

## 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 amended by (EU) 2015/863 (RoHS3)

### Electrical Data

		WDBR1/2	WDBR1	WDBR2	WDBR3	WDBR5	WDBR7
Resistance range	ohms	12, 15, 20, 22, 25, 33, 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			< +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:

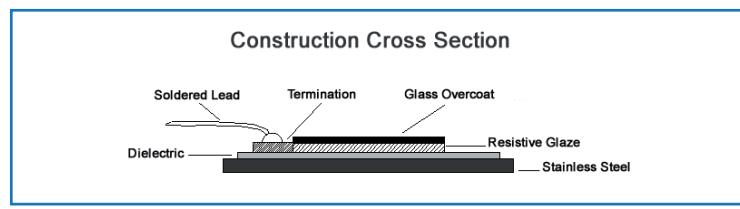
- For details of pulse condition see Fig. 1 in Performance Data.
- Mounted on a 0.53°C/W heatsink with no forced air cooling, air temperature 25°C.
- Mounted on a 0.53°C/W heatsink with 5m/s forced air cooling, air temperature 25°C.
- Based on 100% production test, duration 2s minimum

### Physical Data

Dimensions in mm, weight without terminations in g								Substrate thickness = t	Dimension d = clearance between exposed conductor and exposed steel substrate.
L ±0.1	W ±0.1	t ±0.1	ØD nom	a nom	b nom	c nom	d min		
WDBR1/2	31.9	28.1	2.2	7.5	3.1	4.3	1.4	6.5	
WDBR1	49.3	35.9		3.2	3.2	11.2	6.2	12.6	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.
WDBR2	61	40.6	0.9		4.7	13.0	5.8	3.8	
WDBR3	101.6	70		13.5	22.0	10.2	7.2	50.8	In addition to the central fixing hole, WDBR7 has two corner holes. These are present for manufacturing purposes only and should not be used as fixing holes.
WDBR5	122	70			14.0	23.8	7.4	6.1	60.7
WDBR7	152.4	101.6	1.5		15.0	51.3	9.2	7.9	181.8

#### 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.



#### General Note

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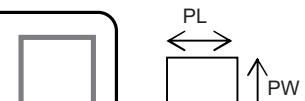
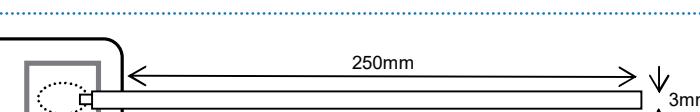
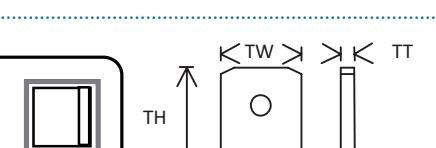
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## WDBR Series

## Terminations

The following termination options are available

Option	Code	Nominal Dimensions (mm)		
Solder pad only <sup>1</sup>	I		WDBR Size	1/2 1, 2, 3, 5 & 7
			Pad Length, PL	7.5 9.0
			Pad Width, PW	4.5 9.0
Flying leads UL3134/5 40A, 600V	L			
Push-on connectors	T		WDBR Size	1/2 1, 2, 3, 5 & 7
			Terminal Height, TH	7.5 12
			Terminal Width, TW	2.8 6.3
			Terminal Thickness, TT	0.8 0.8

## Notes:

- 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) Mounted on a 0.53°C/W heatsink with 5m/s forced air cooling, air temperature 25°C.	ΔR%	Maximum 5
Derating at heatsink temperatures >160°C		See Fig. 2

Fig. 1: Duty Cycle Waveform

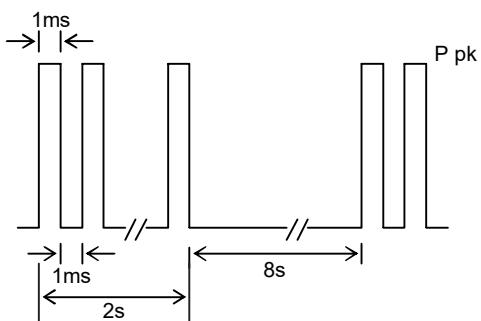
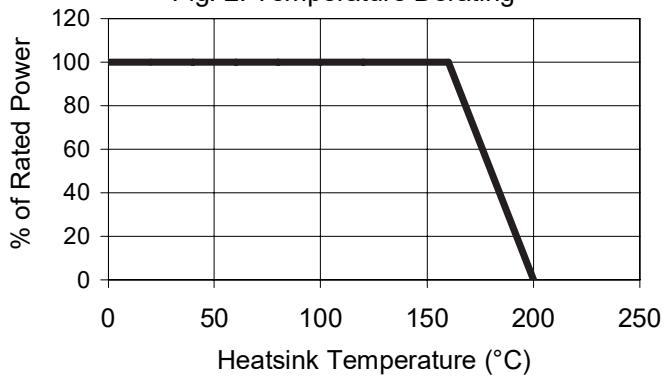


