Features

Standard Varistor Types:

- Formerly a KEMET/VARICON product
- Operating voltage range V_{rms} 60 V to 680 V
- Operating voltage range V_{dc} 85 V to 900 V
- 5 model sizes: 23, 25, 32, 40 and 60 mm
- Broad range of current and energy handling capabilities

Full Custom Parameter Designed Varistors:

- Formerly a KEMET/VARICON product
- Indefinite number of sizes both square and rectangular shapes, the maximum being 60 x 60 mm for customized products
- Broad range of current and energy handling capabilities

BOURNS®

ZOV Series Square Shaped High Energy Varistors

General Information

The ZOV series is a series of high energy varistors. There are two groups of varistors. The first group consists of standard sized surge shaped varistors while the second group consists of full custom parameter designed varistors. With the second ZOV series group, the customer is offered the opportunity to design their own optimum varistor to suit their specific application, within the dimensions that are possible. Parameters free to be chosen are: non-standard DC/AC operating voltage, leakage current, clamping voltage, maximum surge current, energy absorption level, maximum dissipation power as well as shape, the dimensions being the function of required electrical parameters and vice-versa.

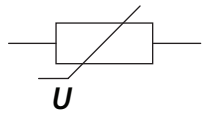
Both of these groups are offered in two versions: epoxy coated with rigid terminals and metallized varistor blocks. The first are designed to provide secondary surge protection in an outdoor and service entrance environment (distribution panels) and also in industrial applications for motor controls and power supplies in oil-drilling, mining and transportation fields. The second are intended for applications with special contact or installation requirements. The electrode finish of devices is solderable and can also be used with pressure contacts for stacking applications.

Agency Recognition

Standard	UL 1449 4th edition
File Number	E313168**

**Not all rated voltages and sizes are UL recognized. Check the file for details.

Varistor Symbol



Absolute Maximum Ratings

Parameter	Standard Types		Custom Designed Types	
	Value	Units	Value	Units
Continuous:				
Steady State Applied Voltage				
DC Voltage Range (V_{dc})	85 to 900	V	85 to 900	V
AC Voltage Range (V_{rms})	60 to 680	V	60 to 680	V
Transient:				
Peak Single Pulse Surge Current, 8/20 μs Waveform (I_{max})	18000 to 80000	A	> 5500	A/cm^2
Single Pulse Surge Energy, 10/1000 μs Waveform (W_{max})	90 to 4140	J	> 400	J/cm^3
Operating Ambient Temperature	-40 to +85	°C	-40 to +85	°C
Storage Temperature Range	-40 to +125	°C	-40 to +125	°C
Threshold Voltage Temperature Coefficient	< +0.05	%/°C	< +0.05	%/°C
Insulation Resistance[1]	> 1	GΩ	> 1	GΩ
Isolation Voltage Capability[1]	> 2.5	kV	> 2.5	kV
Response Time	< 25	ns	< 25	ns
Climatic Category[1]	40 / 85 / 56		40 / 85 / 56	

Note 1: Epoxy coated components

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WARNING
Cancer and Reproductive Harm
www.P65Warnings.ca.gov

* RoHS Directive 2015/863, Mar 31, 2015 and Annex.

