

## UL Recognised Wirewound Resistors



### ULW Series

- UL1412 recognised fusible resistor \*
- Failsafe mains fusing at 120 / 240Vrms
- Inrush and surge withstanding
- UL94-V0 flameproof coating
- Surface mount ZI-form option

\* UL file number E234469.



 All Pb-free parts comply with EU Directive 2011/65/EU amended by (EU) 2015/863 (RoHS3)

## Electrical Data

|                                  |         | ULW2 / ULWP2R                                                   | ULW3 | ULW4 | ULW5 |
|----------------------------------|---------|-----------------------------------------------------------------|------|------|------|
| Power rating at 25°C             | watts   | 2                                                               | 3    | 4    | 5    |
| 5 second overload rating at 25°C | watts   | 10                                                              | 15   | 20   | 25   |
| Inrush / surge performance       |         | See Pulse Performance graphs                                    |      |      |      |
| Resistance range                 | ohms    | 1R0 to 100R                                                     |      |      |      |
| TCR                              | ppm/°C  | ±200                                                            |      |      |      |
| Isolation voltage                | volts   | 250                                                             | 350  | 500  |      |
| Resistance tolerance             | %       | 5                                                               |      |      |      |
| UL recognised standard values    | ohms    | Any value in the range 1R0 to 100R is recognised. E24 preferred |      |      |      |
| Thermal impedance                | °C/watt | 110                                                             | 82   | 62   | 54   |
| Ambient temperature range        | °C      | -55 to +155                                                     |      |      |      |

Note - no limiting element voltage applies; maximum continuous voltage is  $\sqrt{P \cdot R}$

## Physical Data

| Dimensions (mm) and weight (g) |       |       |       |       |                   |                 |         |  |
|--------------------------------|-------|-------|-------|-------|-------------------|-----------------|---------|--------------------------------------------------------------------------------------|
| Type                           | L Max | D Max | f min | d nom | PCB mount centres | Min bend radius | Wt. Nom |                                                                                      |
| ULW2                           | 9.0   | 3.8   | 19.8  | 0.8   | 12.7              | 1.2             | 0.5     |                                                                                      |
| ULW3                           | 14.5  | 5.8   | 24.6  |       | 20.3              |                 | 1.1     |                                                                                      |
| ULW4                           | 13    | 5.6   | 22.8  |       | 18.9              |                 | 1.0     |                                                                                      |
| ULW5                           | 16.5  | 7.2   | 23.6  |       | 22.9              |                 | 1.8     |                                                                                      |

### Construction

A high purity ceramic rod is assembled with interference fit end caps to which are welded the terminations. The surge withstanding resistive element is wound on the rod and welded to the caps. Flameproof fusible cement coating is applied prior to marking with indelible ink. The components are then leadformed if required and packed.

### Marking

ULW2, ULWP2R & ULW3 resistors are marked with five colour bands. The first four indicate value and tolerance in conformance with IEC62. The fifth yellow band denotes defined fusibility. ULW4 and ULW5 resistors are legend marked with type, value and tolerance.

### General Note

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#### Terminations

Material: Hot tin dipped copper wire  
 Strength: The terminations meet the requirements of IEC 68.2.21  
 Solderability: The terminations meet the requirements of IEC 115-1 Clause 4.17.3.2

#### Solvent Resistance

The body protection and marking are resistant to all normal industrial cleaning solvents suitable for printed circuits.

