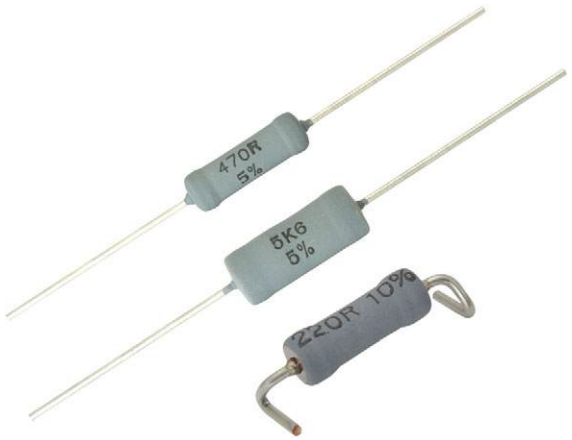
High Surge Axial Cemented Leaded Wirewound Resistors



FEATURES

- Flameproof: non-flammable silicone cement coating conforming to UL 94 V-0
- High impulse voltage withstanding capability up to 12 kV according to IEC 61000-4-5 (1.2 / 50 µs pulse shape)
- High grade ceramic core
- WSZ-form lead bending available for SMD mounting
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free
RoHS COMPLIANT
HALOGEN FREE
GREEN (5-2008)

APPLICATIONS

- Energy meter
- Appliances
- Ballast
- Power supplies

LINKS TO ADDITIONAL RESOURCES

3D Models

The Z300-Cxx series, is the perfect choice for high voltage impulse applications. This product series is tested and proven to meet the 1.2 / 50 µs pulse up to 12 kV defined in IEC 61000-4-5. Typical applications include but are not limited to energy meters, power supplies, etc.

STANDARD ELECTRICAL SPECIFICATIONS

TYPE	POWER RATING P_{40}	POWER RATING P_{70}	RESISTANCE RANGE	RESISTANCE TOLERANCE (1)	IMPULSE HANDLING CAPACITY ACCORDING TO IEC 61000-4-5 (1.2 / 50 µs PULSE SHAPE) (2)	TEMPERATURE COEFFICIENT (3)
Z301-Cxx	1 W	0.9 W	430 Ω to 2 kΩ	± 5 %, ± 10 %	4 kV to 6 kV	± 100 ppm/K, ± 200 ppm/K
ZDA0411-Cxx	2 W	1.8 W	180 Ω to 4.3 kΩ		4 kV to 12 kV	
Z302-Cxx	3 W	2.7 W	62 Ω to 3.3 kΩ		4 kV to 12 kV	
Z303-Cxx	4 W	3.5 W	27 Ω to 3.9 kΩ		4 kV to 12 kV	
Z304-Cxx	5 W	4.4 W	15 Ω to 5.6 kΩ		4 kV to 12 kV	
Z305-Cxx	6 W	5.3 W	4.7 Ω to 10 kΩ		4 kV to 12 kV	
Z306M-Cxx	7 W	6.3 W	10 Ω to 3.9 kΩ		4 kV to 12 kV	

Notes

(1) Resistance value to be selected for ± 10 % tolerance from E12 and for ± 5 % from E24, 1 % tolerance available on request

(2) As impulse handling capacity depends upon resistor type and ohmic value, please check feasibility of resistor type based on ohmic value and desired impulse handling voltage with factory (ww1resistors@vishay.com)

(3) Temperature coefficient of resistive wire

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PART NUMBER AND PRODUCT DESCRIPTION