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Device Ratings

Standard High Energy Varistor Types

Model	V_{rms}	V_{dc}	V_n @ 1 mA	V_c @ I_c	I_c	W_{max} 10/1000 μs	P max.	I_{max} 8/20 μs	C Typ. @ 1 kHz
	V	V	V	V	A	J	W	A	pF
ZOV 60 K 23	60	85	100	165	100	90	1.0	18000	3850
ZOV 60 K 25	60	85	100	165	150	125	1.0	20000	4850
ZOV 60 K 32	60	85	100	165	200	250	1.2	30000	9700
ZOV 60 K 40	60	85	100	165	300	300	1.4	45000	12000
ZOV 75 K 23	75	100	120	200	100	100	1.0	18000	3500
ZOV 75 K 25	75	100	120	200	150	145	1.0	20000	4500
ZOV 75 K 32	75	100	120	200	200	280	1.2	30000	9800
ZOV 75 K 40	75	100	120	200	300	340	1.4	45000	11000
ZOV 95 K 23	95	125	150	250	100	135	1.0	18000	2950
ZOV 95 K 25	95	125	150	250	150	190	1.0	20000	3680
ZOV 95 K 32	95	125	150	250	200	380	1.2	30000	7470
ZOV 95 K 40	95	125	150	250	300	450	1.4	45000	9200
ZOV 130 K 23	130	170	205	340	100	180	1.0	18000	2310
ZOV 130 K 25	130	170	205	340	150	250	1.0	20000	2900
ZOV 130 K 32	130	170	205	340	200	500	1.2	30000	5780
ZOV 130 K 40	130	170	205	340	300	600	1.4	45000	7200
ZOV 130 K 60	130	170	205	340	500	960	1.6	80000	11520
ZOV 150 K 23	150	200	240	395	100	215	1.0	18000	1990
ZOV 150 K 25	150	200	240	395	150	300	1.0	20000	2480
ZOV 150 K 32	150	200	240	395	200	600	1.2	30000	4960
ZOV 150 K 40	150	200	240	395	300	720	1.4	45000	6100
ZOV 150 K 60	150	200	240	395	500	1150	1.6	80000	9760
ZOV 230 K 23	230	300	360	595	100	320	1.0	18000	1320
ZOV 230 K 25	230	300	360	595	150	450	1.0	20000	1650
ZOV 230 K 32	230	300	360	595	200	900	1.2	30000	3300
ZOV 230 K 40	230	300	360	595	300	1080	1.4	45000	4060
ZOV 230 K 60	230	300	360	595	500	1730	1.6	80000	6490
ZOV 250 K 23	250	320	390	650	100	350	1.0	18000	1220
ZOV 250 K 25	250	320	390	650	150	490	1.0	20000	1530
ZOV 250 K 32	250	320	390	650	200	970	1.2	30000	3050
ZOV 250 K 40	250	320	390	650	300	1160	1.4	45000	3760
ZOV 250 K 60	250	320	390	650	500	1860	1.6	80000	6050
ZOV 275 K 23	275	350	430	710	100	380	1.0	18000	1100
ZOV 275 K 25	275	350	430	710	150	530	1.0	20000	1380
ZOV 275 K 32	275	350	430	710	200	1060	1.2	30000	2770
ZOV 275 K 40	275	350	430	710	300	1280	1.4	45000	3400
ZOV 275 K 60	275	350	430	710	500	2050	1.6	80000	5440

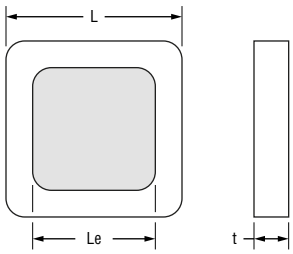
Device Ratings (Continued)

Standard High Energy Varistor Types

Model	V_{rms}	V_{dc}	V_n @ 1 mA	V_c @ I_c	I_c	W_{max} 10/1000 µs	P max.	I_{max} 8/20 µs	C Typ. @ 1 kHz
	V	V	V	V	A	J	W	A	pF
ZOV 300 K 23	300	385	470	775	100	440	1.0	18000	1010
ZOV 300 K 25	300	385	470	775	150	615	1.0	20000	1270
ZOV 300 K 32	300	385	470	775	200	1225	1.2	30000	2540
ZOV 300 K 40	300	385	470	775	300	1470	1.4	45000	3130
ZOV 300 K 60	300	385	470	775	500	2350	1.6	80000	5000
ZOV 320 K 23	320	420	510	840	100	480	1.0	18000	990
ZOV 320 K 25	320	420	510	840	150	680	1.0	20000	1240
ZOV 320 K 32	320	420	510	840	200	1350	1.2	30000	2470
ZOV 320 K 40	320	420	510	840	300	1620	1.4	45000	3050
ZOV 320 K 60	320	420	510	840	500	2600	1.6	80000	4880
ZOV 385 K 23	385	505	620	1025	100	500	1.0	18000	810
ZOV 385 K 25	385	505	620	1025	150	690	1.0	20000	1020
ZOV 385 K 32	385	505	620	1025	200	1390	1.2	30000	2040
ZOV 385 K 40	385	505	620	1025	300	1660	1.4	45000	2500
ZOV 385 K 60	385	505	620	1025	500	2660	1.6	80000	400
ZOV 420 K 23	420	560	680	1120	100	530	1.0	18000	740
ZOV 420 K 25	420	560	680	1120	150	740	1.0	20000	930
ZOV 420 K 32	420	560	680	1120	200	1480	1.2	30000	1850
ZOV 420 K 40	420	560	680	1120	300	1780	1.4	45000	2280
ZOV 420 K 60	420	560	680	1120	500	2850	1.6	80000	3650
ZOV 460 K 23	460	615	750	1240	100	580	1.0	18000	670
ZOV 460 K 25	460	615	750	1240	150	810	1.0	20000	840
ZOV 460 K 32	460	615	750	1240	200	1610	1.2	30000	1680
ZOV 460 K 40	460	615	750	1240	300	1930	1.4	45000	2060
ZOV 460 K 60	460	615	750	1240	500	3090	1.6	80000	3300
ZOV 510 K 23	510	670	820	1355	100	600	1.0	18000	610
ZOV 510 K 25	510	670	820	1355	150	840	1.0	20000	770
ZOV 510 K 32	510	670	820	1355	200	1680	1.2	30000	1530
ZOV 510 K 40	510	670	820	1355	300	2010	1.4	45000	1900
ZOV 510 K 60	510	670	820	1355	500	3220	1.6	80000	3040
ZOV 550 K 23	550	745	910	1500	100	650	1.0	18000	550
ZOV 550 K 25	550	745	910	1500	150	900	1.0	20000	690
ZOV 550 K 32	550	745	910	1500	200	1810	1.2	30000	1380
ZOV 550 K 40	550	745	910	1500	300	2170	1.4	45000	1700
ZOV 550 K 60	550	745	910	1500	500	3470	1.6	80000	2720
ZOV 680 K 23	680	895	1100	1815	100	770	1.0	18000	460
ZOV 680 K 25	680	895	1100	1815	150	1080	1.0	20000	570
ZOV 680 K 32	680	895	1100	1815	200	2160	1.2	30000	1150
ZOV 680 K 40	680	895	1100	1815	300	4140	1.4	45000	1400
ZOV 680 K 60	680	895	1100	1815	500	2050	1.6	80000	2240

