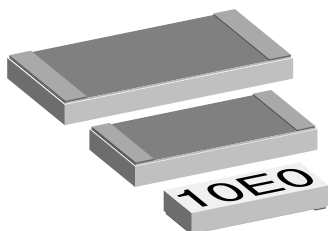


# Power Metal Strip® Flip Chip (Extended Range) Patents Pending



## FEATURES

- SMD alternative for low power leaded wirewound resistors
- Excellent stability in different environmental conditions (< 0.5 % change in resistance)
- Superior overload and pulse handling capability as compared to thin film (as much as 2 x better)
- Low TCR, down to  $\pm 15$  ppm/K
- Low noise:  $< 0.01 \mu V_{RMS}/V$
- Very low inductance:  $< 0.08 \mu H$
- Voltage coefficient:  $< 0.00001 \% / V$  ( $< 0.1$  ppm/V)
- Compliant to RoHS Directive 2002/95/EC



## Notes

\* Pb containing terminations are not RoHS compliant, exemptions may apply

\*\* Please see document "Vishay Material Category Policy": [www.vishay.com/doc?99902](http://www.vishay.com/doc?99902)

## STANDARD ELECTRICAL SPECIFICATIONS

| GLOBAL MODEL | SIZE | POWER RATING<br>$P_{70^{\circ}C}$<br>W | LIMITING ELEMENT VOLTAGE <sup>(1)</sup><br>V | TEMPERATURE COEFFICIENT<br>$\pm$ ppm/K | RESISTANCE VALUE RANGE <sup>(2)</sup><br>$\Omega$ |                  | E-SERIES |
|--------------|------|----------------------------------------|----------------------------------------------|----------------------------------------|---------------------------------------------------|------------------|----------|
|              |      |                                        |                                              |                                        | Tol. $\pm 0.5$ %                                  | Tol. $\pm 1.0$ % |          |
| WSL1506E     | 1506 | 0.25                                   | 63                                           | 15, 25                                 | 0.5 to 10K                                        | 0.5 to 10K       | 96       |
| WSL2010E     | 2010 | 0.5                                    | 100                                          | 15, 25                                 | 0.5 to 10K                                        | 0.5 to 10K       | 96       |
| WSL2512E     | 2512 | 1.0                                    | 100                                          | 15, 25                                 | 0.5 to 10K                                        | 0.5 to 10K       | 96       |

## Notes

- Ask about further value ranges, tighter tolerances and TCR's.

- Power rating depends on the max. temperature at the solder point, the component placement density and the substrate material.

- 4-digit marking, according to MIL-PRF-55342 (except as noted in Ordering Information table), on top side.

<sup>(1)</sup> Rated voltage:  $\sqrt{P \times R}$ .

<sup>(2)</sup> Contact factory using e-mail address at bottom of this page for resistance values available between 0.5 to 10 for 1506 and 0.5 to 100 for 2010 and 2512.

## TECHNICAL SPECIFICATIONS

| PARAMETER                   | UNIT             | WSL1506E                  | WSL2010E                 | WSL2512E                 |
|-----------------------------|------------------|---------------------------|--------------------------|--------------------------|
| Rated dissipation at 70 °C  | W                | 0.25                      | 0.5                      | 1.0                      |
| Insulation voltage (1 min)  | $V_{DC/AC}$ peak | 200                       | 200                      | 200                      |
| Thermal resistance          | K/W              | $\leq 220$ <sup>(3)</sup> | $\leq 88$ <sup>(3)</sup> | $\leq 65$ <sup>(3)</sup> |
| Insulation resistance       | M $\Omega$       | $> 10^6$                  |                          |                          |
| Operating temperature range | °C               | - 55 to + 150             |                          |                          |
| Weight/1000 pieces          | g                | 12                        | 25                       | 35                       |

