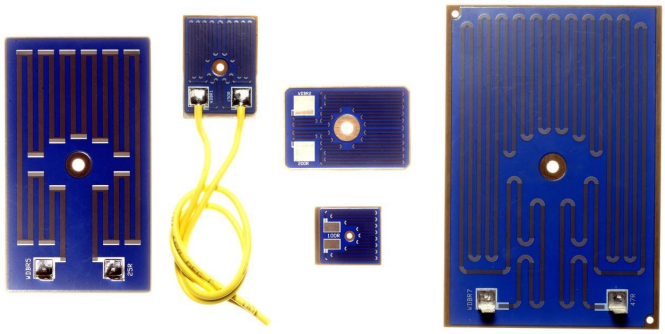
Ultra Low Profile Power Resistors

WDBR Series

Features:

- 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 leads, push-on tags or solder terminations
- Low inductance design
- High isolation, even after failsafe overload fusing
- Non-flammable construction



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

Electrical Data

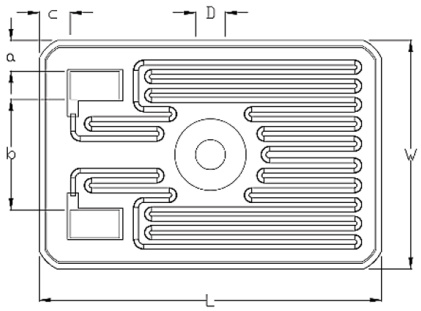
		WDBR1/2	WDBR1	WDBR2	WDBR3	WDBR5	WDBR7
Resistance range	Ω	2R2 – 150R	3R3 – 270R	8R2 – 820R	8R2 – 1K0	10R – 1K5	10R – 1K0
Standard values		E12 preferred. 20R, 25R and 50R are also available.					
Resistance tolerance	%	10					
Pulse peak power rating [1]	kW	0.5	1	2	3	5	7
Power rating on heatsink [2]	W	160	180	200	260	270	280
Power rating on fan cooled heatsink [3]	W	300	700	780	900	1000	1490
TCR	ppm/°C	<+600					
Maximum element temperature	°C	450					
Ambient temperature range (heatsink)	°C	-55 to +200					
Dielectric withstand [4]	V (dc/ac pk)	2500					
Inductance	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 and weight without terminations in g

Type	L ±0.1	W ±0.1	t ±0.1	ØD nom	a nom	b nom	c nom	d min	Wt. nom
WDBR1/2	31.9	28.1	0.9	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	1.9	12.6
WDBR2	61	40.6		5.3	4.7	13	5.8	3.8	17.1
WDBR3	101.6	70			13.5	22	10.2	7.2	50.8
WDBR5	122	70			14	23.8	7.4	6.1	60.7
WDBR7	152.4	101.6	1.5		15	51.3	9.2	7.9	181.8



t = substrate thickness.

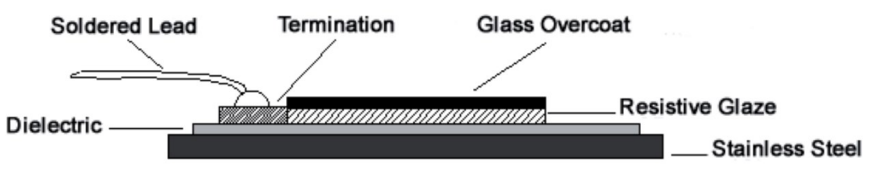
d = clearance between exposed conductor and exposed steel substrate.

Notes:
1. The fixing hole is located centrally except on WDBR1/2 where the dimension from the edge by the terminations to the mounting hole centre is 16.7mm.
2. In addition to the central fixing hole, WDBR7 has two smaller corner holes. These are present for manufacturing purposes only and should not be used as fixing holes.

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



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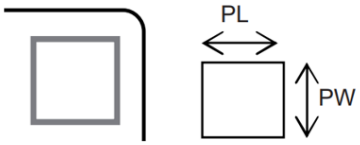
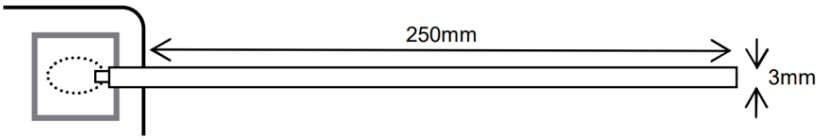
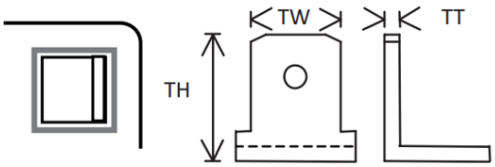
Termination Options

Option	Code	Nominal Dimensions (mm)
Solder pads only	I	
Flying leads UL3134/5 40A, 600V	L	
Push-on tags	T	

WDBR Size	1/2	1, 2, 3, 5 & 7
Pad Length, PL	7.5	9
Pad Width, PW	4.5	

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	

Note:
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.

