

## High Power Metal Oxide Leaded Resistors



### FEATURES

- Rugged metal oxide film
- High power dissipation in small size (1 W/0207 size to 4 W/0922 size)
- WK2 is AEC-Q200 qualified
- High temperature coating (up to 200 °C), non-flammable
- Lead (Pb)-free solder contacts
- Pure tin plating provides compatibility with lead (Pb)-free and lead containing soldering processes
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
COMPLIANT

### STANDARD ELECTRICAL SPECIFICATIONS

MODEL	SIZE	RATED DISSIPATION $P_{70}$ W	LIMITING ELEMENT VOLTAGE $U_{max.}$ $V_{\cong}$	TEMPERATURE COEFFICIENT $\pm$ ppm/K	TOLERANCE $\pm$ %	RESISTANCE RANGE $\Omega$	E-SERIES
WK2	0207	1.0	500	50	1	4.7 to 1M	E24, E96
WK2	0207	1.0	500	100	2	4.7 to 1M	E24, E48
WK2	0207	1.0	500	100	5	4.7 to 1M	E24
WK2	0207	1.0	500	200	5	0.22 to 1M	E24
WR4	0414	2.0	500	200	2	1 to 1M	E24, E48
WR4	0414	2.0	500	200	5	0.33 to 1M	E24
WR5	0617	3.0	750	200	2	1 to 100K	E24, E48
WR5	0617	3.0	750	200	5	0.22 to 560K	E24
WK8	0922	4.0	750	200	2	1 to 68K	E24, E48
WK8	0922	4.0	750	200	5	0.22 to 100K	E24

#### Notes

- Coating: Green
- Marking: WK2 and WR4 have color code band marking. TCR band will be given to only WK2, 100 ppm, 5 %. WR5 and WK8 are printed marked.

### TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	WK2	WR4	WR5	WK8
Rated Dissipation, $P_{70}$	W	1.0	2.0	3.0	4.0
Limiting Element Voltage, $U_{max.}$ <sup>(1)</sup>	$V_{\cong}$	500	500	750	750
Insulation Voltage, $U_{ins}$ (1 min)	V	> 500	> 500	> 500	> 500
Thermal Resistance, $R_{th}$	K/W	$\leq$ 140	$\leq$ 100	$\leq$ 70	$\leq$ 60
Insulation Resistance	$\Omega$	> 10 <sup>9</sup>			
Category Temperature Range <sup>(2)</sup>	°C	-55 to +200			
Failure Rate	10 <sup>-9</sup> /h	< 1			
Weight	g	0.2	0.7	1.5	3.5

#### Notes

- (1) Rated voltage  $\sqrt{P \times R}$
- (2) For values < 10R the upper limiting temperature is 155 °C. The power rating is correspondingly lower and can be calculated by  $R_{th}$ .



**PART NUMBER AND PRODUCT DESCRIPTION WK2-SERIES**

**PART NUMBER: WK202070C1001FD500**

W	K	2	0	2	0	7	0	C	1	0	0	1	F	D	5	0	0
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

<b>MODEL/SIZE</b> WK20207	<b>VARIANT</b> 0 = Neutral	<b>TCR</b> C = ± 50 ppm/K B = ± 100 ppm/K A = ± 200 ppm/K	<b>VALUE</b> 3 digit value 1 digit multiplier MULTIPLIER  7 = *10 <sup>-3</sup> 2 = *10 <sup>2</sup> 8 = *10 <sup>-2</sup> 3 = *10 <sup>3</sup> 9 = *10 <sup>-1</sup> 4 = *10 <sup>4</sup> 0 = *10 <sup>0</sup> 5 = *10 <sup>5</sup> 1 = *10 <sup>1</sup> 6 = *10 <sup>6</sup>	<b>TOLERANCE</b> F = ± 1 % G = ± 2 % J = ± 5 %	<b>PACKAGING (1)</b> 22 = A2 25 = A5 D5 = R5	<b>SPECIAL</b> Up to 2 digits 00 = Standard
------------------------------	-------------------------------	--	---	---	---	---

**PRODUCT DESCRIPTION: WK2 50 1K0 1 % R5**

<b>WK2</b>	<b>50</b>	<b>1K0</b>	<b>1 %</b>	<b>R5</b>
<b>MODEL</b>	<b>TCR</b>	<b>RESISTANCE VALUE</b>	<b>TOLERANCE</b>	<b>PACKAGING (1)</b>
WK2	± 50 ppm/K ± 100 ppm/K ± 200 ppm/K	49K9 = 49.9 kΩ 50R1 = 50.1 Ω 1K0 = 1.0 kΩ	± 1 % ± 2 % ± 5 %	A2 A5 R5

**PART NUMBER AND PRODUCT DESCRIPTION WK8-SERIES**

**PART NUMBER: WK80922001000J5C00**

W	K	8	0	9	2	2	0	0	1	0	0	0	J	5	C	0	0
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