#### Flammability

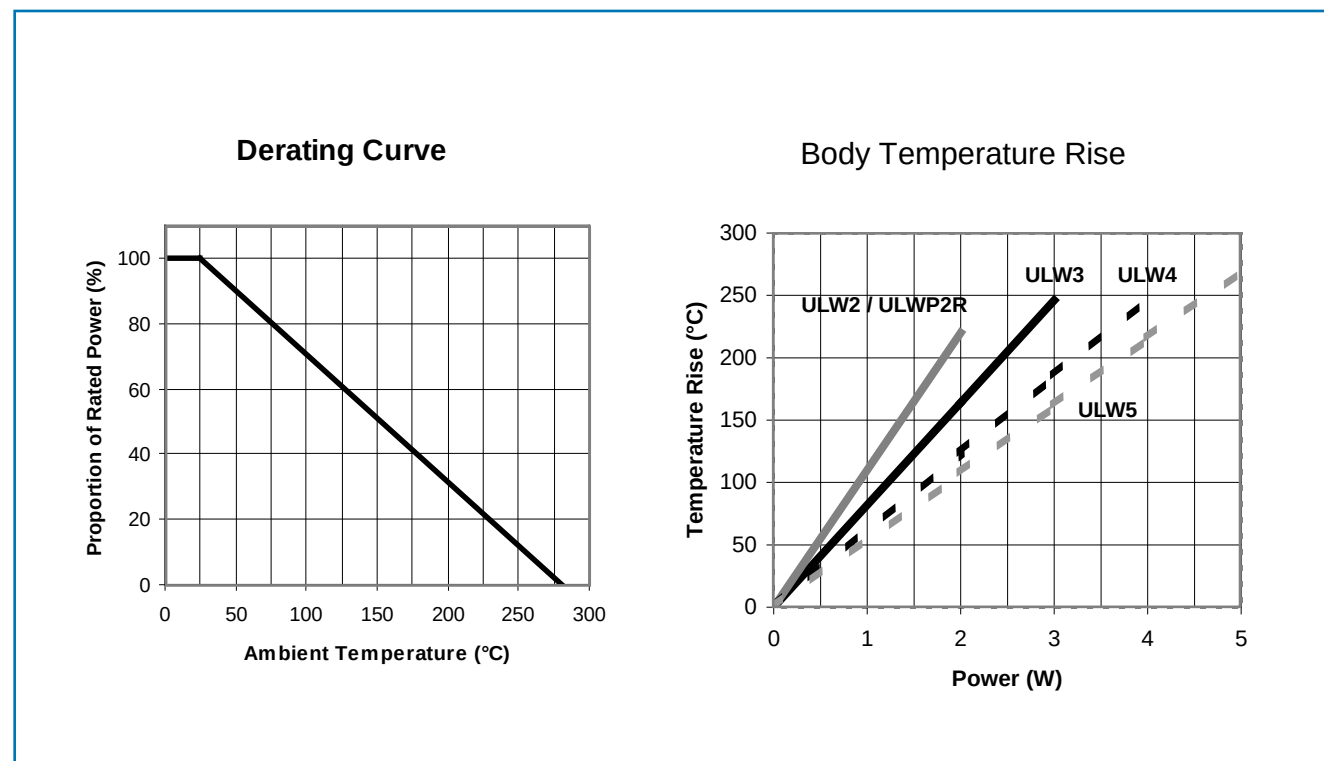
The resistor coating will not burn or emit incandescent particles under any condition of applied temperature or power overload.

## Performance Data

|                                            |              | Maximum*  | Typical |
|--------------------------------------------|--------------|-----------|---------|
| Load at rated power (1000 hours @ 25°C)    | $\Delta R\%$ | 5         | 3       |
| Short term overload (5 x Pr for 5 seconds) | $\Delta R\%$ | 5         | 1       |
| Pulse (see Pulse Performance graphs)       | $\Delta R\%$ | 5         | 2       |
| Climatic                                   | $\Delta R\%$ | 5         | 2       |
| Long term damp heat (56 days)              | $\Delta R\%$ | 5         | 1       |
| Climatic category                          |              | 55/200/56 |         |
| Temperature rapid change                   | $\Delta R\%$ | 5         | 1       |
| Dry heat (1000 hours @ 200°C)              | $\Delta R\%$ | 5         | 3       |
| Vibration                                  | $\Delta R\%$ | 5         | 1       |
| Robustness & solder heat                   | $\Delta R\%$ | 5         | 1       |