Performance Data

	±ΔR%
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	5
Derating at heatsink temperatures >160°C	See Fig. 2

Fig. 1 Duty Cycle Waveform

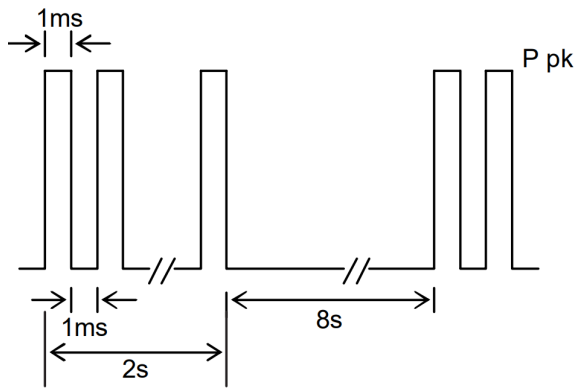
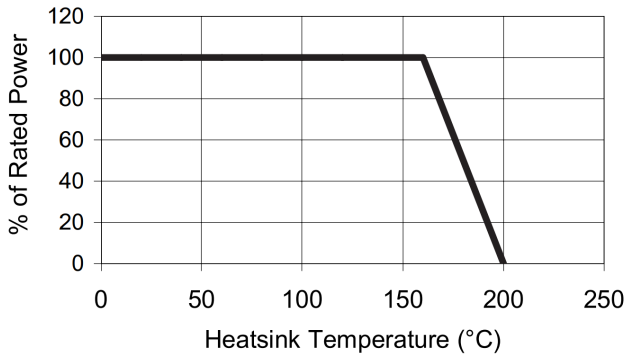
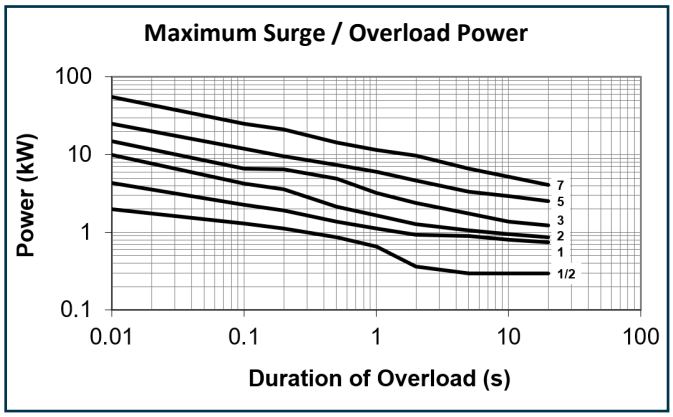
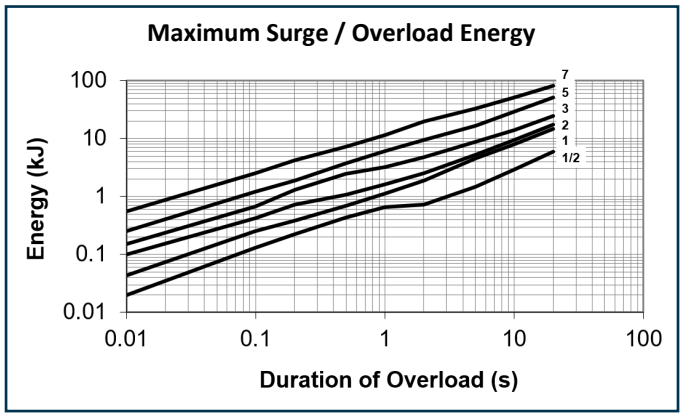


Fig. 2 Temperature De-rating



Pulse and Overload Performance





Note:
Mounted on a 0.53°C/W heatsink with 5m/s forced air cooling, air temperature 25°C. Single pulse or low repetition rate, such that mean power ≤ 10% of rated power. ΔR ≤ 5%

Maximum Peak Current

Type	Maximum Peak Current (A)
WDBR1/2	≤15R: 15.2 >15R: 7.6
WDBR1	≤20R: 21.6 >20R: 8.3
WDBR2	≤15R: 20.3 >15R: 7.6
WDBR3	≤22R: 25.4 >22R: 11.4
WDBR5	≤25R: 25.4 >25R: 10.2
WDBR7	≤25R: 44.5 >25R: 20.3

Application Notes

A heatsink with thermal resistance ≤0.53°C/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 <6.3µm with flatness of <0.05mm. 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.

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

WDBR resistors will fail safe (open circuit) under overload fault conditions and still maintain a 1kV dielectric withstand.

Soldering of solder pad (termination I) variants requires the use of a hot plate. Hand solder process recommendations are available.

WDBR resistors may be customised in various ways including:

- Alternative shapes and dimensions up to 406mm x 406mm
- Integration of temperature measurement elements and thermal cutouts
- Alternative ohmic values and tolerances
- Increased dielectric withstand voltage
- Custom braking resistors
- Integration of multiple power resistors

For a similar product with UL508 recognition see WDBR-UL:
https://www.ttelectronics.com/TTElectronics/media/ProductFiles/Datasheet/WDBR-UL.pdf

Ordering Procedure

Example: WDBR2-100RKLW (WDBR2 with standard solder and flying lead terminations, 100 ohms ±10%, Pb-free)

W	D	B	R	2					-	1	0	0	R	K	L	W
1					2					3				4	5	6

1 Type	2 Solder Option	3 Value	4 Tolerance	5 Termination	6 Packing			
WDBR1/2	Omit for standard (96SC)	E12 3/4 characters R = ohms K = kilohms	K = ±10%	I = Solder pads only	W = Standard bulk pack at quantities below			
WDBR1					Type	Term. I	Term. L	Term. T
WDBR2	HT = High Temperature			L = Flying leads	WDBR1/2	180/box	40/box	64/box
WDBR3					WDBR1	100/box		80/box
WDBR5				T = Push-on tags	WDBR2			
WDBR7					WDBR3	40/box	20/box	40/box
					WDBR5			
					WDBR7			