<b>MODEL/SIZE</b> WK80922	<b>VARIANT</b> 0 = Neutral	<b>TCR</b> 0 = Standard	<b>VALUE</b> 3 digit value 1 digit multiplier MULTIPLIER  7 = *10 <sup>-3</sup> 2 = *10 <sup>2</sup> 8 = *10 <sup>-2</sup> 3 = *10 <sup>3</sup> 9 = *10 <sup>-1</sup> 4 = *10 <sup>4</sup> 0 = *10 <sup>0</sup> 5 = *10 <sup>5</sup> 1 = *10 <sup>1</sup>	<b>TOLERANCE</b> G = ± 2 % J = ± 5 %	<b>PACKAGING (1)</b> 5C = AC G1 = R1	<b>SPECIAL</b> Up to 2 digits 00 = Standard
------------------------------	-------------------------------	----------------------------	--	--	--	---

**PRODUCT DESCRIPTION: WK8 100R 5 % AC**

<b>WK8</b>	<b>100R</b>	<b>5 %</b>	<b>AC</b>
<b>MODEL</b>	<b>TCR</b>	<b>TOLERANCE</b>	<b>PACKAGING (1)</b>
WK8	100R = 100 Ω 47K = 47 kΩ	± 2 % ± 5 %	AC R1

**PART NUMBER AND PRODUCT DESCRIPTION WR-SERIES**

**PART NUMBER: WR404140A1001GF00**

W	R	4	0	4	1	4	0	A	1	0	0	1	G	F	E	0	0
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

<b>MODEL/SIZE</b> WR40414 WR50617	<b>VARIANT</b> 0 = Neutral	<b>TCR</b> A = ± 200 ppm/K	<b>VALUE</b> 3 digit value 1 digit multiplier MULTIPLIER  7 = *10 <sup>-3</sup> 2 = *10 <sup>2</sup> 8 = *10 <sup>-2</sup> 3 = *10 <sup>3</sup> 9 = *10 <sup>-1</sup> 4 = *10 <sup>4</sup> 0 = *10 <sup>0</sup> 5 = *10 <sup>5</sup> 1 = *10 <sup>1</sup> 6 = *10 <sup>6</sup>	<b>TOLERANCE</b> G = ± 2 % J = ± 5 %	<b>PACKAGING (1)</b> 41 = A1 G73 51 = A1 G77 FE = RE G73 GP = RP	<b>SPECIAL</b> Up to 2 digits 00 = Standard
---	-------------------------------	-------------------------------	---	--	--	---

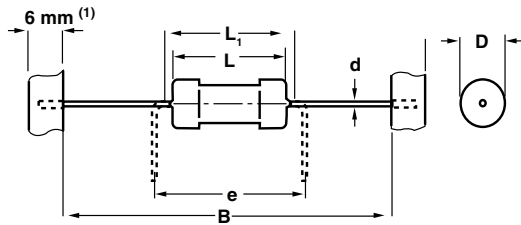
**PRODUCT DESCRIPTION: WR4 1K0 2 % RE**

<b>WR4</b>	<b>1K0</b>	<b>2 %</b>	<b>RE</b>
<b>MODEL</b>	<b>RESISTANCE VALUE</b>	<b>TOLERANCE</b>	<b>PACKAGING (1)</b>
WR4 WR5	1K0 = 1.0 kΩ 51R0 = 51.0 Ω	± 2 % ± 5 %	A1 (G73)    RE (G73) A1 (G77)    RP

