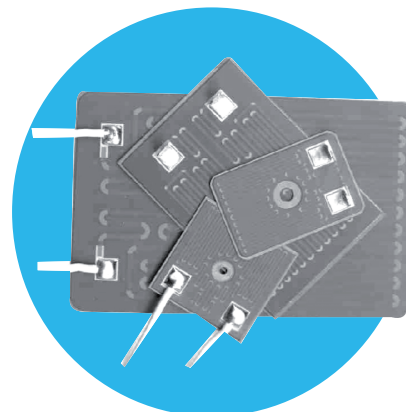


# Ultra Low Profile Power Resistors

## WDBR Series

- Ultra low profile thick-film on steel
- 500W to 7kW peak power
- Single fixing heatsink mountable
- Ideal for dynamic braking, inrush limit and snubber circuits
- Choice of flying lead, push-on or solder terminations
- Low inductance design
- High isolation, even after failsafe overload fusing
- RoHS compliant, non-flammable construction



 All Pb-free parts comply with EU Directive 2011/65/EU (RoHS2)

## Electrical Data

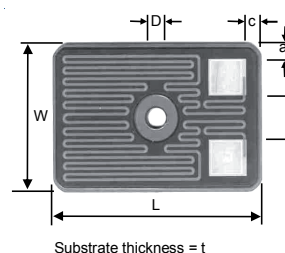
|                                                  |                | WDBR1/2                         | WDBR1                                | WDBR2 | WDBR3 | WDBR5 | WDBR7 |
|--------------------------------------------------|----------------|---------------------------------|--------------------------------------|-------|-------|-------|-------|
| Resistance range                                 | ohms           | 12, 15, 20, 22, 25, 47, 50, 100 | 12, 15, 20, 22, 25, 47, 50, 100, 150 |       |       |       |       |
| Resistance tolerance                             | %              | 10                              |                                      |       |       |       |       |
| Pulse power rating <sup>1</sup>                  | kW             | 0.5                             | 1.5                                  | 2.0   | 3.5   | 5.0   | 7.0   |
| Power rating on heatsink <sup>2</sup>            | W              | 160                             | 180                                  | 200   | 260   | 270   | 280   |
| Power rating on fan-cooled heatsink <sup>3</sup> | W              | 300                             | 700                                  | 780   | 900   | 1000  | 1490  |
| TCR                                              | ppm/°C         | +500 to +600                    |                                      |       |       |       |       |
| Maximum element temperature                      | °C             | 365                             |                                      |       |       |       |       |
| Ambient temperature range (heatsink)             | °C             | -55 to +200                     |                                      |       |       |       |       |
| Dielectric withstand <sup>4</sup>                | V (dc/ac peak) | 2500                            |                                      |       |       |       |       |
| Inductance (typical)                             | μH             | <3                              |                                      |       | <4    | <5    | <6    |

Notes:

1. For details of pulse condition see Fig. 1 in Performance Data.
2. Mounted on a 0.53°C/W heatsink with no forced air cooling, air temperature 25°C.
3. Mounted on a 0.53°C/W heatsink with 5m/s forced air cooling, air temperature 25°C.
4. Based on 100% production test, duration 2s minimum

## Physical Data

| Dimensions in mm, weight without terminations in g |        |        |        |        |       |       |       |         |
|----------------------------------------------------|--------|--------|--------|--------|-------|-------|-------|---------|
|                                                    | L ±0.1 | W ±0.1 | t ±0.1 | ØD nom | a nom | b nom | c nom | Wt. nom |
| WDBR1/2                                            | 31.9   | 28.1   | 0.9    | 2.2    | 7.5   | 3.1   | 4.3   | 6.5     |
| WDBR1                                              | 49.3   | 35.9   |        | 3.2    | 3.2   | 11.2  | 6.2   | 12.6    |
| WDBR2                                              | 61     | 40.6   |        | 5.3    | 4.7   | 13.0  | 5.8   | 17.1    |
| WDBR3                                              | 101.6  | 70     |        |        | 13.5  | 22.0  | 10.2  | 50.8    |
| WDBR5                                              | 122    | 70     |        |        | 14.0  | 23.8  | 7.4   | 60.7    |
| WDBR7                                              | 152.4  | 101.6  | 1.5    | 15.0   | 51.3  | 9.2   | 181.8 |         |