\* Addition of 0.01 $\Omega$  applies

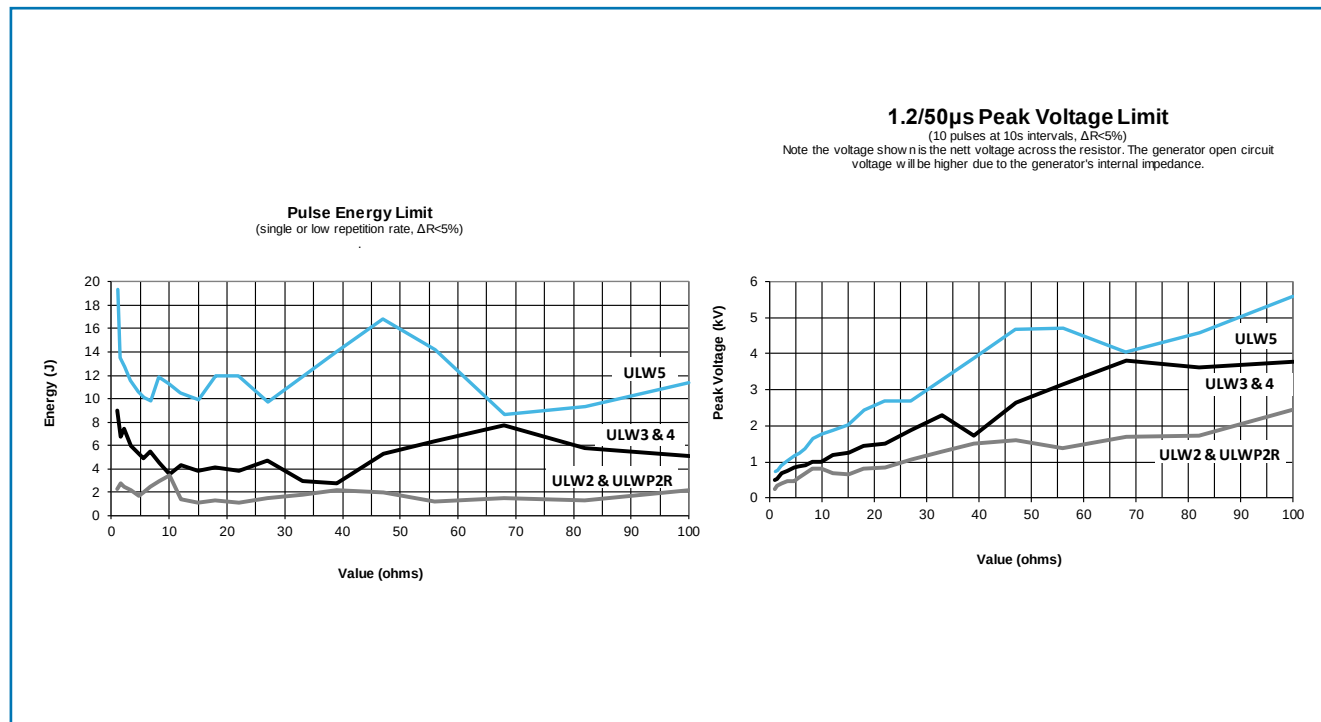
## Thermal Performance



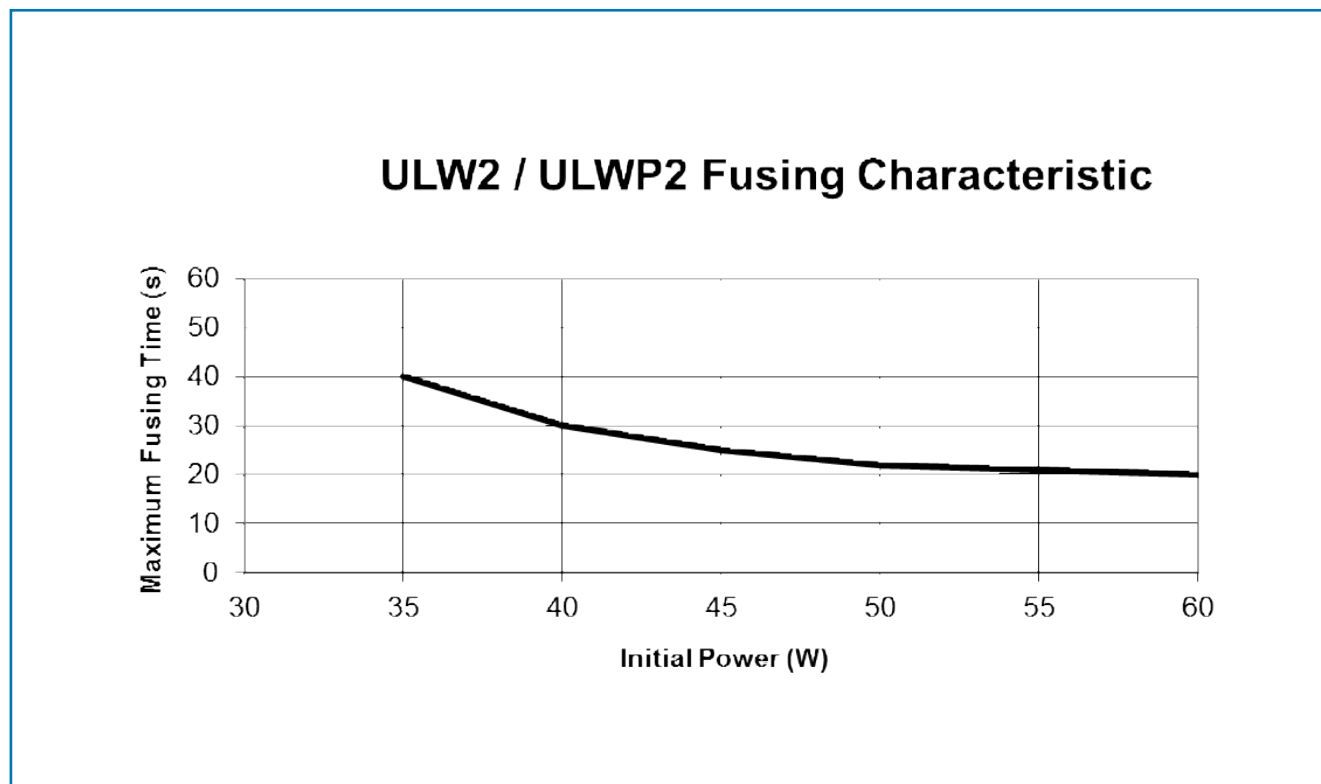
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## Pulse Performance



