
|---|---|---|---|
| TYCO Pn | 2176082-7 | | |
| DESC | EP 3W (S) | ± 5% | 100R |
| QTY | 1,000 | Pcs. | PPM: 300 |
| LOT | SAMPLE | | |
| REF | RoHS 2011/65/EU | | |



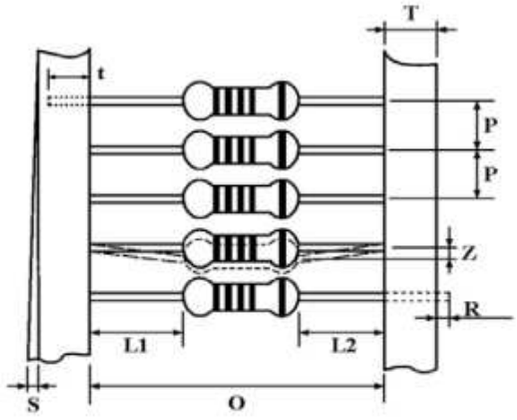
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## Packaging

Tape dimensions (mm)




| | Style | O ± 1 | P | L1-L2 Max. | T ± 1 | Z Max. | R | T ± 1 | S Max. |
|---|---|---|---|---|---|---|---|---|---|
| EP05W | PT-52 | 52 | 5± 0.3 | 1 | 6 | 1 | 0 | 4 | 0.5 |
| EP1W | PT-52 | 52 | 5± 0.3 | 1 | 6 | 1 | 0 | 4 | 0.5 |
| EP2W | PT-64 | 64 | 10± 0.5 | 1 | 6 | 1 | 0 | 5 | 0.5 |
| EP3W | PT-64 | 64 | 10± 0.5 | 1 | 6 | 1 | 0 | 6 | 0.5 |
| Small Size | | | | | | | | | |
| EP1WS | PT-52 | 52 | 5± 0.3 | 1 | 6 | 1 | 0 | 4 | 0.5 |
| EP2WS | PT-52 | 52 | 5± 0.3 | 1 | 6 | 1 | 0 | 4 | 0.5 |
| EP3WS | PT-64 | 64 | 10± 0.5 | 1 | 6 | 1 | 0 | 5 | 0.5 |
| EP5WS | PT-64 | 64 | 10± 0.5 | 1 | 6 | 1 | 0 | 6 | 0.5 |
| Extra Small Size | | | | | | | | | |
| EP1WSSS | PT-52 | 52 | 5± 0.3 | 1 | 6 | 1 | 0 | 4 | 0.5 |
| EP1WSS | PT-52 | 52 | 5± 0.3 | 1 | 6 | 1 | 0 | 4 | 0.5 |
| EP2WSS | PT-52 | 52 | 5± 0.5 | 1 | 6 | 1 | 0 | 4 | 0.5 |
| EP3WSS | PT-64 | 64 | 10± 0.5 | 1 | 6 | 1 | 0 | 5 | 0.5 |
| EP4WSS | PT-64 | 64 | 10± 0.5 | 1 | 6 | 1 | 0 | 6 | 0.5 |

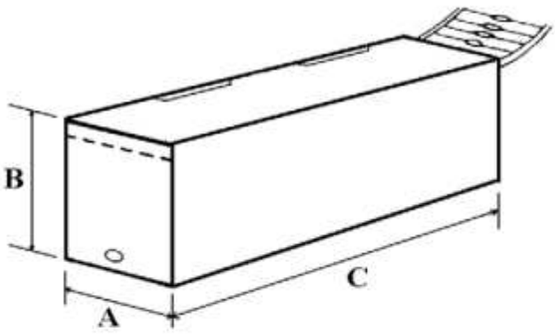


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## Tape In Box Packaging (mm)