**Notes**

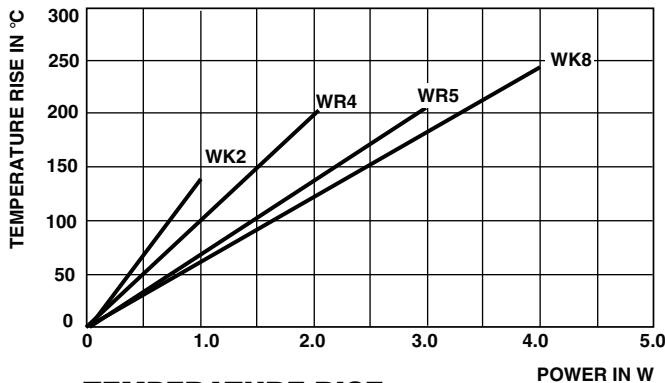
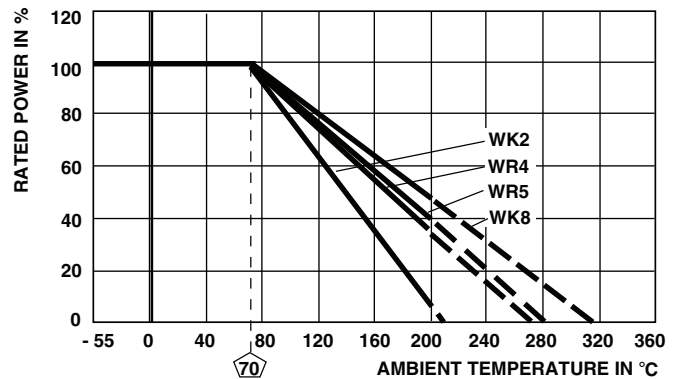
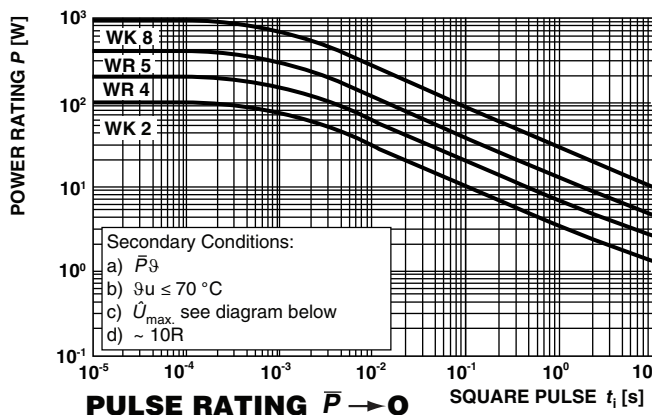
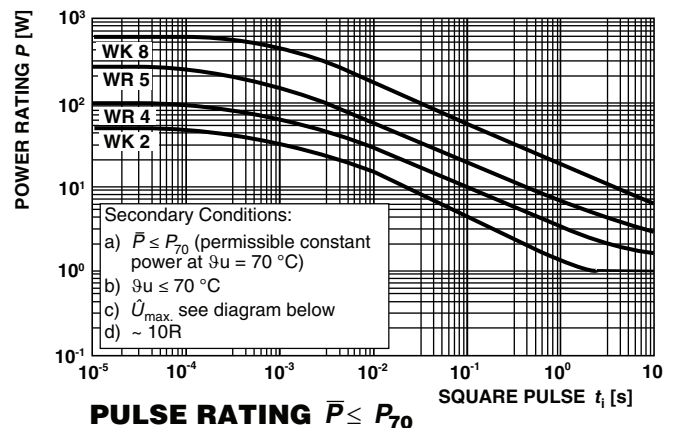
- The PART NUMBER shown above is to facilitate the unified part numbering system for ordering products
- (1) Please refer to table PACKAGING

PACKAGING						
MODEL	REEL			BOX		
	PIECES/REEL	CODE	MIN. ORDER QTY PACKAGING UNITS	PIECES/BOX	CODE	MIN. ORDER QTY PACKAGING UNITS
WK2	5000	R5	1	5000 2000	A5 A2	1 1
WR4	2500	RE	2	1000	A1 (G73)	2
WR5	1500	RP	2	1000	A1 (G77)	2
WK8	1000	R1	2	500	AC	2

**DIMENSIONS**

**Notes**

- Taping in acc. with IEC 60286-1
- D and L measured in acc. with IEC 60294
- d according to IEC 60301
- (1) 9 mm for WR5/WK8

MODEL	DIMENSIONS (in millimeters)					
	D	L	L <sub>1 max.</sub>	B	d	e
WK2	2.5 - 0.5	6.5 - 0.5	8.0	53 ± 1	0.6	7.5
WR4	3.9 - 0.5	10.0 - 1.6	12.0	73 ± 1	0.8	15.0
WR5	6.0 - 0.5	16.5 - 1.5	20.0	77 ± 1	0.8	17.5
WK8	9.0 - 0.5	20.0 - 1.5	24.0	77 ± 1	0.8	22.5