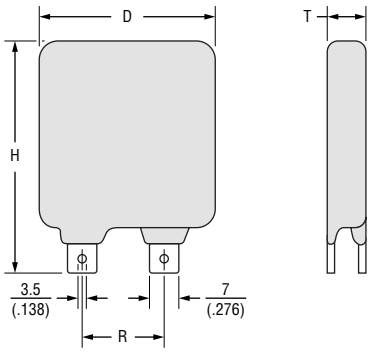
Product Dimensions

Metallized Varistor Block



Size	Dimension	
	L (max)	Le (max)
23	23 (.901)	18 (.709)
25	23 (.901)	20 (.787)
32	30 (1.181)	28 (1.102)
40	34 (1.339)	31 (1.220)
60	43 (1.693)	39 (1.535)

Epoxy Coated Varistor Block



Size	Dimension		
	D (max)	R[1]	H (max)
23	25 (.984)	18.5 (.728)	43 (1.693)
25	25 (.984)	18.5 (.728)	43 (1.693)
32	35 (1.378)	25.4 (1.00)	53 (2.087)
40	36.5 (1.437)	25.4 (1.00)	56 (2.205)
60	48 (1.890)	25.4 (1.00)	66 (2.598)

Note 1: Tolerance of ±1 mm (.039 in)

Model	Dimension	
	t (max)	T (max)
ZOV 60 K 23	1.0 (.039)	7.7 (.303)
ZOV 60 K 25		
ZOV 60 K 32		
ZOV 60 K 40		
ZOV 75 K 23	1.1 (.043)	7.9 (.311)
ZOV 75 K 25		
ZOV 75 K 32		
ZOV 75 K 40		
ZOV 95 K 23	1.3 (.051)	8.1 (.319)
ZOV 95 K 25		
ZOV 95 K 32		
ZOV 95 K 40		
ZOV 130 K 23	1.5 (.059)	8.1 (.319)
ZOV 130 K 25		
ZOV 130 K 32		
ZOV 130 K 40		
ZOV 130 K 60		
ZOV 150 K 23	1.7 (.067)	8.3 (.327)
ZOV 150 K 25		
ZOV 150 K 32		
ZOV 150 K 40		
ZOV 150 K 60		
ZOV 230 K 23	2.4 (.094)	9.0 (.354)
ZOV 230 K 25		
ZOV 230 K 32		
ZOV 230 K 40		
ZOV 230 K 60		
ZOV 250 K 23	2.6 (.102)	9.2 (.362)
ZOV 250 K 25		
ZOV 250 K 32		
ZOV 250 K 40		
ZOV 250 K 60		
ZOV 275 K 23	2.8 (.110)	9.4 (.370)
ZOV 275 K 25		
ZOV 275 K 32		
ZOV 275 K 40		
ZOV 275 K 60		

DIMENSIONS: MM / (INCHES)

Model	Dimension	
	t (max)	T (max)
ZOV 300 K 23	3.1 (.122)	9.7 (.382)
ZOV 300 K 25		
ZOV 300 K 32		
ZOV 300 K 40		
ZOV 300 K 60		
ZOV 320 K 23	3.2 (.126)	9.9 (.390)
ZOV 320 K 25		
ZOV 320 K 32		
ZOV 320 K 40		
ZOV 320 K 60		
ZOV 385 K 23	3.8 (.150)	10.6 (.417)
ZOV 385 K 25		
ZOV 385 K 32		
ZOV 385 K 40		
ZOV 385 K 60		
ZOV 420 K 23	4.4 (.173)	10.9 (.429)
ZOV 420 K 25		
ZOV 420 K 32		
ZOV 420 K 40		
ZOV 420 K 60		
ZOV 460 K 23	4.8 (.189)	11.4 (.449)
ZOV 460 K 25		
ZOV 460 K 32		
ZOV 460 K 40		
ZOV 460 K 60		
ZOV 510 K 23	5.2 (.205)	11.8 (.465)
ZOV 510 K 25		
ZOV 510 K 32		
ZOV 510 K 40		
ZOV 510 K 60		
ZOV 550 K 23	5.9 (.232)	12.5 (.492)
ZOV 550 K 25		
ZOV 550 K 32		
ZOV 550 K 40		
ZOV 550 K 60		
ZOV 680 K 23	6.9 (.272)	13.5 (.531)
ZOV 680 K 25		
ZOV 680 K 32		
ZOV 680 K 40		
ZOV 680 K 60		