## Note

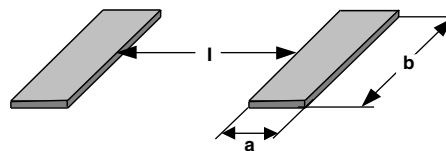
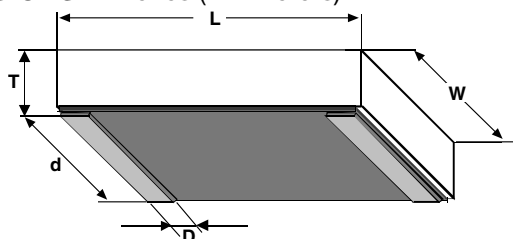
<sup>(3)</sup> Depending on solder pad dimensions.

## GLOBAL PART NUMBER INFORMATION

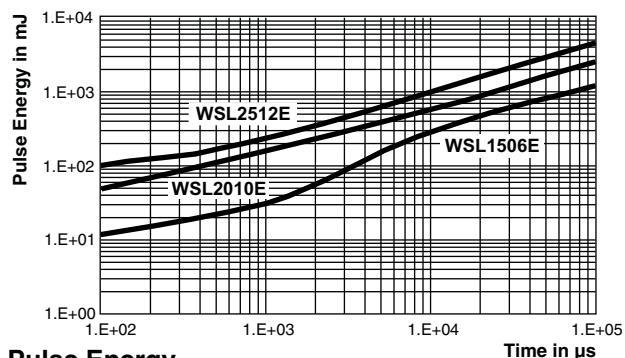
Global Part Numbering example: WSL1506E10E0XEA

W S L 1 5 0 6 E 1 0 E 0 X E A

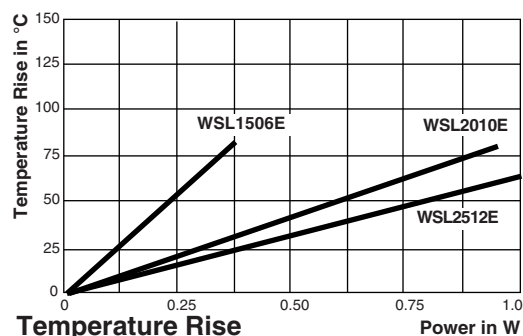
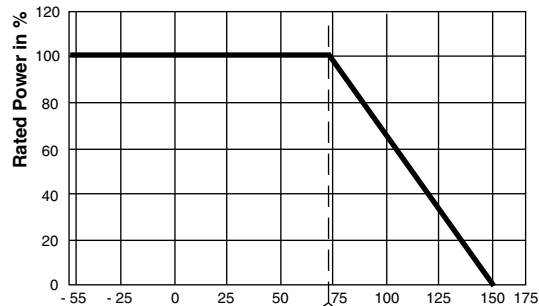
| GLOBAL MODEL | RESISTANCE VALUE AND TOLERANCE    |            |        | TCR CODE                                 | PACKAGING CODE                                         | SPECIAL                                                         |
|--------------|-----------------------------------|------------|--------|------------------------------------------|--------------------------------------------------------|-----------------------------------------------------------------|
| WSL1506E     | Resistance<br>Tolerance ( $\pm$ ) | Multiplier | Symbol | E = $\pm 25$ ppm/K<br>X = $\pm 15$ ppm/K | EA = Lead (Pb)-free, tape/reel<br>TA = Tape/reel (R86) | (Dash number)<br>(up to 2 digits)<br>From 1 to 99 as applicable |
|              | 0.5                               | X1         | W      |                                          |                                                        |                                                                 |
|              | 0.5                               | X1000      | X      |                                          |                                                        |                                                                 |
|              | 0.5                               | X1 000 000 | Y      |                                          |                                                        |                                                                 |
|              | 1.0                               | X1         | D      |                                          |                                                        |                                                                 |
|              | 1.0                               | X1000      | E      |                                          |                                                        |                                                                 |
|              | 1.0                               | X1 000 000 | F      |                                          |                                                        |                                                                 |