Part Number: **Z34081832700J6EC10**
Z36082638209J6BC08

Z	3	4	0	8	1	8	3	2	7	0	0	J	6	E	C	1	0
Z	3	6	0	8	2	6	3	8	2	0	9	J	6	B	C	0	8

TYPE	TCR / MATERIAL / VARIANT	RESISTANCE	TOLERANCE CODE	PACKAGING CODE	SPECIAL [1]
Z310309 = Z301-C **ZDA0411** = ZDA0411-C **Z320414** = Z302-C **Z330617** = Z303-C **Z340818** = Z304-C **Z350922** = Z305-C **Z360826** = Z306M-C	**1** = ± 100 ppm/K **3** = ± 200 ppm/K **4** = SWI (special winding) **K** = Z302-Cxx WSZ or Z304-Cxx WSZ	**3 digit value** **1 digit multiplier** MULTIPLIER **7** = $*10^{-3}$ **8** = $*10^{-2}$ **9** = $*10^{-1}$ **0** = $*10^{0}$ **1** = $*10^{1}$ **2** = $*10^{2}$	**J** = ± 5.0 % **K** = ± 10.0 %	(see Packaging table)	**C04** = 4 kV impulse **C06** = 6 kV impulse **C08** = 8 kV impulse **C10** = 10 kV impulse **C12** = 12 kV impulse

Product Description: **Z304-C 3 270R 5 % AB G83 CD1317**
Z306M-C 3 82R 5 % AB G83 CD1401

Z304-C	3	270R	5 %	AB G83	CD1317
Z306M-C	**3**	**82R**	**5 %**	**AB G83**	**CD1401**

TYPE	TCR / MATERIAL / VARIANT	RESISTANCE	TOLERANCE CODE	PACKAGING DESCRIPTION	**CDxxxx** = specialty
Z301-C ZDA0411-C Z302-C Z303-C Z304-C Z305-C Z306M-C		82R 270R	5 % 10 %	A1 G53 AC G53 AC G73 AC G83 AB G63 AB G83 BW BM S1 AC RT	

Note

[1] As impulse handling capacity depends upon resistor type and ohmic value, please check feasibility of resistor type based on ohmic value and desired impulse handling voltage with factory (ww1resistors@vishay.com)

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PACKAGING							
TYPE	**CODE**	**DESCRIPTION**	**QUANTITY**	**PACKAGING STYLE**	**WIDTH**	**PITCH**	**DIMENSIONS**
Z301-Cxx	21	A1 G53	1000	Taped acc. to IEC 60286-1 fan-folded in a box	53 mm	5 mm	84 mm x 73 mm x 326 mm
ZDA0411-Cxx	21	A1 G53	1000				84 mm x 83 mm x 326 mm
Z302-Cxx	2C	AC G53	500		53 mm	5 mm	82 mm x 50 mm x 326 mm
	4C	AC G73	500		73 mm		100 mm x 43 mm x 325 mm
	6C	AC G83	500		83 mm	10 mm	110 mm x 87 mm x 324 mm
	S1	S1	1000	Taped acc. to IEC 60286-2 on reel	-	5 mm	60 mm x 365 mm x 370 mm
Z302-Cxx WSZ	BM	BM	1250	Blister taped acc. to IEC 60286-3 on reel	-	8 mm	350 mm x 335 mm x 35 mm
Z303-Cxx	2C	AC G53	500	Taped acc. to IEC 60286-1 fan-folded in a box	53 mm	5 mm	82 mm x 49 mm x 324 mm
	6C	AC G83	500		83 mm	10 mm	110 mm x 103 mm x 324 mm
Z304-Cxx	6D	AB G63	250		63 mm	10 mm	84 mm x 80 mm x 326 mm
	6E	AB G83	250		83 mm		110 mm x 87 mm x 326 mm
Z304-Cxx	GC	AC RT	500	Taped acc. to IEC 60286-2 on reel	-	7.5 mm	67 mm x 365 mm x 370 mm
Z304-Cxx WSZ	BW	BW	350	Blister taped acc. to IEC 60286-3 on reel	-	16 mm	350 mm x 335 mm x 60 mm
Z305-Cxx	6B	AB G83	250	Taped acc. to IEC 60286-1 fan-folded in a box	83 mm	10 mm	110 mm x 87 mm x 326 mm
Z306M-Cxx							

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DESCRIPTION

Wirewound resistors are best suited for use in high power, high current applications. The silicone cement lacquer coating enables Z300-Cxx to withstand challenging high voltage impulse 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 value, tolerance and impulse rating.

The result of the determined production is verified by an extensive testing procedure performed on 100 % of the individual resistors. Only accepted products are stuck directly on the adhesive tapes in accordance with IEC 60286-1 (for axial leaded) or for the radial versions in accordance with IEC 60286-2 or blister taped for the WSZ version in accordance with IEC 60286-3.