How to Order – Metallized Varistor Block

ZOV75K40Myy

Series Designator
ZOV = ZOV Series

Max. Continuous Operating Voltage (V_{rms})

V_n Tolerance
K = ±10 %

Model Size
23 = 23 mm
25 = 25 mm
32 = 32 mm
40 = 40 mm
60 = 60 mm

Design
M = Metallized Varistor Block
ME = Uncoated Block w/Rigid Terminals (available upon request)
MP = Metallized Varistor Block w/Passivation (available upon request)

Special Requirements
yy = Unique two-digit suffix assigned to each customer requesting special parameters.
Please contact Bourns for more information.

Instructions for Creating Orderable Part Number:

1) Start with base part number in characteristics table (example ZOV75K40)
2) Add Design: M (example part number becomes ZOV75K40M).
3) Part number can have no spaces or lower case letters.

How to Order – Epoxy Coated Varistor Block

ZOV385K40Eyy

Series Designator
ZOV = ZOV Series

Max. Continuous Operating Voltage (V_{rms})

V_n Tolerance
K = ±10 %

Model Size
23 = 23 mm
25 = 25 mm
32 = 32 mm
40 = 40 mm
60 = 60 mm

Design
E = Epoxy Coated Varistor w/Rigid Terminals

Special Requirements
yy = Unique two-digit suffix assigned to each customer requesting special parameters.
Please contact Bourns for more information.

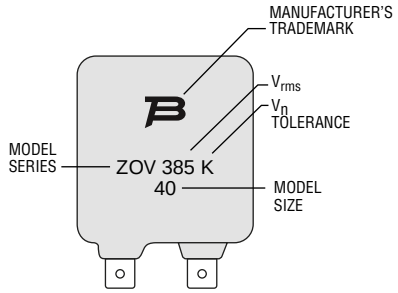
Instructions for Creating Orderable Part Number:

1) Start with base part number in characteristics table (example ZOV385K40)
2) Add Design: E (example part number becomes ZOV385K40E).
3) Part number can have no spaces or lower case letters.

Typical Part Marking – Metallized Varistor Block

No marking.

Typical Part Marking – Epoxy Coated Varistor Block



ZOV Series Square Shaped High Energy Varistors

BOURNS®

Device Ratings – Full Custom Parameter Designed High Energy Varistors

The ZOV series of full custom parameter designed varistors consists of square or rectangular shaped varistors, available as epoxy coated or as metallized varistor blocks. Other versions such as metallized blocks with rigid terminals, etc., or other coatings are also available.

The customer can specify the varistor electrical properties and set the limits of size parameters in accordance with the general technical data, as provided below. The customer can also choose to have standard electrical parameters in a non-standard varistor shape and size to best suit the available housing. The customer has our full engineering support in realizing his specific protection requirement.

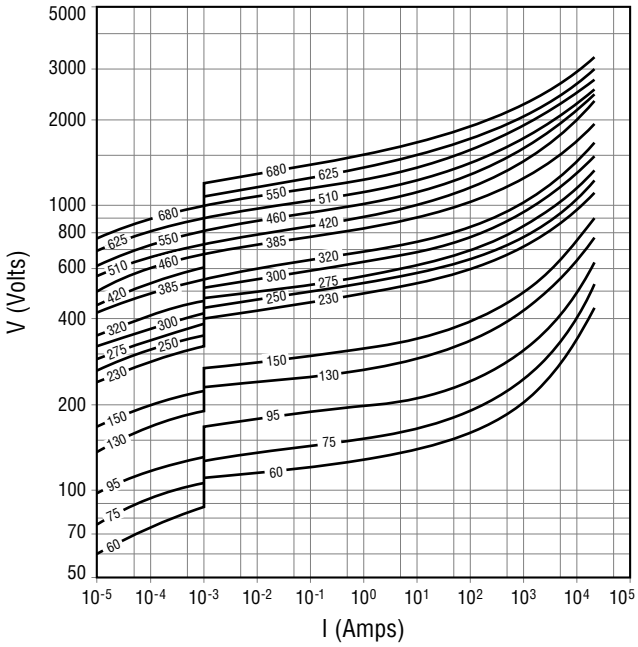
In the case that a ZOV varistor is used as a metallized block without leads and coating, device ratings and characteristics are only valid for professionally soldered and coated components. Improper soldering and further manufacturing steps can lead to a change of characteristics such as reduced long term stability, a reduced surge current and energy absorption capability, reduced adhesive strength of electrodes and low climatic strength. In the case that a dipping soldering method is chosen, Bourns can help minimize this problem by the passivation of varistor block edges.

