Industrial Axial Cemented Leaded Wirewound Resistors

FEATURES

- All welded construction
- Non flammable cement coating
- Ceramic core
- Various kinds of lead forming available
- 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

Pb-free

RoHS COMPLIANT

HALOGEN FREE GREEN (5-2008)

The Z300 series, is the perfect choice for high power, high current applications. This product series is tested to meet challenging operating and ambient conditions. Typical applications include but are not limited to home appliances, lighting ballast, etc.

APPLICATIONS

- Appliances (washing machine, ovens)
- Ballast
- TV
- Power supply

STANDARD ELECTRICAL SPECIFICATIONS

TYPE	POWER RATING P_{40}	RESISTANCE RANGE	TEMPERATURE COEFFICIENT	RESISTANCE TOLERANCE
Z301	1 W	0.30 Ω to 270 Ω	-10 ppm/K to -80 ppm/K	± 10 %, ± 5 %
		0.68 Ω to 2 kΩ	100 ppm/K to 180 ppm/K	
ZDA0411	2 W	0.47 Ω to 560 Ω	-10 ppm/K to -80 ppm/K	± 10 %, ± 5 %
		1.50 Ω to 4.30 kΩ	100 ppm/K to 180 ppm/K	
ZDV0411	2 W	0.47 Ω to 560 Ω	-10 ppm/K to -80 ppm/K	± 10 %, ± 5 %
		1.50 Ω to 4.30 kΩ	100 ppm/K to 180 ppm/K	
Z302	3 W	0.10 Ω to 510 Ω	-10 ppm/K to -80 ppm/K	± 10 %
		1.80 Ω to 3.30 kΩ	100 ppm/K to 180 ppm/K	
		0.10 Ω to 510 Ω	-10 ppm/K to -80 ppm/K	± 5 %
		24 Ω to 3.30 kΩ	100 ppm/K to 180 ppm/K	
		0.22 Ω to 510 Ω	-10 ppm/K to -80 ppm/K	± 2 %
		1 Ω to 510 Ω	-10 ppm/K to -80 ppm/K	± 1 %
Z303	4 W	0.10 Ω to1 kΩ	-10 ppm/K to -80 ppm/K	± 10 %
		1.80 Ω to 3.90 kΩ	100 ppm/K to 180 ppm/K	
		0.10 Ω to 1 kΩ	-10 ppm/K to -80 ppm/K - 10 ppm/K to - 80 ppm/K	± 5 %
		12 Ω to 3.90 kΩ	100 ppm/K to 180 ppm/K	
		0.10 Ω to 1 kΩ	-10 ppm/K to -80 ppm/K	± 2 %
		1 Ω to 1 kΩ	-10 ppm/K to -80 ppm/K	± 1 %
Z307	10 W	0.20 Ω to 8.2 kΩ	-10 ppm/K to -80 ppm/K	± 10 %, ± 5 %
		12 Ω to 30 kΩ	100 ppm/K to 180 ppm/K	
		1.80 Ω to 8.2 kΩ	-10 ppm/K to -80 ppm/K	± 2 %
		3.30 Ω to 8.2 kΩ	-10 ppm/K to -80 ppm/K	± 1 %