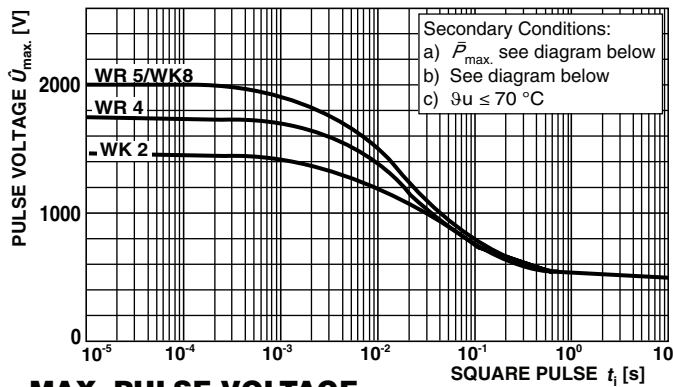
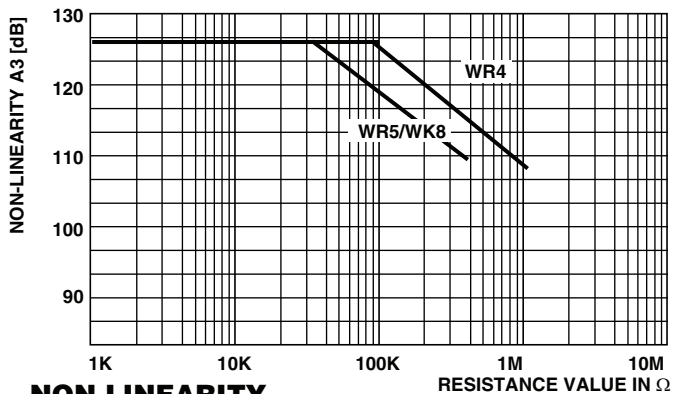
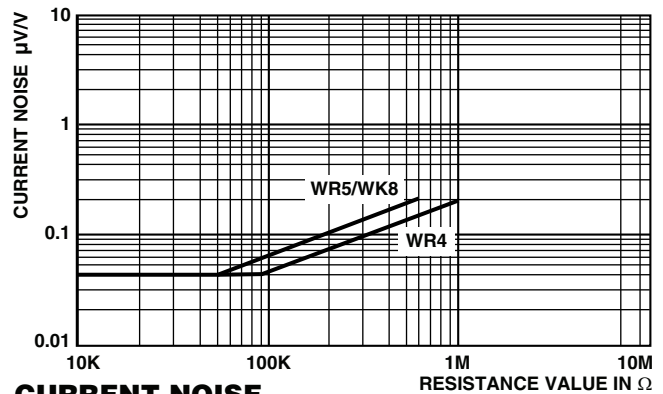

**TEMPERATURE RISE**

**DERATING**

**PULSE RATING  $\bar{P} \rightarrow \infty$** 

**PULSE RATING  $\bar{P} \leq P_{70}$** 

Secondary Conditions:

- $\bar{P} \leq P_{70}$
- $\vartheta u \leq 70^\circ\text{C}$
- $\dot{U}_{max}$ , see diagram below
- $\sim 10R$

Secondary Conditions:

- $\bar{P} \leq P_{70}$  (permissible constant power at  $\vartheta u = 70^\circ\text{C}$ )
- $\vartheta u \leq 70^\circ\text{C}$
- $\dot{U}_{max}$ , see diagram below
- $\sim 10R$


**MAX. PULSE VOLTAGE**

**NON-LINEARITY**

**CURRENT NOISE**

PERFORMANCE		
TEST	CONDITIONS OF TEST	REQUIREMENTS (ΔR MAX.) <sup>(1)</sup>
Rated Dissipation, $P_{70}$ IEC 60115-1, 4.25.1	1000 h at 70 °C 1.5 h ON, 0.5 h OFF	WK2 ≤ ± (5 % R + 0.1 Ω) WK8 ≤ ± (2 % R + 0.1 Ω) WR4, WR5 ≤ ± (5 % R + 0.1 Ω)
Endurance at UCT IEC 60115-1, 4.25.3	1000 h at 200 °C without load	WK2, WR4 ≤ ± (5 % R + 0.1 Ω) WR5, WK8 ≤ ± (1 % R + 0.1 Ω)
Overload Test IEC 60115-1, 4.13	Short time overload 5 s at 2.5 x rated voltage or ≤ ± twice the limiting element voltage	≤ ± (0.25 % R + 0.05 Ω)
Thermal Shock IEC 60115-1, 4.19	Rapid change between upper and lower category temperature	≤ ± (0.25 % R + 0.05 Ω)
Climatic Sequence IEC 60115-1, 4.23	Dry heat, damp heat cycle, cold, low air pressure	≤ ± (0.5 % R + 0.1 Ω)
Damp Heat Steady State IEC 60115-1, 4.24	56 days; 40 °C; 90 % to 95 % RH; loaded with 0.01 $P_{70}$	≤ ± (1.5 % R + 0.1 Ω)
Resistance to Soldering Heat IEC 60115-1, 4.18	10 s at 260 °C solder bath temperature	≤ ± (0.25 % R + 0.05 Ω)
Robustness of Terminations IEC 60115-1, 4.16	Tensile, bending and torsion	≤ ± (0.25 % R + 0.05 Ω)
Vibration IEC 60115-1, 4.22	Frequency 10 Hz to 500 Hz; displacement 1.5 mm or acceleration 10 g; three directions; 6 h	≤ ± (0.25 % R + 0.05 Ω)

**Note**
<sup>(1)</sup> Limits for change of resistance at test

**APPLICABLE SPECIFICATIONS**

- EN140100, EN60115-1, IEC 60115-1



## Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and/or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.

## Material Category Policy

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.**

**Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.**

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.**