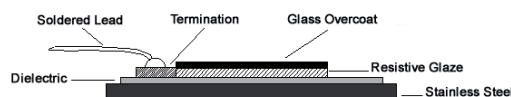
Substrate thickness = t

Fixing hole is located centrally except on WDBR1/2 where the dimension from the edge by the terminations to the mounting hole centre is 16.68mm

## Construction

A high integrity dielectric layer is applied to a machined stainless steel substrate. Thick-film conductor and resistor patterns are printed and fired, then protected with a high temperature overglaze. The termination pads are tinned with solder and optional terminals or leads are soldered on.

### Construction Cross Section



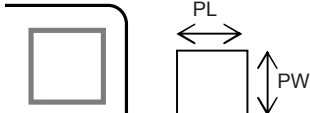
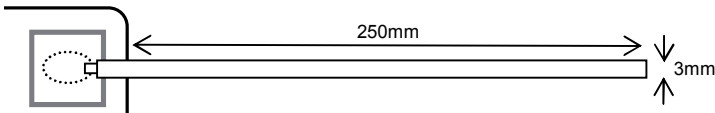
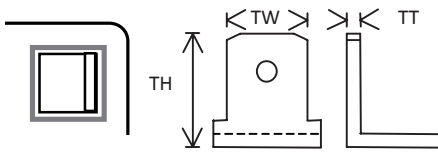
## General Note

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WDBR Series

Terminations

The following termination options are available

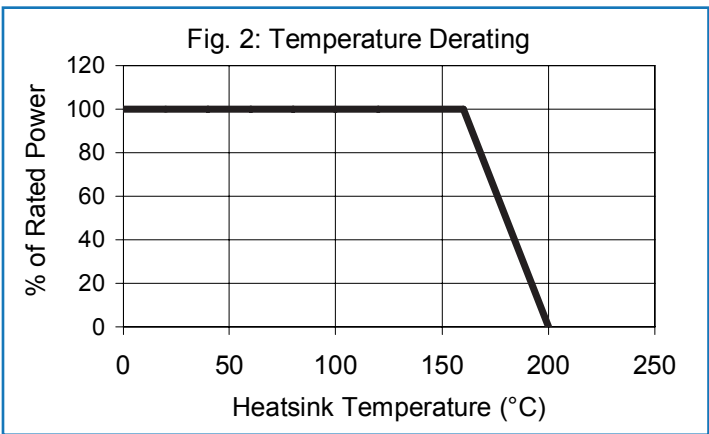
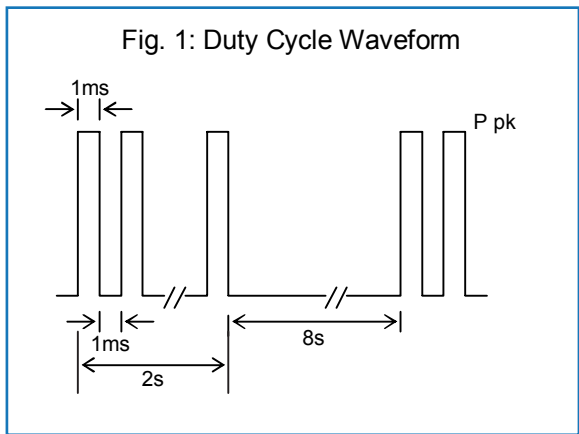
| Option                                | Code | Nominal Dimensions (mm)                                                            |                        |     |
|---------------------------------------|------|------------------------------------------------------------------------------------|------------------------|-----|
| Solder pad only <sup>1</sup>          | I    |   | WDBR Size              | 1/2 |
|                                       |      |                                                                                    | Pad Length, PL         | 7.5 |
|                                       |      |                                                                                    | Pad Width, PW          | 4.5 |
| Flying leads<br>UL3134/5<br>40A, 600V | L    |  | 1, 2, 3, 5 & 7         | 9.0 |
| Push-on connectors                    | T    |   | WDBR Size              | 1/2 |
|                                       |      |                                                                                    | Terminal Height, TH    | 6.8 |
|                                       |      |                                                                                    | Terminal Width, TW     | 2.8 |
|                                       |      |                                                                                    | Terminal Thickness, TT | 0.8 |
|                                       |      |                                                                                    | 1, 2, 3, 5 & 7         | 11  |
|                                       |      |                                                                                    | 6.3                    | 0.8 |