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PACKAGING							
TYPE	CODE	DESCRIPTION	QUANTITY	PACKAGING STYLE	WIDTH	PITCH	DIMENSIONS
Z301	21	A1 G53	1000	Taped acc. to IEC 60286-1 fan-folded in a box	53 mm	5 mm	324 mm x 79 mm x 75 mm
	D2	R2 R53	2000	Taped acc. to IEC 60286-1 in a reel	53 mm	5 mm	260 mm x 260 mm x 95 mm
ZDA0411	41	A1 G73	1000	Taped acc. to IEC 60286-1 fan-folded in a box	73 mm	5 mm	324 mm x 101 mm x 64 mm
ZDV0411	40	A2 G73	2000	Taped acc. to IEC 60286-1 fan-folded in a box	-	12.7 mm	334 mm x 157 mm x 53 mm
Z302	2C	AC G53	500	Taped acc. to IEC 60286-1 fan-folded in a box	53 mm	5 mm	324 mm x 82 mm x 49 mm
	24	A4 G53	4000	Taped acc. to IEC 60286-1 fan-folded in a box	53 mm	5 mm	380 mm x 75 mm x 170 mm
	25	A4 G63	4000	Taped acc. to IEC 60286-1 fan-folded in a box	63 mm	5 mm	380 mm x 85 mm x 200 mm
	4C	AC G73	500	Taped acc. to IEC 60286-1 fan-folded in a box	73 mm	5 mm	324 mm x 101 mm x 49 mm
	6C	AC G83	500	Taped acc. to IEC 60286-1 fan-folded in a box	83 mm	10 mm	324 mm x 111 mm x 75 mm
	D2	R2 R53	2000	Taped acc. to IEC 60286-1 in a reel	53 mm	5 mm	260 mm x 260 mm x 95 mm
	H1	R1 R83	1000	Taped acc. to IEC 60286-1 in a reel	83 mm	10 mm	260 mm x 260 mm x 125 mm
	LC	LC	500	Bulk Packing	94 mm (1)	-	225 mm x 140 mm x 140 mm
Z303	2C	AC G53	500	Taped acc. to IEC 60286-1 fan-folded in a box	53 mm	5 mm	324 mm x 79 mm x 75 mm
	6C	AC G83	500	Taped acc. to IEC 60286-1 fan-folded in a box	83 mm	10 mm	324 mm x 111 mm x 90 mm
	LC	LC	500	Bulk Packing	94 mm (1)	-	225 mm x 140 mm x 140 mm
	D1	R1 R53	1000	Taped acc. to IEC 60286-1 in a reel	53 mm	10 mm	260 mm x 260 mm x 125 mm
	H1	R1 R83	1000	Taped acc. to IEC 60286-1 in a reel	83 mm	10 mm	260 mm x 260 mm x 95 mm
Z307	LJ	LJ	200	Bulk Packing	120 mm (1)	-	225 mm x 140 mm x 140 mm

Note

(1) For bulk packing, defined width is end-to-end length and not inner tape width

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PART NUMBER AND PRODUCT DESCRIPTION

Part Number: Z32041411509K2C000

Z	3	2	0	4	1	4	1	1	5	0	9	K	2	C	0	0	0

TYPE	TCR / MATERIAL	VALUE	TOLERANCE CODE	PACKAGING CODE	SPECIAL
Z310309 = Z301 **ZDA0411** = ZDA0411 **ZDV0411** = ZDV0411 **Z320414** = Z302 **Z330617** = Z303 **Z370947** = Z307	**1** = -10 ... -80 ppm/K WM 50 Class 1 **3** = 100 ... 180 ppm/K WM 110 Class 3 **4** = SWI (special winding)	3 digit value 1 digit multiplier MULTIPLIER **7** = $*10^{-3}$ **8** = $*10^{-2}$ **9** = $*10^{-1}$ **0** = $*10^{0}$ **1** = $*10^{1}$ **2** = $*10^{2}$	**F** = ± 1.0 % **G** = ± 2.0 % **J** = ± 5.0 % **K** = ± 10.0 %	(see Packaging table)	The 5 digit BV number will be encoded using a 36 character code. This code contains numbers 0...9 and letters A...Z (36 characters total) and allows to encode at least 46 655 five digit BV numbers. **000** = standard

Product Description: Z302 1 15R 10 % AC G53

Z302	1	15R	10 %	AC G53
TYPE	TCR / MATERIAL	VALUE	TOLERANCE CODE	PACKAGING DESCRIPTION
Z301 ZDA0411 ZDV0411 Z302 Z303 Z307		2K0 4K3	1 % 2 % 5 % 10 %	A1 G53 R2 R53 A1 G73 A2 G73 AC G53 A4 G53 A4 G63 AC G73 LJ AC G83 R1 R83 LC AC G83 R1 R53

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DESCRIPTION

Wirewound resistors are best suited for use in high power, high current applications. The silicon cement lacquer coating enables Z300 to withstand challenging operating and environmental conditions.

