

## Surface Mount Sense Resistors

### OARS, OARS-XP, OARSZ Series

- Flexible leads for thermal expansion
- Open-air design reduces PCB heating
- Values down to 1milliohm
- TCR to  $\pm 40\text{ppm}/^\circ\text{C}$  (Element TCR  $\pm 20\text{ppm}/^\circ\text{C}$ )
- Zero-ohm 65A jumper version



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

### Electrical Data

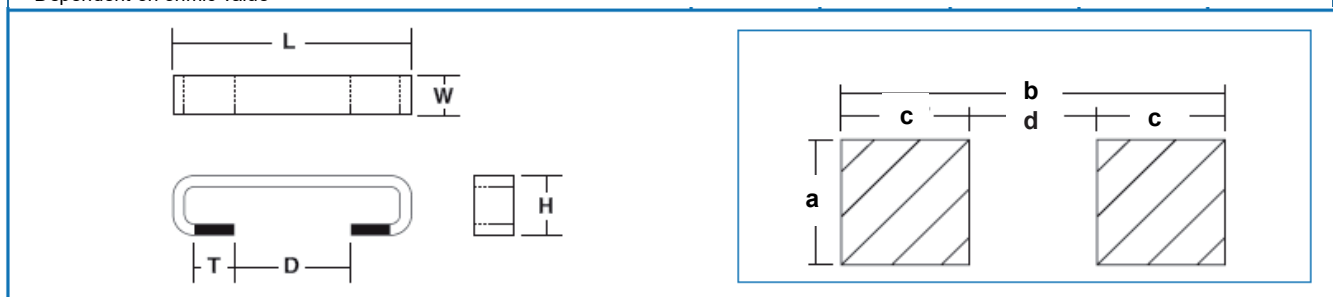
|   |           | OARS1                                      | OARS3              | OARS-XP                             |
|---|-----------|--|--------------------|-------------------------------------|
| Power rating at 70°C ambient, or 140°C terminal temperature | watts     | 2  | 3                  | 5                                   |
| Resistance range  | ohms      | R002 to R050                               | R002 to R015       | R001 to R025                        |
| Resistance Tolerance  | %         | $\leq R002: 5, > R002: 1, 5$               |                    |                                     |
| Standard Values (Enquire for unlisted values)               | milliohms | 2, 3, 4, 5, 10, 15, 20, 22, 25, 30, 40, 50 | 2, 3, 4, 5, 10, 15 | 1, 2, 2.5, 5, 7.5, 12.5, 10, 20, 25 |
| Inductance  | nH        | <10  |                    |                                     |
| Ambient temperature range                                   | °C        | -55 to +160                                |                    |                                     |

|                                |           | OARS-1Z     | Comments        |
|--------------------------------|-----------|-------------|-----------------|
| Current rating at 25°C ambient | amps      | 65          | Zero-ohm jumper |
| Max residual resistance        | milliohms | 0.3         |                 |
| Ambient temperature range      | °C        | -55 to +160 |                 |

### Physical Data

| Dimensions (mm) and recommended solder pads |                     |                    |                    |                    |                    |        |        |        |        |
|---|---------------------|--------------------|--------------------|--------------------|--------------------|--------|--------|--------|--------|
| Type  | L                   | H                  | T                  | D                  | W                  | a nom. | b nom. | c nom. | d nom. |
| OARS1 >R003, OARS-1Z                        | 11.18<br>$\pm 0.38$ | 3.05<br>$\pm 0.76$ | 2.36<br>$\pm 0.25$ | 4.83<br>$\pm 0.76$ | 3.18<br>$\pm 0.38$ | 4.07   | 9.37   | 3.07   | 3.23   |
| OARS1-R003                                  |                     | 3.51<br>$\pm 0.76$ |                    | 4.7<br>$\pm 0.76$  | 3.56<br>$\pm 0.38$ | 4.45   |        |        |        |
| OARS1-R002                                  | 11.56<br>$\pm 0.38$ |                    |                    | 4.83<br>$\pm 0.76$ | 6.01<br>$\pm 0.38$ | 7.24   |        |        |        |
| OARS-XP                                     | 10.7 to 12.0*       | 2.28 to 4.57*      |                    |                    |                    |        |        |        |        |