## Fusing Performance

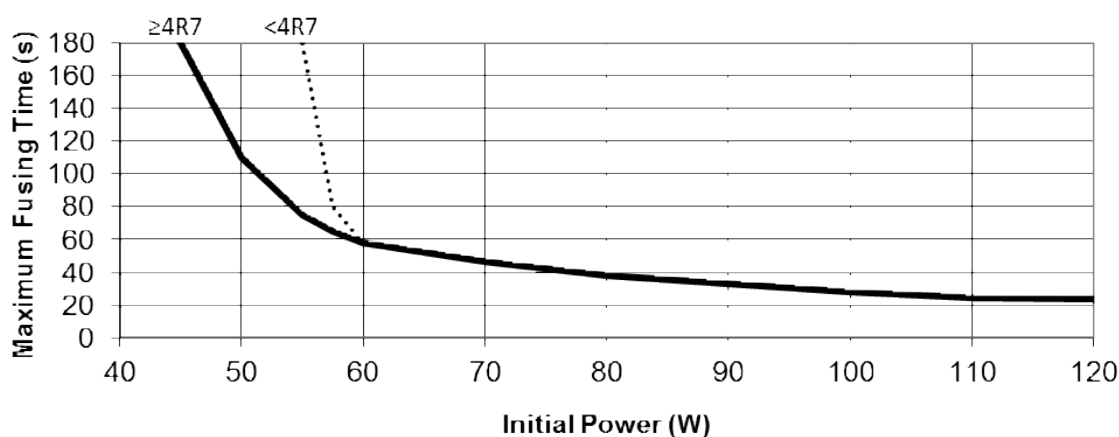


### General Note

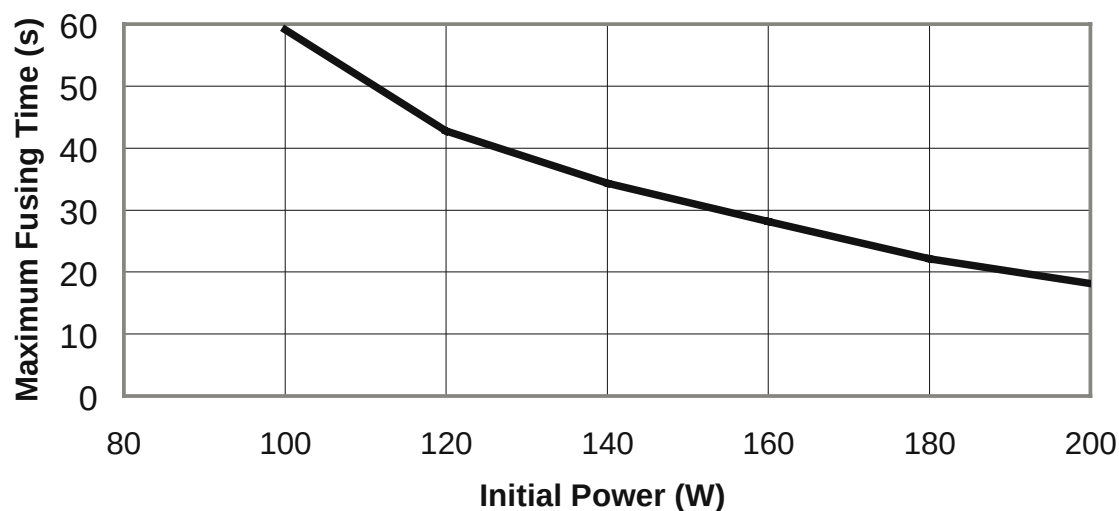
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## Fusing Performance

### ULW3 & ULW4 Fusing Characteristic



### ULW5 Fusing Characteristic



#### Notes:

1. Typical fusing times are around 1/3 of the maximum figures.
2. After fusing the resistance value is >100 times the initial nominal value, provided the initial power is at least 20 x rated power.
3. Suitable for fusing at voltages up to 264Vrms.