Absolute Maximum Ratings

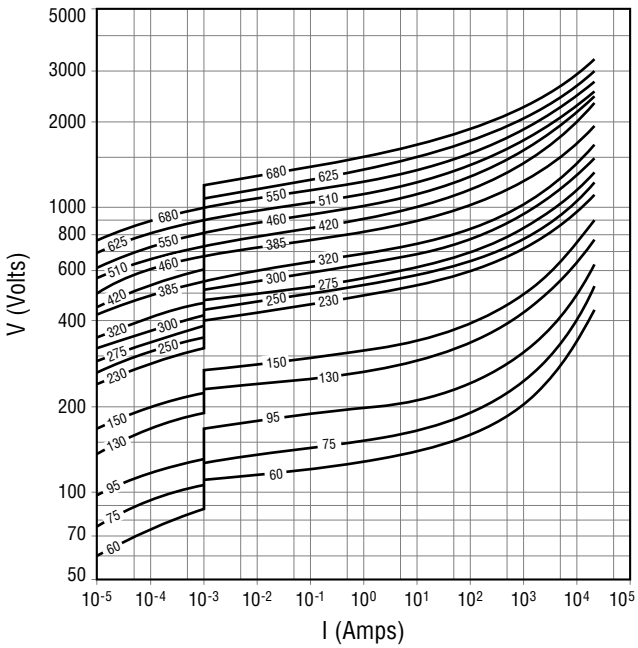
Parameter	Value	Units
Varistor Threshold Voltage (V_n) Range at 1 mA	100 to 1100	V
Continuous:		
Steady State Applied Voltage		
DC Voltage Range (V_{dc})	85 to 900	V
AC Voltage Range (V_{rms})	60 to 680	V
Transient:		
Peak Single Pulse Surge Current, 8/20 μs Waveform (I_{max})	> 5500	A/cm^2
Single Pulse Surge Energy, 10/1000 μs Waveform (W_{max})	> 400	J/cm^3
Protective Level:		
Clamping Voltage	< 1.9 x V_{dc}	V
Coefficient of nonlinearity α: minimum	30	
typical	60	
Leakage Current Level:		
@ 25 °C	0.5	μA/cm^2
@ 85 °C	10	μA/cm^2
Temperature Behavior:		
Operating Ambient Temperature	-40 to +85 °C	°C
Storage Temperature Range	-40 to +125 °C	°C
Minimum Threshold Voltage Temperature Coefficient	+0.05	%/°C
Design:		
Epoxy Coated with Rigid Terminals		
Metallized Block with Solderable Electrode Finish		
Physical Parameters:		
Maximum size L x W	Custom design	
Shape	Square, rectangle	

Protection Level

Model Size 23 - (ZOV 60 K 23 ~ ZOV 680 K 23)

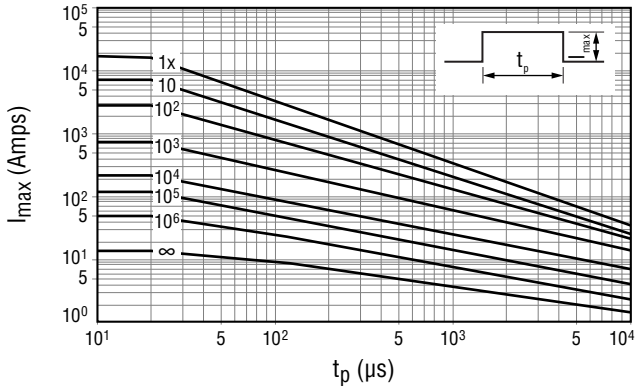


Model Size 25 - (ZOV 60 K 25 ~ ZOV 680 K 25)

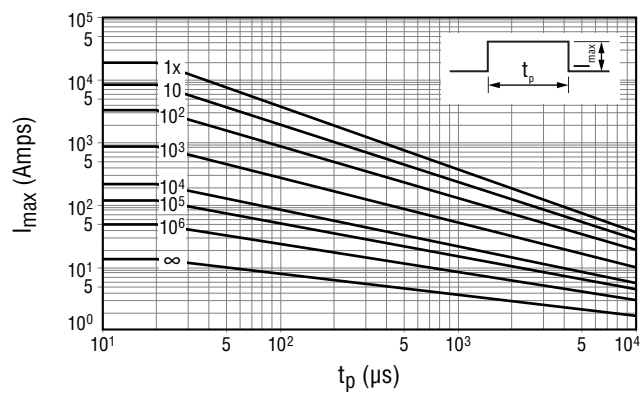


Pulse Rating Curves

Model Size 23 - (ZOV 60 K 23 ~ ZOV 680 K 23)