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 or bend leads for soldering. Z bend leads offer SMD mounting compatibility. The terminals of the resistors are completely lead (Pb)-free, the special matte 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 continuous power applications and challenging environmental conditions, see the datasheets:

- AC Series - Cemented Wirewound Resistors
  www.vishay.com/doc?28730
- Z300-C00 - Commercial Axial Cemented Wirewound Resistors
  www.vishay.com/doc?21047

For precision applications, there is the cemented leaded wirewound PAC series, see the datasheet:

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

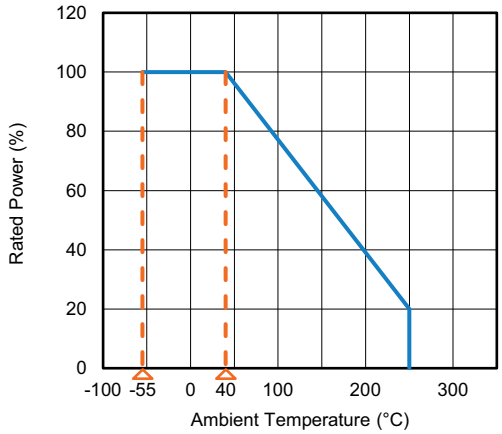
Notes

[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

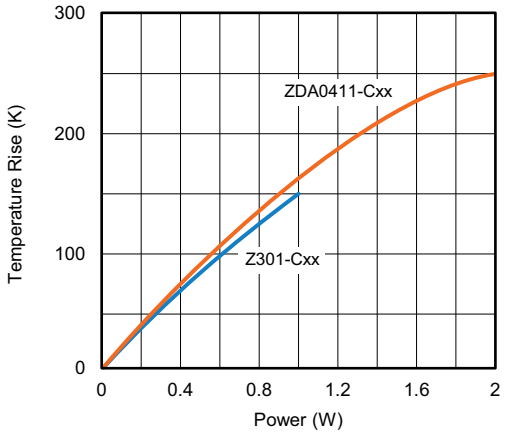
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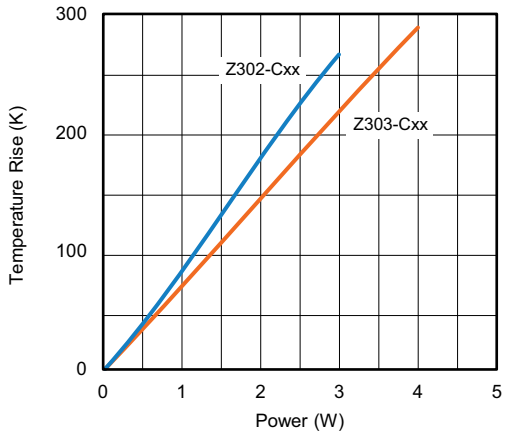
FUNCTIONAL PERFORMANCE