Bandoliers may also be contained in a cardboard box ("Ammopack")

| | Style | C ± 5 | A ± 5 | B ± 5 | Quantity Per Box (pcs.) |
|---|---|---|---|---|---|
| EP05W | PT-52 | 260 | 85 | 70 | 1000 |
| EP1W | PT-52 | 262 | 86 | 80 | 1000 |
| EP2W | PT-64 | 262 | 92 | 108 | 1000 |
| EP3W | PT-64 | 256 | 92 | 80 | 500 |
| Small Size | | | | | |
| EP1WS | PT-52 | 260 | 85 | 70 | 1000 |
| EP2WS | PT-52 | 262 | 86 | 80 | 1000 |
| EP3WS | PT-64 | 262 | 92 | 108 | 1000 |
| EP5WS | PT-64 | 256 | 92 | 80 | 500 |
| Extra Small Size | | | | | |
| EP1WSSS | PT-52 | 260 | 85 | 70 | 1000 |
| EP1WSS | PT-52 | 260 | 85 | 70 | 1000 |
| EP2WSS | PT-52 | 262 | 86 | 80 | 1000 |
| EP3WSS | PT-64 | 262 | 86 | 80 | 1000 |
| EP4WSS | PT-64 | 262 | 86 | 80 | 1000 |

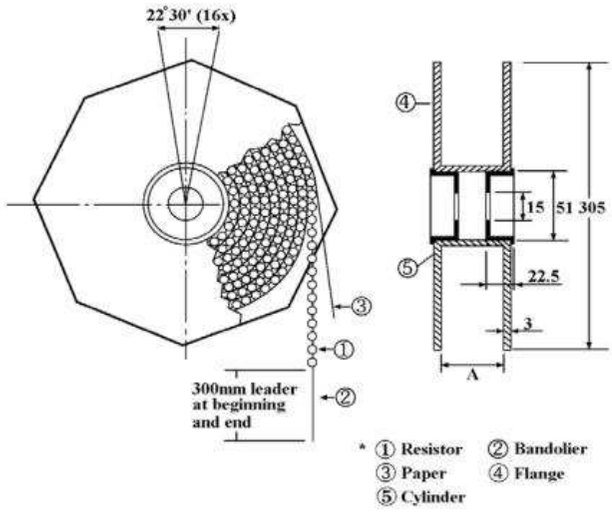


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## Tape On Reel Packaging (mm)




| | Style | A (Across Flanges) | Quantity Per Reel |
|---|---|---|---|
| EP05W | PT-52 | 73 ± 2 | 2500 |
| EP1W | PT-52 | 73 ± 2 | 2500 |
| EP2W | PT-64 | 81 ± 5 | 1000 |
| EP3W | PT-64 | 81 ± 5 | 500 |
| Small Size | | | |
| EP1WS | PT-52 | 73 ± 2 | 2500 |
| EP2WS | PT-52 | 73 ± 2 | 2500 |
| EP3WS | PT-64 | 81 ± 5 | 1000 |
| EP5WS | PT-64 | 81 ± 5 | 500 |
| Extra Small Size | | | |
| EP1WSSS | PT-52 | 73 ± 2 | 2500 |
| EP1WSS | PT-52 | 73 ± 2 | 2500 |
| EP2WSS | PT-52 | 73 ± 2 | 2500 |
| EP3WSS | PT-64 | 81 ± 5 | 1000 |
| EP4WSS | PT-64 | 81 ± 5 | 1000 |

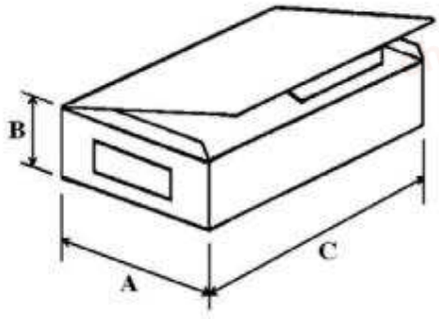


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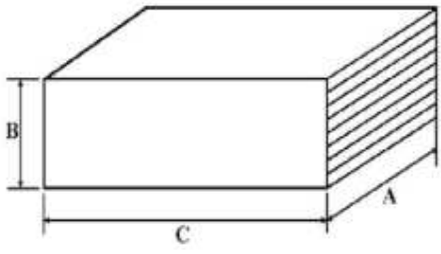