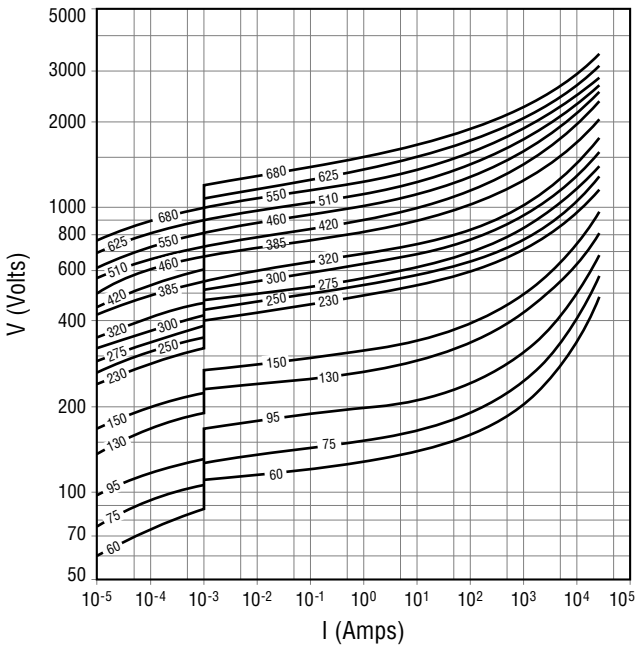


Model Size 25 - (ZOV 60 K 25 ~ ZOV 680 K 25)

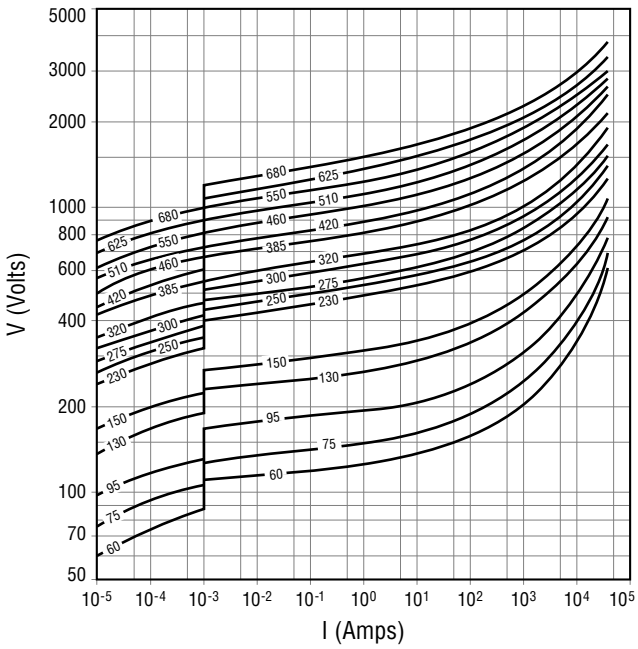


Protection Level

Model Size 32 - (ZOV 60 K 32 ~ ZOV 680 K 32)

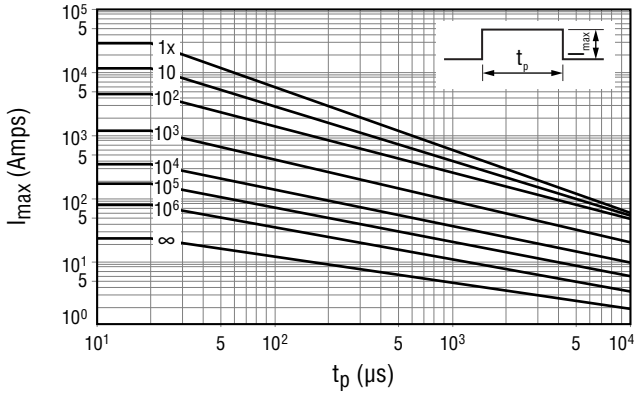


Model Size 40 - (ZOV 60 K 40 ~ ZOV 680 K 40)

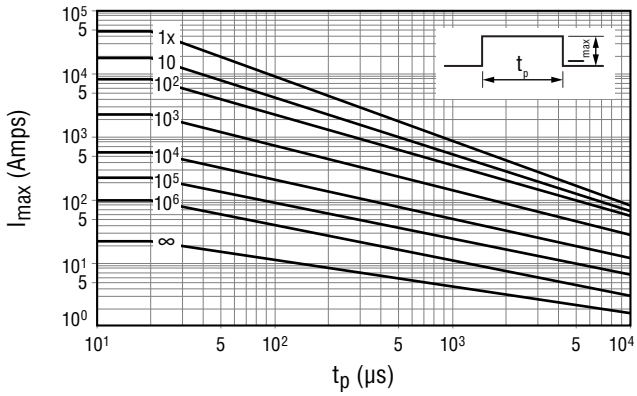


Pulse Rating Curves

Model Size 32 - (ZOV 60 K 32 ~ ZOV 680 K 32)