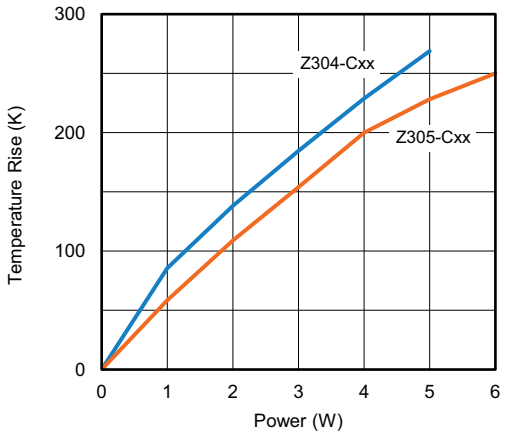
Derating



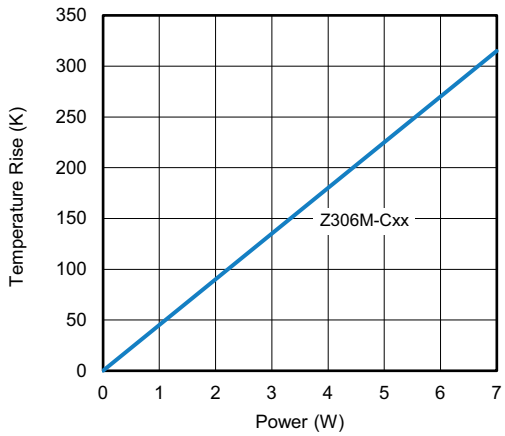
Temperature Rise



Temperature Rise



Temperature Rise

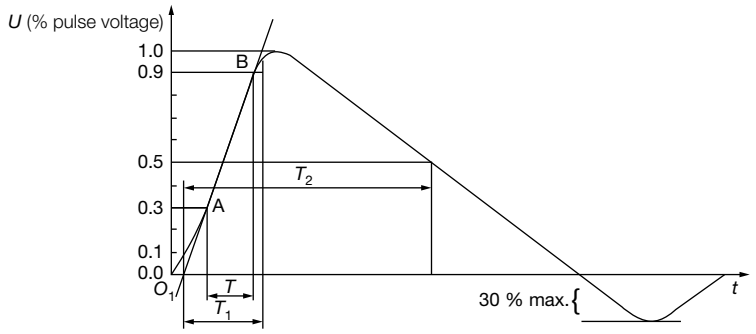


Temperature Rise

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HIGH VOLTAGE IMPULSE

The specially designed Z300-Cxx high surge wirewound resistors are tested for impulse handling capability by applying impulse voltage as per the 1.2 / 50 µs exponential open circuit voltage waveform according to IEC 61000-4-5 standard as shown below:



Front time: $T_1 = 1.67 \times T = 1.2\ \mu s \pm 30\ \%$
Time to half-value: $T_2 = 50\ \mu s \pm 20\ \%$

Waveform of open-circuit voltage (1.2 / 50 µs) at the output of pulse generator

TESTS PROCEDURES AND REQUIREMENTS

All tests are carried out in accordance with the following specifications:

- IEC 60115-1, generic specification (includes tests)

The test and requirements table contains only the most important tests. For the full test schedule refer to the documents listed above.

The tests are carried out with reference to IEC 60115-1, in accordance with IEC 60068-2-xx test method and under standard atmospheric conditions in accordance with IEC 60068-1, 4.3.

A climatic category 40 / 200 / 56 is applied, defined by the lower category temperature (LCT = -40 °C), the upper category temperature (UCT = 200 °C), and the duration of exposure in the damp heat, steady state test (56 days).

Unless otherwise specified the following values apply:

- Temperature: 15 °C to 35 °C
- Relative humidity: 45 % to 75 %
- Air pressure: 86 kPa to 106 kPa (860 mbar to 1060 mbar).

For performing some of the tests, the components are mounted on a test board in accordance with IEC 60115-1, 5.5.

In test procedures and requirements table, only the tests and requirements are listed with reference to the relevant clauses of IEC 60115-1 and IEC 60068-2-xx test methods. A short description of the test procedure is also given.

TEST PROCEDURES AND REQUIREMENTS

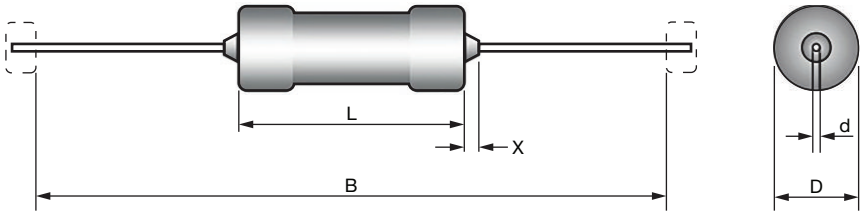
IEC 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE ($\Delta R_{MAX.}$)
8.1	-	Short-term overload	Room temperature; 10x rated power P_{40}; 5 s	± (2 % R + 0.05 Ω)
9.5	21 (Ua_1) 21 (Ub) 21 (Uc)	Robustness of terminations	Tensile, bending and torsion	No damage ± (0.5 % R + 0.05 Ω)
11.2	20 (Tb)	Resistance to soldering heat	Unmounted components (260 ± 5) °C; (10 ± 1) s	± (1 % R + 0.05 Ω)
10.3		Climatic sequence:		± (3 % R + 0.1 Ω)
10.3.4.2	2 (Bb)	dry heat	16 h; 200 C	
10.3.4.3	30 (Db)	Damp heat (accelerated) 1st cycle	24 h; 55 °C; 90 % to 100 % RH	
10.3.4.4	1 (Ab)	Cold	2 h; -55 °C	
10.3.4.5	13 (M)	Low air pressure	2 h; 8.5 kPa; 15 °C to 35 °C	
10.3.4.6	30 (Db)	Damp heat remaining cyclic	5 days; 55 °C; 95 % to 100 % RH; 5 cycles	