\* Dependent on ohmic value



### General Note

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**Performance Data (AEC-Q200)**

|                              | OARS1/3 | <R004                        | R004 to R015 | >R015 |
|------------------------------|---------|------------------------------|--------------|-------|
|                              | OARS-XP | <R002                        | R002 to R007 | >R007 |
| TCR (-55 to 125°C)           | ppm/°C  | 240                          | 40           | 40    |
| Thermal Shock                | ΔR%     | 0.75                         | 0.75         | 0.75  |
| High Temp. Exposure (125°C)  | ΔR%     | 1.75                         | 0.5          | 1     |
| Temp. Cycling (-40 to 125°C) | ΔR%     | 1                            | 1            | 0.75  |
| Operational Life             | ΔR%     | 2                            | 1            | 1     |
| Biased Humidity              | ΔR%     | 0.75                         | 0.5          | 0.5   |
| Mechanical Shock             | ΔR%     | 1.5                          | 1            | 1     |
| Vibration                    | ΔR%     | 1                            | 1            | 1     |
| Terminal Strength            |         | Meets JIS-C-6429             |              |       |
| Solvent Resistance           |         | Meets MIL-STD-002 Method 215 |              |       |
| Solderability                |         | Meets J-STD-002 Method B     |              |       |

**Temperature Derating**



Note: For OARS1/3/XP this relates to power rating, for OARSZ it relates to current rating.

**Pulse Energy Rating**

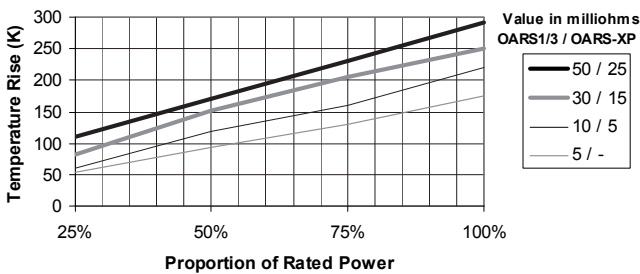


— OARS1/3 — OARS-XP

Note: This graph relates to single pulses of short duration ( $\leq 100\text{ms}$ ). Higher energy limits apply for longer pulses and overloads

**Hot Spot Temperature Rise**

7.6mm x 7.6mm pads, 2 oz copper on FR4, still air



**Joint Temperature Rise**

7.6mm x 7.6mm pads, 2 oz copper on FR4, still air

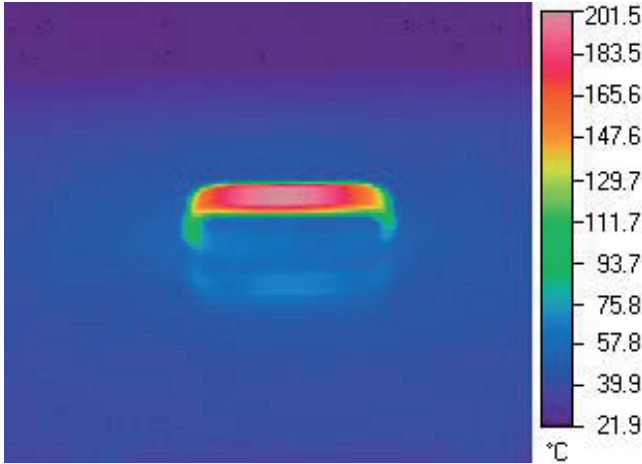


Note: Temperature rise data are given here for typical mounting conditions. Actual figures depend on PCB copper weight, mounting pad size, track width and substrate type. Also, the open air format responds better to forced air cooling than chip format resistors. For values below 5 milliohms allowance should be made for heat generated in the copper tracks themselves. Application-specific guidance is available on request.