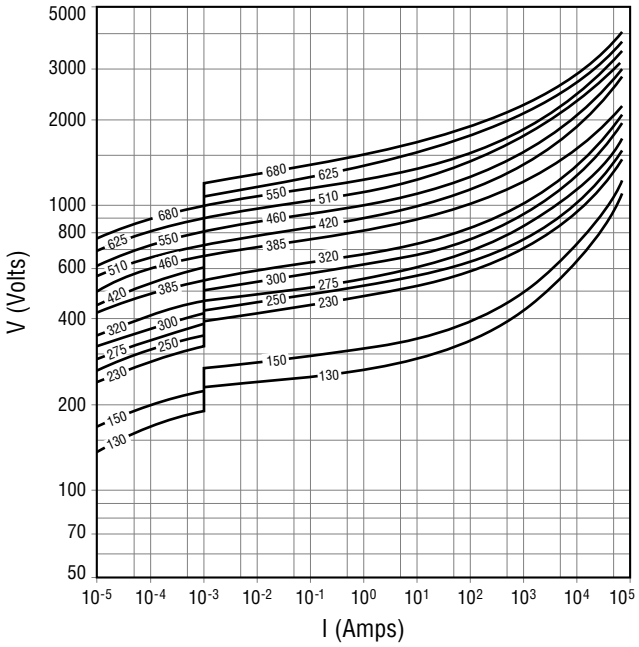


Model Size 40 - (ZOV 60 K 40 ~ ZOV 680 K 40)



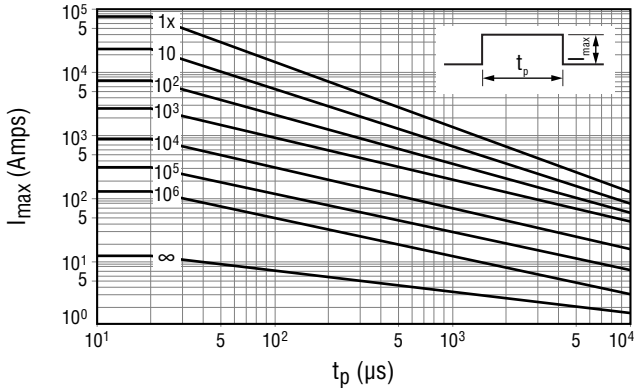
Protection Level

Model Size 60 - (ZOV 60 K 60 ~ ZOV 680 K 60)



Pulse Rating Curves

Model Size 60 - (ZOV 60 K 60 ~ ZOV 680 K 60)



Packaging Quantities – Bulk

Voltage	Model Size				
	23	25	32	40	60
60	64	64	100	64	—
75	64	64	100	64	—
95	64	64	100	64	—
130	64	64	100	64	66
150	64	64	100	64	66
230	64	64	100	64	66
250	64	64	100	64	66
275	64	64	100	64	66
300	64	64	100	64	66
320	64	64	100	64	66
385	64	64	64	64	66
420	64	64	64	64	66
460	64	64	64	64	66
510	64	64	64	64	66
550	64	64	64	64	66
680	64	64	64	64	66

Reliability Testing Procedures (Where Applicable)

Varistor test procedures comply with CECC 42200, IEC 1051-1/2 (and AEC-Q200, if applicable). Test results are available upon customer request. Special tests can be performed upon customer request.