Notes:

1. Two options exist for solder type. The standard is SnAg (96SC) which is Pb-free and the second (HT) is high temperature HMP alloy which is Pb-bearing. Both are RoHS compliant, but the second relies on the RoHS exemption for high temperature solders and is targeted at specialist high temperature applications.

Thermal Performance

|                                                                                                                                                        |              |            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|------------|
| Pulsed load at full pulse power rating 50,000 cycles (see Fig 1)<br>Mounted on a 0.53°C/W heatsink with 5m/s forced air cooling, air temperature 25°C. | $\Delta R\%$ | Maximum    |
|                                                                                                                                                        |              | 5          |
|                                                                                                                                                        |              | See Fig. 2 |



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## WDBR Series

### Application Notes

A heatsink with thermal resistance  $\leq 0.53^{\circ}\text{C/W}$  will enable the component to operate at its continuous power rating. Thermal grease (e.g. Dow Corning DC340) should be used and the heatsink should have a surface finish of  $<6.3\mu\text{m}$  with flatness of  $<0.05\text{mm}$ . The resistor should be mounted using an appropriate bolt as listed in the table below. This should be tightened so as to bring the whole area of the steel substrate into intimate contact with the heatsink. The unmounted part is slightly bowed so that the centre is above the edges. Inadequate tightening will leave the centre out of contact with the heatsink, whilst over tightening can cause the edges to rise. The tightening torque required will depend on the fixings and heatsink used, but typical figures are given for guidance. WDBR resistors will fail safe (open circuit) under overload fault conditions and still maintain a 1kV dielectric withstand.

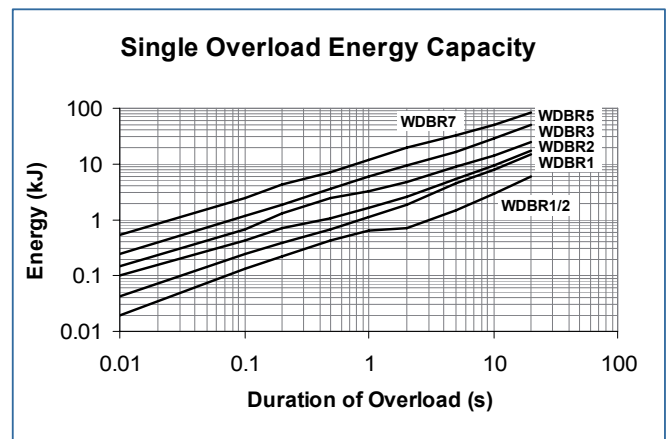
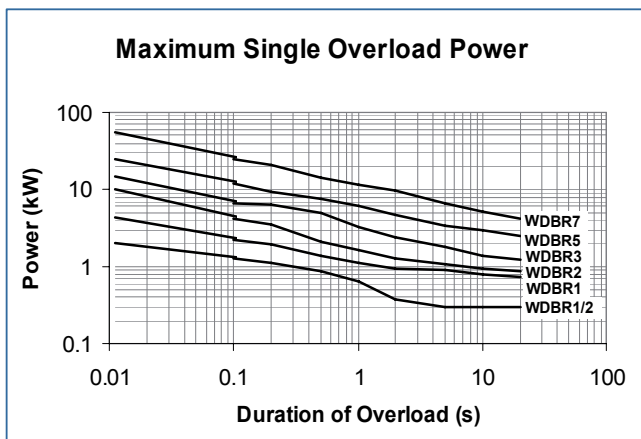
|         | Bolt Size | Typical Tightening Torque (Nm) |
|---------|-----------|--------------------------------|
| WDBR1/2 | M2        | 0.6                            |
| WDBR1   | M3        | 2                              |
| WDBR2   | M5        | 2.5                            |
| WDBR3   | M5        | 2.5                            |
| WDBR5   | M5        | 3.5                            |
| WDBR7   | M5        | 4                              |