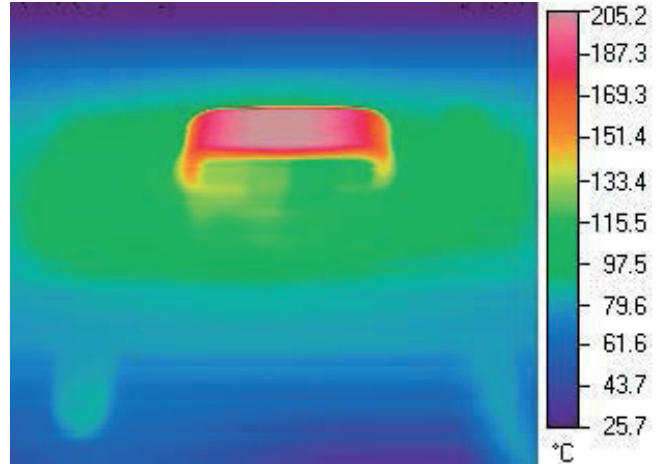
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**Thermal Performance Examples**



OARS1-R005 at 2W



OARSXP-R0025 at 5W

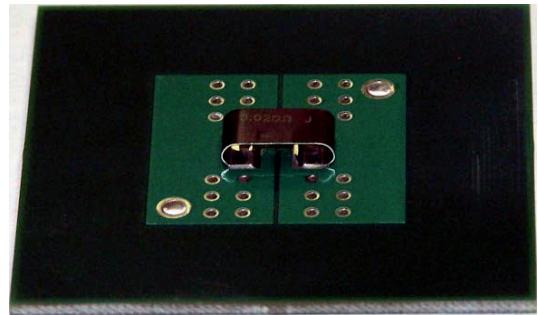
These thermal images were taken under ambient conditions of still air at 25°C with the components mounted on horizontal standard test boards as defined below.

JEDEC standard circuit board:

2" (50.8mm) square FR4

2 outer power planes, 2 ounce (70µ) Cu  
1" (25.4mm) square exposed

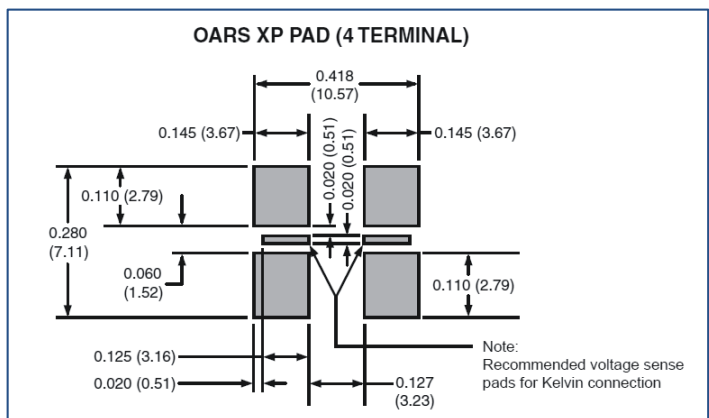
2 inner signal planes, 1 ounce (35µ) Cu  
(continuous planes)



In contrast to the flat chip format, the OARS format keeps the hot spot thermally distant from the solder joints and reduces undesirable heat delivery into the PCB. Further thermal images for other ohmic values and power dissipations are available on request.

**Kelvin (4 Terminal) Mounting**

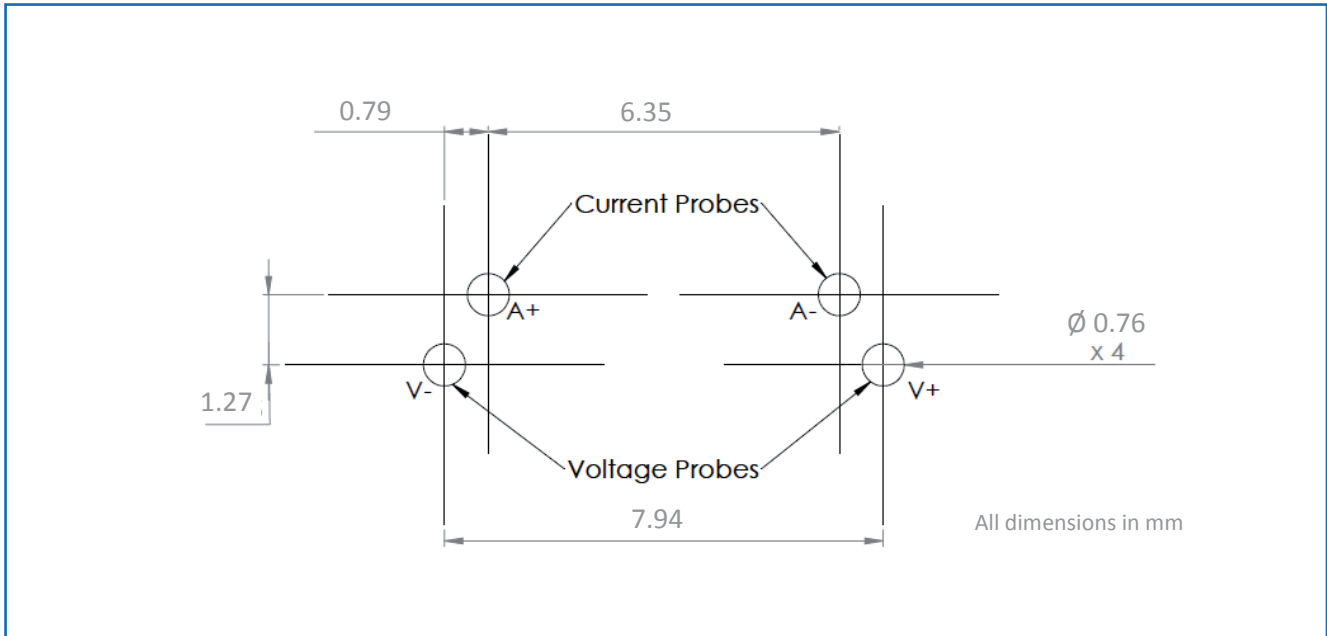
For high precision applications a Kelvin (4 Terminal) mounting method is recommended. An example to illustrate the design principle is shown. High current connections are made to the two pairs of larger pads, whilst the voltage sense connections are made to the two smaller central pads.