Fig. 2: Temperature Derating



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## WDBR Series

### Application Notes

A heatsink with thermal resistance  $\leq 0.53^\circ\text{C}/\text{W}$  will enable the component to operate at its continuous power rating. Sufficient thermal grease (e.g. Dow Corning DC340) to give void-free coverage, or a 0.5mm thick compliant thermal pad (e.g. T Global TG-X) 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.

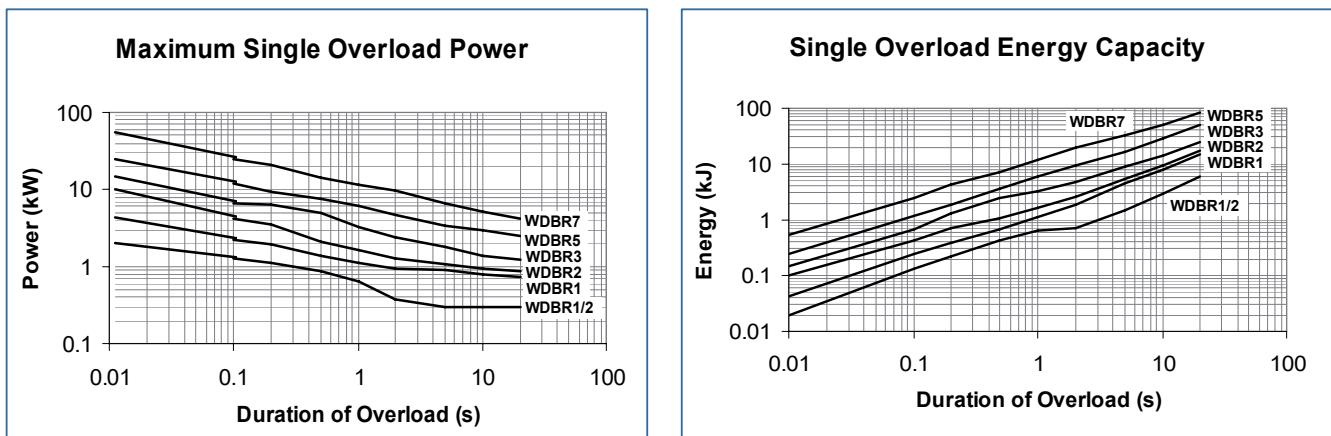
	Bolt Size	Typical Tightening Torque (Nm)
WDBR1/2	M2	0.6
WDBR1	M3	2
WDBR2	M5	2.5
WDBR3	M5	2.5
WDBR5	M5	3.5
WDBR7	M5	4

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 <https://www.ttelectronics.com/TTElectronics/media/ProductFiles/Resistors/ApplicationNotes/WDBR-Series-Resistors.pdf>

### Overload Conditions



Mounted on a  $0.53^\circ\text{C}/\text{W}$  heatsink with 5m/s forced air cooling, air temperature  $25^\circ\text{C}$ .  $\Delta R \leq 5\%$ .

### 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	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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## Ordering Procedure

**Example: WDBR2-100RKLW** (WDBR2 with flying lead terminations, 100 ohms  $\pm 10\%$ , Pb-free)



1 Type	2 Solder Option	3 Value	4 Tolerance	5 Termination	6 Packing				
					Term = I	Term = L	Term = T	Bulk pack	
WDBR1/2	Blank	Standard (96SC)	3/4 characters R = ohms	I	Solder pad only	W	1/2	180/box	
WDBR1				L	Flying leads		1 & 2	100/box	
WDBR2				T	Push-on connectors		1 & 2	80/box	
WDBR3		HT High temperature					1/2	64/box	
WDBR5							3 & 5	40/box	
WDBR7							7	20/box	

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