The coating is resistant to cleaning solvents specified in IEC 60115-1 [1]. Production is strictly controlled and follows an extensive set of instructions established for reproducibility. The winding is done with a specific material on a specially developed fine ceramic body (Al_2O_3). The ceramic meets the highest requirements against mechanical resistance, thermal shocks, dielectric strength, and insulation resistance at high temperatures. With different diameters and turn spacing's, a large ohmic value range can be covered. The resistors are marked with resistance and tolerance.

Product quality is verified by testing procedures, performed on all individual resistors. Resistance is measured on the lead wires at a distance of 6 mm from the resistor body. If a greater length of lead wire is used in the application, the user may need to consider the additional wire resistance, particularly with low resistance products.

MATERIALS

Vishay acknowledges the following systems for the regulation of hazardous substances:

- IEC 62474, Material Declaration for Products of and for the Electrotechnical Industry, with the list of declarable substances given therein [2]
- The Global Automotive Declarable Substance List (GADSL) [3]
- The REACH regulation (1907/2006/EC) and the related list of substances with very high concern (SVHC) [4] for its supply chain

The products do not contain any of the banned substances as per IEC 62474, GADSL, or the SVHC list, see www.vishay.com/how/leadfree. Hence the products fully comply with the following directives:

- 2000/53/EC End-of-Life Vehicle Directive (ELV) and Annex II (ELV II)
- 2011/65/EU Restriction of the Use of Hazardous Substances Directive (RoHS) with amendment 2015/863/EU
- 2012/19/EU Waste Electrical and Electronic Equipment Directive (WEEE)

Vishay pursues the elimination of conflict minerals from its supply chain, see the Conflict Minerals Policy at www.vishay.com/doc?49037.

ASSEMBLY

The resistors are axial leaded for soldering. The terminals of the resistors are completely lead (Pb)-free, the special tin plating provides compatibility with lead (Pb)-free and lead-containing soldering processes.

Special lead forms may be available on request, please inquire at ww1resistors@vishay.com.

These components are high dissipation power resistors, customers are advised to use a high melting point solder.

APPLICATION INFORMATION

The power dissipation of the resistor generates a temperature rise with respect to the ambient. The permissible dissipation is derated for temperatures above 40 °C, as shown in the derating diagram, in order to avoid overheating of the resistor. The heat dissipated from the resistor may affect adjacent components, hence proper clearance will be required in order to avoid overheating. The resistive wire is hermetically encapsulated.

All materials used are non-flammable and inorganic.

These resistors do not feature a limited lifetime when operated within the permissible limits. However, resistance value drift increasing over operating time may result in exceeding a limit acceptable to the specific application, thereby establishing a functional lifetime.

RELATED PRODUCTS

In similar applications and high dissipation conditions, see the datasheets:

- AC Series - Cemented Wirewound Resistors
  www.vishay.com/doc?28730
- Z300-Cxx - High Surge Axial Cemented Wirewound Resistors
  www.vishay.com/doc?21027

For precision applications, there is the cement coated PAC series, see the datasheet:

- PAC Series - Cemented Wirewound Precision Resistors
  www.vishay.com/doc?28731

Notes

[1] Other cleaning solvents with aggressive chemicals should be evaluated in actual cleaning process for their suitability
[2] The IEC 62474 list of declarable substances is maintained in a dedicated database, which is available at http://std.iec.ch/iec62474
[3] The Global Automotive Declarable Substance List (GADSL) is maintained by the American Chemistry Council and available at www.gadsl.org
[4] The SVHC list is maintained by the European Chemical Agency (ECHA) and available at http://echa.europa.eu/candidate-list-table