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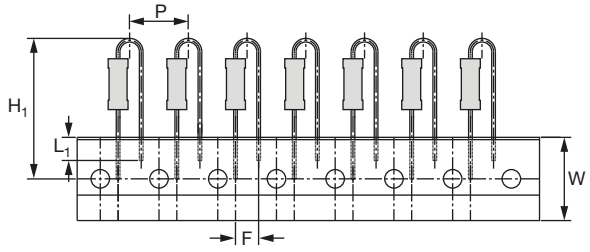
TEST PROCEDURES AND REQUIREMENTS				
IEC 60115-1 CLAUSE	**IEC 60068-2 TEST METHOD**	**TEST**	**PROCEDURE**	**REQUIREMENTS PERMISSIBLE CHANGE ($\Delta R_{MAX.}$)**
10.4	78 (Cab)	Damp heat, (steady state)	56 days; (40 ± 2) °C; (93 ± 5) % RH	± (3 % R + 0.1 Ω)
7.2	-	Endurance (at room temperature)	1000 h; loaded with 116 % of P_{70}; 1.5 h ON and 0.5 h OFF	± (3 % R + 0.1 Ω)
7.3	-	Endurance (at 200 °C)	1000 h; loaded with 30 % of P_{70}; 1.5 h ON and 0.5 h OFF	± (3 % R + 0.1 Ω)
-	-	Impulse test as per IEC 61000-4-5	1.2 / 50 µs impulse test (impedance of impulse tester is 2 Ω); 10 pulses at 30 s interval	± (5 % R + 0.1 Ω)

DIMENSIONS



TYPE	DIMENSIONS in millimeters (inches)					MASS (g)
	$L_{MAX.}$	$D_{MAX.}$	$d_{MAX.}$	B	$X_{MAX.}$	
Z301-Cxx	8.5 (0.355)	3 (0.118)	0.7 (0.027)	53 ± 1 (2.087 ± 0.039)	2 (0.079)	0.5
ZDA0411-Cxx	11 (0.433)	4 (0.157)	0.7 (0.027)	53 ± 1 (2.087 ± 0.039)	2 (0.079)	0.8
Z302-Cxx	13 (0.512)	4.8 (0.189)	0.8 (0.031)	53 ± 1 (2.087 ± 0.039) 73 ± 1 (2.87 ± 0.039) 83 ± 1 (3.268 ± 0.039)	2 (0.079)	0.6 0.7 0.8
Z303-Cxx	15.8 (0.622)	5.5 (0.217)	0.8 (0.031)	63 ± 1 (2.48 ± 0.039) 83 ± 1 (3.268 ± 0.039)	2 (0.079)	1.0 1.1
Z304-Cxx	18 (0.709)	7.5 (0.295)	0.8 (0.031)	63 ± 1 (2.48 ± 0.039) 83 ± 1 (3.268 ± 0.039)	2 (0.079)	1.8 2.0
Z305-Cxx	22.3 (0.878)	8.7 (0.343)	0.8 (0.031)	83 ± 1 (3.268 ± 0.039)	2 (0.079)	3.8
Z306M-Cxx	26 (1.023)	7.5 (0.295)			3 (0.118)	2.9