WDBR resistors may be customised in various ways including:

- Alternative shapes and dimensions up to 406mm x 406mm
- Integration of temperature measurement elements
- Alternative ohmic values, tolerance & TCR
- Increased dielectric withstand voltage
- Custom braking resistors with UL approval

For a full Applications Note for dynamic braking see [http://www.welwyn-tt.com/pdf/application\\_notes/WDBR.pdf](http://www.welwyn-tt.com/pdf/application_notes/WDBR.pdf)

### Overload Conditions



### Maximum peak current (A)

| Value (ohms) | 12   | 15   | 20   | 22   | 25   | 47   | 50   | 100  | 150  |
|--------------|------|------|------|------|------|------|------|------|------|
| WDBR1/2      | 15.2 | 15.2 | 7.6  | 7.6  | 7.6  | 7.6  | 7.6  | 7.6  |      |
| WDBR1        | 21.6 | 21.6 | 21.6 | 8.3  | 8.3  | 8.3  | 8.3  | 8.3  | 8.3  |
| WDBR2        | 20.3 | 20.3 | 7.6  | 7.6  | 7.6  | 7.6  | 7.6  | 7.6  | 7.6  |
| WDBR3        | 25.4 | 25.4 | 25.4 | 25.4 | 11.4 | 11.4 | 11.4 | 11.4 | 11.4 |
| WDBR5        | 25.4 | 25.4 | 25.4 | 25.4 | 25.4 | 10.2 | 10.2 | 10.2 | 10.2 |
| WDBR7        | 44.5 | 44.5 | 44.5 | 44.5 | 44.5 | 20.3 | 20.3 | 20.3 | 20.3 |

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WDBR Series

Ordering Procedure

Example: WDBR2 at 100 ohms and 10% tolerance with standard solder, flying leads and packed in a box of 40 pieces:

**WDBR2-100RKLW**

Type \_\_\_\_\_

Solder Option - - - - -

|    |      |                  |
|----|------|------------------|
|    | 96SC | Standard         |
| HT | HMP  | High temperature |

Value (use IEC62 code) \_\_\_\_\_

Tolerance (use IEC62 code) \_\_\_\_\_

|   |     |
|---|-----|
| K | 10% |
|---|-----|

Termination \_\_\_\_\_

|   |                    |
|---|--------------------|
| I | Solder pad only    |
| L | Flying leads       |
| T | Push-on connectors |

Packing \_\_\_\_\_

|   |                                                          |      |         |          |
|---|----------------------------------------------------------|------|---------|----------|
| W | WDBR1/2I                                                 | Bulk | 180/box | Standard |
|   | WDBR1/2T                                                 |      | 64/box  |          |
|   | WDBR1/2L, WDBR1L, WDBR2L, WDBR3I, WDBR3T, WDBR5I, WDBR5T |      | 40/box  |          |
|   | WDBR1I, WDBR2I                                           |      | 100/box |          |
|   | WDBR1T, WDBR2T                                           |      | 80/box  |          |
|   | WDBR3L, WDBR5L, WDBR7 all terminations                   |      | 20/box  |          |

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