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Standard 4-Terminal Probe Positions for Measuring Unmounted Parts



**Construction**

Copper terminations are welded to resistance alloy strip which is then formed. Value adjustment is achieved by control of width, without the need for subsequent abrasion or notch trimming. Pb-free termination finish is 96% Sn / 4% Ag alloy.

**Flammability**

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

**Marking**

The parts are legend marked with ohmic value and tolerance code.

**Packaging Data**

| Dimensions (mm)  |           |           |        |          |          |        |       |
|------------------|-----------|-----------|--------|----------|----------|--------|-------|
| Type             | A         | B         | C      | D        | E        | F      | G     |
| OARS1/3, OARS-1Z | 4.32±0.08 | 11.7±0.08 | 24±0.3 | 11.5±0.1 | 1.75±0.1 | 8±0.1  | 4±0.1 |
| OARS-XP-R001     | 7.21±0.1  | 11.94±0.1 |        |          |          | 12±0.1 |       |
| OARS-XP >R001    |           | 11.56±0.1 |        |          |          |        |       |



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### Ordering Procedure

This product has two valid part numbers:

**European (Welwyn) Part Numbers:** **OARS1-R01JI** (OARS1, 10 milliohms  $\pm 5\%$ , Pb-free)  
**OARS-1Z** (OARS-1Z, Pb-free)



| 1<br>Type | 2<br>Value          | 3<br>Tolerance | 4<br>Termination & Packing |
|-----------|---------------------|----------------|----------------------------|
| OARS1     | 3-5 characters      | F = $\pm 1\%$  | I = Pb-free, Tape & Reel   |
| OARS3     | See Electrical Data | J = $\pm 5\%$  | OARS1, OARS3 1900/reel     |
| OARS-XP   | R = ohms            |                | OARS-XP 1200/reel          |



| 1<br>Type |   |
|-----------|---|
| OARS-1Z   | No value or tolerance applies. Termination is Pb-free. Packing is Tape & Reel, 1900/reel. |

**USA (IRC) Part Numbers:** **OARS1R010JLF** (OARS1, 10 milliohms  $\pm 5\%$ , Pb-free)  
**OARS-1ZLF** (OARS-1Z, Pb-free)



| 1<br>Type | 2<br>Value          | 3<br>Tolerance | 4<br>Termination & Packing |
|-----------|---------------------|----------------|----------------------------|
| OARS1     | 4/5 characters      | F = $\pm 1\%$  | LF = Pb-free               |
| OARS3     | See Electrical Data | J = $\pm 5\%$  | OARS1, OARS3 1900/reel     |
| OARS-XP   | R = ohms            |                | OARS-XP 1200/reel          |



| 1<br>Type | 2<br>Termination & Packing  |
|-----------|---|
| OARS-1Z   | No value or tolerance applies. LF= Pb-free, Tape & Reel, 1900/reel. |

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