ZDA0411-C RADIAL

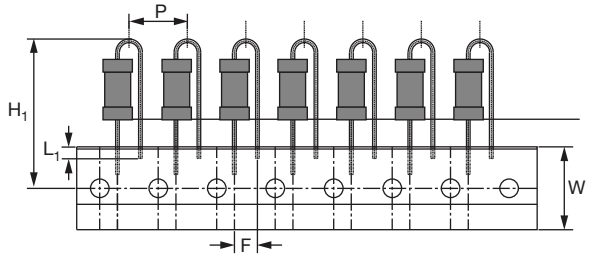


DIMENSIONS in millimeters		
Pitch of components	P	12.7 ± 1.0
Lead to lead distance	F	4.8 + 0.7 / - 0
Tape width	W	18 ± 0.5
Component height	H_1	30.0 ± 3
Min. lead wire (tape portion) shortest lead	L_1	4.3

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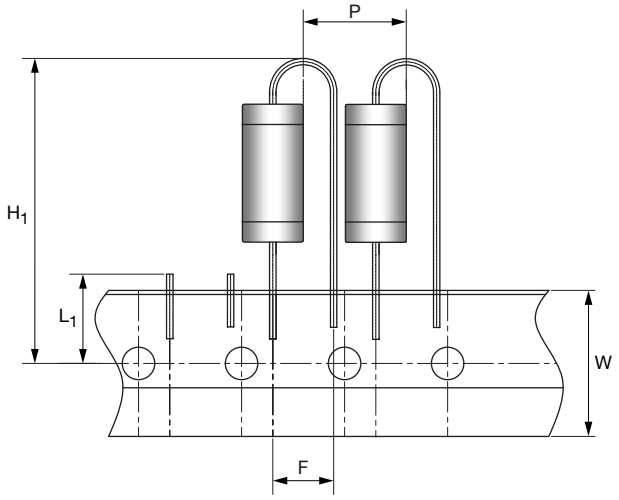
Z302-C RADIAL



DIMENSIONS in millimeters		
Pitch of components	P	12.7 ± 1.0
Lead to lead distance	F	5.00 ± 0.5
Tape width	W	18 ± 0.5
Maximum component height	H_1	34
Min. lead wire (tape portion) shortest lead	L_1	2.5

Z304-C RADIAL

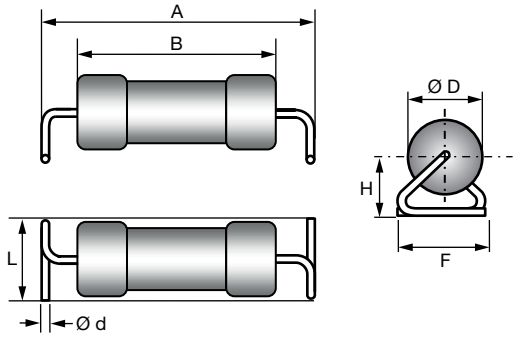
LEAD BENDING STYLE = RT (Radial Taped)



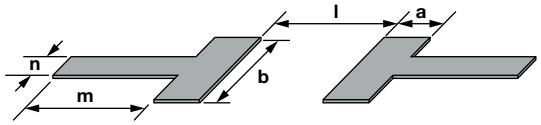
DIMENSIONS in millimeters		
Pitch of components	P	12.7 ± 1.0
Lead spacing	F	7.50 ± 0.5
Width of carrier tape	W	18.0 ± 0.5
Height for cutting (max.)	L_1	11
Height for insertion (max.)	H_1	37

Z-FORM LEADS FOR SMD MOUNTING in millimeters

LEAD BENDING STYLE = WSZ (Z-form)



Recommended solder pad dimensions



TYPE WSZ	Ø d	Ø $D_{max.}$	A	B	F	H	L	a	b	l	m	n
Z302-Cxx WSZ	0.8 ± 0.03	4.8	17 ± 0.3	11 - 12	4.8 ± 0.3	3.6 ± 0.2	5.0 ± 0.5	4	8	12.2	25	2
Z304-Cxx WSZ	0.8 ± 0.03	7.5	23.5 ± 0.5	18 max.	7.7 ± 0.5	5.73 ± 0.5	7.9 ± 0.7	4	10	18.7	25	2

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