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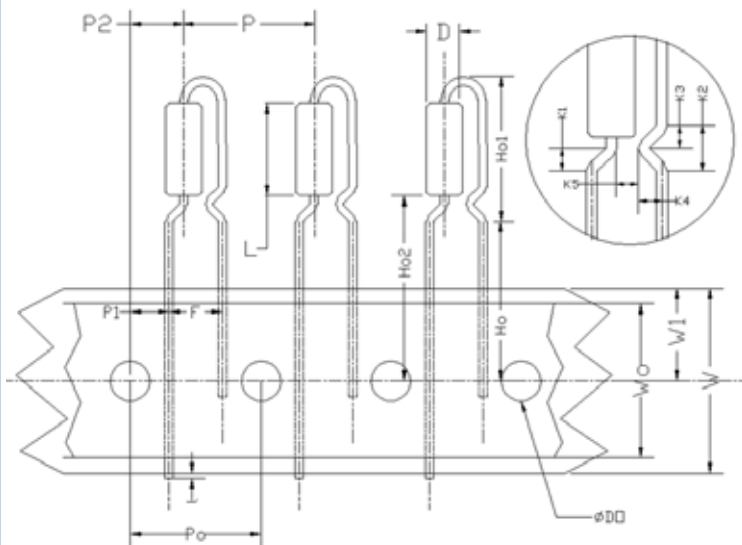
## Application Notes

1. If the resistors are to dissipate full rated power, it is recommended that the terminations should not be soldered closer than 4mm from the body.
2. Due to operating temperature limits imposed by some PCB materials, derating may be necessary. An estimate of the temperature rise to be expected can be calculated using the thermal impedance figures given under Electrical Data.
3. For the purposes of UL approval, the following points should be observed:
  - 3.1 To protect against fire under all conditions of overload, a positive clearance of at least 13mm should be provided between the body of the resistor and any combustible materials.
  - 3.2 A positive clearance of 13mm should be provided between the resistor body or terminations and uninsulated parts of opposite polarity or uninsulated dead metal parts.
  - 3.3 Limited Short Circuit testing should be performed in the complete appliance.
4. ULW resistors can also be supplied with radial, goalpost or lancet pre-formed leads - see <https://www.ttelectronics.com/TTElectronics/media/ProductFiles/Resistors/ApplicationNotes/TN008-resistors-Leadform-Capability.pdf>.  
 ULW2, ULW3, ULW4 and ULW5 are available in ZI-form SMD format packed in blister tape - see <https://www.ttelectronics.com/TTElectronics/media/ProductFiles/Resistors/Datasheets/ZI-form.pdf>

| Hairpin                                                                            | Goalpost                                                                           | Lancet                                                                              | ZI-form                                                                              |
|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|  |  |  |  |

Also a 2W and 3W radial taped version is available as shown below

| Radial Taped Dimensions (mm) |          |                    |          |
|------------------------------|----------|--------------------|----------|
| Dimension                    | Notation | ULWP2R             | ULW3R    |
| Component body length        | L        | 10.0 Max           | 14.5 Max |
| Component body diameter      | D        | 4.0 Max            | 5.8 Max  |
| Terminal lead diameter       | d        | 0.8 Nom            |          |
| Component pitch              | P        | 12.7±0.5           | 12.7±1.0 |
| Hole pitch                   | Po       | 12.7±0.2           | 12.7±0.3 |
| Component to hole offset     | P1       | 3.85±0.3           | 3.85±0.7 |
|                              | P2       | 5.85±0.5           | 6.35±1.3 |
| Lead pitch                   | F        | 5.0<br>+0.75 -0.34 | 5.0±1.0  |
| Width of backing strip       | W        | 18.0±0.3           | 18.0±1.0 |
| Position of hole             | W1       | 9.0±0.25           | 9.0±0.5  |
| Diameter of hole             | Do       | 4.0±0.3            |          |
| Height to lead form          | Ho       | 16.0±0.3           | 17.0±1.0 |
| Height from lead form        | Ho1      | 17.0 Max           | 23.0 Max |
| Height to resistor           | Ho2      | 18.0 Min           |          |
| Width of adhesive tape       | W0       | 15.0±0.5           |          |
| Length of protrusion         | I        | <2.5               |          |
| Form dimensions              | K1       | 2.0±0.3            |          |
|                              | K2       | 3.0±0.5            |          |
|                              | K3       | 1.5±0.25           |          |
|                              | K4       | 1.0±0.2            |          |
|                              | K5       | --                 | 2.0 Min  |