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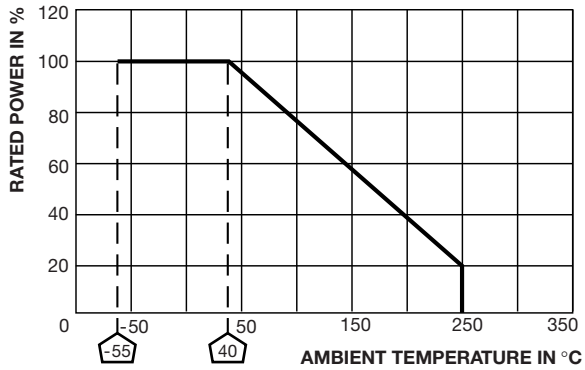
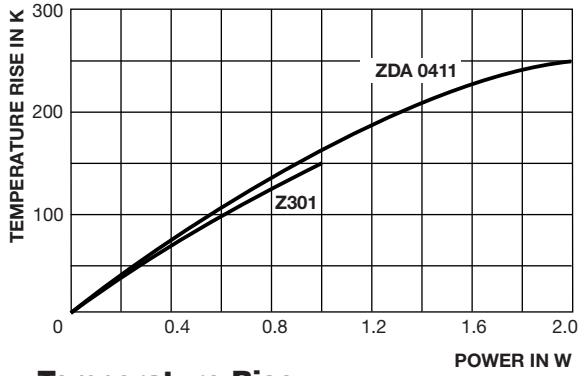
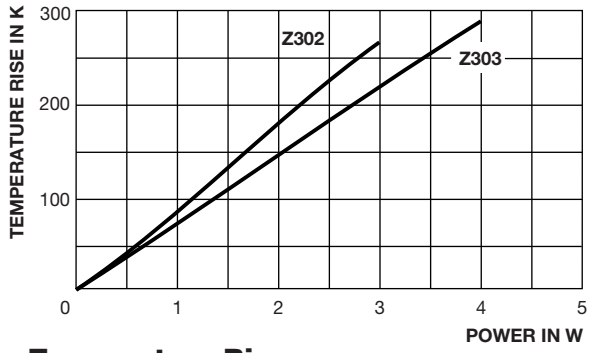
FUNCTIONAL PERFORMANCE



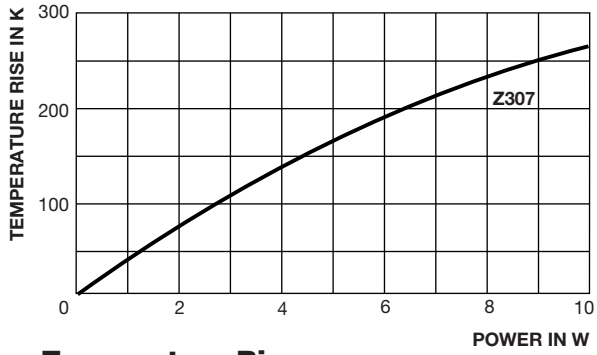
Derating



Temperature Rise



Temperature Rise



Temperature Rise

TEST PROCEDURES AND REQUIREMENTS				
IEC 60115-1 CLAUSE	**IEC 60068-2 TEST METHOD**	**TEST**	**PROCEDURE**	**REQUIREMENTS PERMISSIBLE CHANGE ($\Delta R_{MAX.}$)**
4.13	-	Short time overload	Room temperature; 10 x rated power P_{40}; 5 s	± (1 % R + 0.1 Ω)
4.16	21 (Ua_1) 21 (Ub) 21 (Uc)	Robustness of terminations	Tensile, bending and torsion	No damage ± (0.5 % R + 0.05 Ω)
4.18	20 (Tb)	Resistance to soldering heat	Unmounted components (260 ± 5) °C; (10 ± 1) s	± (0.5 % R + 0.05 Ω)
4.24	78 (Cab)	Damp heat, (steady state)	56 days; (40 ± 2) °C; (93 ± 3) % RH	± (3 % R + 0.1 Ω)
4.25.2	-	Endurance (at room temperature)	1000 h; loaded with 116 % of P_{70}; 1.5 h ON and 0.5 h OFF	± (3 % R + 0.1 Ω)
4.25.3	-	Endurance (at 200 °C)	1000 h; without load	± (3 % R + 0.1 Ω)