**DIMENSIONS** in inches (millimeters)


| MODEL   | DIMENSIONS                     |                                |                   |                                |                                | SOLDER PAD DIMENSIONS |              |              |
|---------|--------------------------------|--------------------------------|-------------------|--------------------------------|--------------------------------|-----------------------|--------------|--------------|
|         | L                              | W                              | T <sub>max.</sub> | D                              | d                              | a                     | b            | l            |
| WSL1506 | 0.15 ± 0.005<br>(3.81 ± 0.13)  | 0.062 ± 0.003<br>(1.57 ± 0.08) | 0.025 (0.64)      | 0.012 ± 0.003<br>(0.30 ± 0.08) | 0.059 ± 0.003<br>(1.50 ± 0.08) | 0.015 (0.38)          | 0.062 (1.57) | 0.118 (3.00) |
| WSL2010 | 0.200 ± 0.005<br>(5.08 ± 0.13) | 0.100 ± 0.003<br>(2.54 ± 0.08) | 0.025 (0.64)      | 0.020 ± 0.003<br>(0.51 ± 0.08) | 0.097 ± 0.003<br>(2.46 ± 0.08) | 0.023 (0.58)          | 0.100 (2.54) | 0.153 (3.89) |
| WSL2512 | 0.250 ± 0.005<br>(6.35 ± 0.13) | 0.126 ± 0.003<br>(3.20 ± 0.08) | 0.025 (0.64)      | 0.024 ± 0.003<br>(0.61 ± 0.08) | 0.123 ± 0.003<br>(3.12 ± 0.08) | 0.027 (0.69)          | 0.126 (3.20) | 0.196 (4.98) |


**Pulse Energy**
**Pulse Energy Plot:**

This represents the energy in each of 50 pulses, with a 1 s rest between pulses, that it takes to shift the WSL....E resistance ± (0.50 % + 0.01 Ω).


**Temperature Rise**

**Derating**

| PERFORMANCE               |                                                            |                     |
|---------------------------|------------------------------------------------------------|---------------------|
| TEST                      | CINDITIONS OF TEST                                         | TEST LIMITS         |
| Thermal shock             | - 55 °C to + 150 °C, 100 cycles, 15 min at each extreme    | ± (0.20 % + 0.01 Ω) |
| Short time overload       | 5 x rated power for 5 s                                    | ± (0.20 % + 0.01 Ω) |
| Low temperature operation | - 65 °C for 24 h                                           | ± (0.20 % + 0.01 Ω) |
| High temperature exposure | 1000 h at +150 °C                                          | ± (0.50 % + 0.01 Ω) |
| Moisture resistance       | MIL-STD-202, method 106, 0 % power, 7a and 7b not required | ± (0.50 % + 0.01 Ω) |
| Load life                 | 1000 h at rated power, + 70 °C, 1.5 h "ON", 0.5 h "OFF"    | ± (0.50 % + 0.01 Ω) |
| Vibration                 | MIL-STD-202, method 204D                                   | ± (0.10 % + 0.01 Ω) |
| Mechanical shock          | 100 g's for 6 ms, 5 pulses                                 | ± (0.10 % + 0.01 Ω) |
| Resistance to solder heat | + 260 °C solder, 10 s to 12 s dwell, 25 mm/s emergence     | ± (0.50 % + 0.01 Ω) |

| PACKAGING |                        |           |             |      |
|-----------|------------------------|-----------|-------------|------|
| MODEL     | REEL                   |           |             |      |
|           | TAPE WIDTH             | DIAMETER  | PIECES/REEL | CODE |
| WSL1506E  | 12 mm/embossed plastic | 178 mm/7" | 4000        | EA   |
| WSL2010E  | 12 mm/embossed plastic | 178 mm/7" | 4000        | EA   |
| WSL2512E  | 12 mm/embossed plastic | 178 mm/7" | 2000        | EA   |

**Note**

- Embossed Carrier Tape per EIA-481.



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