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## Packaging

The standard packaging for ULW is taped. The critical dimensions are shown in Figure 1. The component wires will not protrude beyond the outside edge of the tapes. Taped product is then packed into ammo boxes for ULW2, 3 and 4 or onto reels for ULW5. Alternative packaging is available by request. The standard packaging for ULWP2R is tape and reel. Pre-formed radial, goalpost & lancet resistors are supplied loose packed in plastic bags or boxes. ZI-form SMD are packed in blister tape.

| Dimensions (mm) |      |                     |
|-----------------|------|---------------------|
| Type            | b ±2 | C ±0.5 <sup>1</sup> |
| ULW2            | 52   | 5                   |
| ULW3            | 67   | 10                  |
| ULW4            | 63   | 10                  |
| ULW5            |      |                     |

**Figure 1**

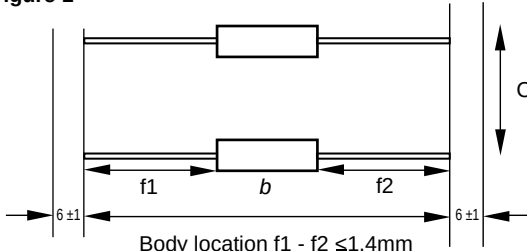


Figure 1 is a technical drawing of a wirewound resistor. It shows a rectangular body of length  $b$  and thickness  $C$ . Two leads of length  $f_1$  and  $f_2$  extend from the body. The total length is  $b + f_1 + f_2$ . The lead thickness is  $6 \pm 1$  mm. The body location is defined by  $f_1 - f_2 \leq 1.4$  mm.

**Note 1:** Cumulative tolerance over 10 pitches is  $\pm 2\text{mm}$

## Ordering Procedure

**Example: ULW2-33RJA25** (ULW2, 33 ohms  $\pm 5\%$ , Pb-free)

|   |   |   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|---|---|
| U | L | W | 2 | - | 3 | 3 | R | J | A | 2 | 5 |
| 1 |   | 2 |   | 3 |   | 4 |   | 5 |   |   |   |

| 1<br>Type | 2<br>Leadforming | 3<br>Value                 | 4<br>Tolerance | 5<br>Packing |            |                       |
|-----------|------------------|----------------------------|----------------|--------------|------------|-----------------------|
| ULW2      | Optional code    | 3/4 characters<br>R = ohms | J = $\pm 5\%$  | A25          | ULW2       | Ammo pack, 2500/box   |
| ULW3      |                  |                            |                | A1           | ULW3, ULW4 | Ammo pack, 1000/box   |
| ULW4      |                  |                            |                | T075         | ULW5       | Tape & reel, 750/reel |
| ULW5      |                  |                            |                |              |            |                       |

**Example: ULWP2R-33RJT15** (ULWP2R radially formed & taped, 33 ohms  $\pm 5\%$ , Pb-free)

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| U | L | W | P | 2 | R | - | 3 | 3 | R | J | T | 1 | 5 |
| 1 |   | 2 |   | 3 |   | 4 |   | 5 |   |   |   |   |   |

| 1<br>Type | 2<br>Leadforming | 3<br>Value                 | 4<br>Tolerance | 5<br>Packing |        |             |           |
|-----------|------------------|----------------------------|----------------|--------------|--------|-------------|-----------|
| ULWP2     | R = Radial taped | 3/4 characters<br>R = ohms | J = ±5%        | T15          | ULWP2R | Tape & reel | 1500/reel |
| ULW3      |                  |                            |                | A2           | ULW3R  | Ammo pack   | 2000/box  |
|           |                  |                            |                | T1           |        | Tape & reel | 1000/reel |

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### Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: [info@moschip.ru](mailto:info@moschip.ru)

Skype отдела продаж:

moschip.ru

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