## Bulk In Box (in plastic bag) (mm)




| | C ± 5 | A ± 5 | B ± 5 | Quantity Per Bag/Box (pcs.) |
|---|---|---|---|---|
| EP05W | 155 | 95 | 53 | 100 / 1000 |
| EP1W | 155 | 95 | 53 | 100 / 500 |
| EP2W | 155 | 95 | 53 | 100 / 500 |
| EP3W | 155 | 95 | 53 | 100 / 400 |
| Small Size | | | | |
| EP1WS | 155 | 95 | 53 | 100 / 1000 |
| EP2WS | 155 | 95 | 53 | 100 / 500 |
| EP3WS | 155 | 95 | 53 | 100 / 500 |
| EP5WS | 155 | 95 | 53 | 100 / 400 |
| Extra Small Size | | | | |
| EP1WSSS | 155 | 95 | 53 | 100 / 1000 |
| EP1WSS | 155 | 95 | 53 | 100 / 1000 |
| EP2WSS | 155 | 95 | 53 | 100 / 1000 |
| EP3WSS | 155 | 95 | 53 | 100 / 1000 |
| EP4WSS | 155 | 95 | 53 | 100 / 500 |

## Bulk In Plastic Case Packaging (mm)




| | C ± 5 | A ± 5 | B ± 5 | Quantity Per Case/Box (pcs.) |
|---|---|---|---|---|
| EP5W | 36 | 20 | 8 | 100 / 1000 |
| Small Size | | | | |
| EP7WS | 36 | 20 | 8 | 100 / 1000 |

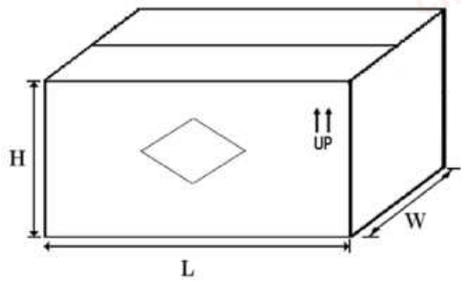


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Bulk In Inner Box Packaging (in plastic bag) (mm)




Carton Box

| | Quantity / Bag (pcs.) | Quantity Inner Box (pcs.) | Quantity Carton (pcs.) | Carton Box Size L x W x H (± 5) |
|---|---|---|---|---|
| EP7W | 10 | 250 | 1000 | 520 x 220 x 250 |
| EP8W | 10 | 250 | 1000 | 520 x 220 x 250 |
| EP9W | 10 | 250 | 1000 | 520 x 220 x 250 |
| Small Size | | | | |
| EP8WS | 10 | 250 | 1000 | 520 x 220 x 250 |
| EP9WS | 10 | 250 | 1000 | 520 x 220 x 250 |
| EP10WS | 10 | 250 | 1000 | 520 x 220 x 250 |
| Extra Small Size | | | | |
| EP10WSS | 10 | 250 | 1000 | 215 x 520 x 250 |

## Environmental Related Substance

This product complies to EU RoHS directive, EU PAHs directive, EU PFOS directive and halogen free.

Ozone layer depleting substances.

Ozone depleting substances are not used in our manufacturing process of this product.

This product is not manufactured using Chloro fluorocarbons (CFGs), Hydrochlorofluorocarbons (HCFCs), Hydrobromofluorocarbons (HBFCs) or other ozone depleting substances in any phase of the manufacturing process.



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## Storage Conditions (MSL1)

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 25℃ ± 10℃ and a relative humidity of 60%RH ± 10%RH, chemical and dust free atmosphere.

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, suck as $C1_2$, $H_2S$, $NH_3$, $SO_2$, or $NO_2$
2. In direct sunlight

## How To Order

| EP | 3W | 200R | J | |
|---|---|---|---|---|
| **Common Part** | **Power Rating** | **Nominal Resistance** | **Resistance Tolerance** | **Packaging** |
| EP | 05W = 1/2W<br>1W = 1W<br>1WS = 1W-S<br>1WSS = 1W-SS<br>1WSSS = 1W-SSS<br>As per Electrical Characteristics chart | 10 Ω – 10R<br><br>1K Ω – 1K0<br>(1000 Ω) | F = ±1<br>G = ±2<br>J = ±5<br>K = ±10 | - Tape/Box<br>TR - Tape/Reel<br>BB - Bulk/Box |

*Preferred range is E24 resistances at 5% Tolerance with Tape/Box packaging.

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