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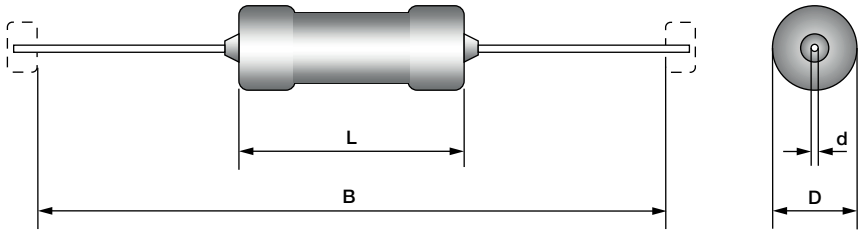
DIMENSIONS

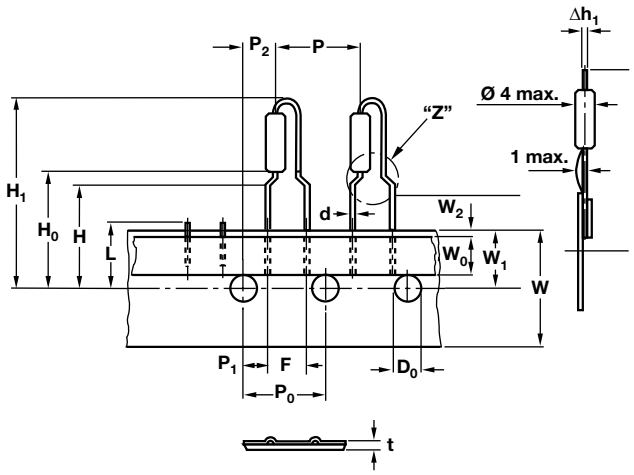


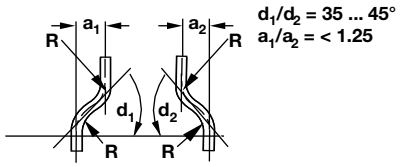
TYPE	DIMENSIONS in millimeters [inches]				
	$L_{MAX.}$	$D_{MAX.}$	d	B	MASS (g)
Z301	8.5 [0.355]	3 [0.118]	0.7 [0.027]	53 ± 1 [2.087 ± 0.039]	0.5
ZDA0411	11 [0.433]	4 [0.157]	0.7 [0.027]	53 ± 1 [2.087 ± 0.039	0.8
Z302	13 [0.512]	4.8 [0.189]	0.8 [0.031]	53 ± 1 [2.087 ± 0.039]	1.1
Z303	15.8 [0.622]	5.5 [0.217]	0.8 [0.031]	53 ± 1 [2.087 ± 0.039]	1.4
Z307	49.8 [1.961	9 [0.354]	0.8 [0.031]	120 (1) ± 2 [4.724 ± 0.079]	7

Note

(1) For Z307, dimension “B” is resistor end-to-end length and not inner tape width

DIMENSIONS ZDV0411





DIMENSIONS in millimeters			TOL.
Lead Ø	d	0.6	-
Pitch of components	P	12.7	± 1.0
Pitch of sprocket holes (1)	P_0	12.7	± 0.3
Distance between hole center and resistor center	P_1	3.85	± 0.7
Distance between hole center and lead center	P_2	6.35	± 0.7
Lead spacing	F	5	+0.6, -0.1
Angle of Insertion	Δh_1	2 max.	-
Width of carrier tape	W	18.0	+1, -0.5
Width of adhesive tape	W_0	12.0	± 0.5
Position of holes	W_1	9	+0.75, -0.5
Position of adhesive tape	W_2	0.5	+0, -0.5
Body to hole center	H	16.0	± 0.5
Lead crimp to hole center (2)	H_0	19.5	± 1.0
Hole Ø	D_0	4.0	± 0.2
Thickness of tape (3)	t	0.9 max.	-
Height of cutting	L	11 max.	-
Height of insertion	H_1	32.3 max.	-

Notes

(1) Test over 10 holes - 9 intervals P0 12 x 9 = 114.3 ± 0.5

(2) Parallelism, < 0.5 mm

(3) Thickness of carrier tape: 0.55 mm ± 0.1

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