Reliability Parameter	Test	Tested According to	Condition to be Satisfied after Testing
AC/DC Bias Reliability	AC/DC Life Test	CECC 42200, Test 4.20 or IEC 1051-1, Test 4.20, AEC-Q200 Test 8 - 1000 h at UCT	$\lvert\delta V_n$ (1 mA)$\rvert$ < 10 %
Pulse Current Capability	I_{max} 8/20 μs	CECC 42200, Test C 2.1 or IEC 1051-1, Test 4.5 10 pulses in the same direction at 2 pulses per minute at maximum peak current for 10 pulses	$\lvert\delta V_n$ (1 mA)$\rvert$ < 10 % no visible damage
Pulse Energy Capability	W_{max} 10/1000 μs	CECC 42200, Test C 2.1 or IEC 1051-1, Test 4.5 10 pulses in the same direction at 1 pulse every 2 minutes at maximum peak current for 10 pulses	$\lvert\delta V_n$ (1 mA)$\rvert$ < 10 % no visible damage
WLD Capability	WLD x 10	ISO 7637, Test pulse 5, 10 pulses at rate of 1 per minute	$\lvert\delta V_n$ (1 mA)$\rvert$ < 15 % no visible damage
V_{jump} Capability	V_{jump} 5 min.	Increase of supply voltage to V ≥ V_{jump} for 1 minute	$\lvert\delta V_n$ (1 mA)$\rvert$ < 15 % no visible damage
Environmental and Storage Reliability	Climatic Sequence	CECC 42200, Test 4.16 or IEC 1051-1, Test 4.17 a) Dry heat, 16h, UCT, Test Ba, IEC 68-2-2 b) Damp heat, cyclic, the first cycle: 55 °C, 93 % RH, 24 h, Test Db 68-2-4 c) Cold, LCT, 2 h, Test Aa, IEC 68-2-1 d) Damp heat cyclic, remaining 5 cycles: 55 °C, 93 % RH, 24 h/cycle, Test Bd, IEC 68-2-30	$\lvert\delta V_n$ (1 mA)$\rvert$ < 10 %
	Thermal Shock	CECC 42200, Test 4.12, Test Na, IEC 68-2-14, AEC-Q200 Test 16, 5	$\lvert\delta V_n$ (1 mA)$\rvert$ < 10 % no visible damage
	Steady State Damp Heat	CECC 42200, Test 4.17, Test Ca, IEC 68-2-3, AEC-Q200 Test 6, 56 days, 40 °C, 93 % RH, AEC-Q200 Test 7: Bias, Rh, T all at 85.	$\lvert\delta V_n$ (1 mA)$\rvert$ < 10 %
	Storage Test	IEC 68-2-2, Test Ba, AEC-Q200 Test 3, 1000 h at maximum storage temperature	$\lvert\delta V_n$ (1 mA)$\rvert$ < 5 %

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Reliability Testing Procedures (Where Applicable – Continued)

Reliability Parameter	Test	Tested According to	Condition to be Satisfied after Testing
Mechanical Reliability	Solderability	CECC 42200, Test 4.10.1, Test Ta, IEC 68-2-20 solder bath and reflow method	Solderable at shipment and after 2 years of storage, criteria: >95% must be covered by solder for reflow meniscus
	Resistance to Soldering Heat	CECC 42200, Test 4.10.2, Test Tb, IEC 68-2-20 solder bath nad reflow method	$\lvert\delta V_n$ (1 mA)$\rvert < 5$ %
	Terminal Strength	JIS-C-6429, App. 1, 18N for 60 sec. - same for AEC-Q200 Test 22	No visual damage
	Board Flex	JIS-C-6429, App. 2, 2 mm min. AEC-Q200 test 21 - Board flex: 2 mm flex min.	$\lvert\delta V_n$ (1 mA)$\rvert < 2$ % No visible damage
	Vibration	CECC 42200, Test 4.15, Test Fc, IEC 68-2-6, AEC-Q200 Test 14 Frequency range 10 to 55 Hz (AEC: 10-2000 Hz) Amplitude 0.75 m/s^2 or 98 m/s^2 (AEC: 5 g for 20 minutes) Total duration 6 h (3x2 h) (AEC: 12 cycles each of 3 directions) Waveshape - half sine	$\lvert\delta V_n$ (1 mA)$\rvert < 2$ % No visible damage
	Mechanical Shock	CECC 42200, Test 4.14, Test Ea, IEC 68-2-27, AEC-Q200 Test 13. Acceleration = 490 m/s^2 (AEC: MIL-STD-202-Method 213), Pulse duration = 11 ms, Waveshape - half sine; Number of shocks = 3x6	$\lvert\delta V_n$ (1 mA)$\rvert < 10$ % No visible damage
Electrical Transient Conduction	ISO-7637-1 Pulses	AEC-Q200 Test 30: Test pulses 1 to 3. Also other pulses - freestyle.	$\lvert\delta V_n$ (1 mA)$\rvert < 10$ % No visible damage

Terminology

Term	Symbol	Definition
Rated AC Voltage	V_{rms}	Maximum continuous sinusoidal AC voltage (<5 % total harmonic distortion) which may be applied to the component under continuous operation conditions at +25 °C
Rated DC Voltage	V_{dc}	Maximum continuous DC voltage (<5 % ripple) which may be applied to the component under continuous operating conditions at +25 °C
Supply Voltage	V	The voltage by which the system is designated and to which certain operating characteristics of the system are referred; V_{rms} = 1.1 x V
Leakage Current	I_{dc}	The current passing through the varistor at V_{dc} and at +25 ° or at any other specified temperature
Varistor Voltage	V_n	Voltage across the varistor measured at a given reference current (I_n)
Reference Current	I_n	Reference current = 1 mA DC
Clamping Voltage Protection Level	V_c	The peak voltage developed across the varistor under standard atmospheric conditions, when passing an 8/20 μs class current pulse
Class Current	I_c	A peak value of current which is 1/10 of the maximum peak current for 100 pulses at two per minute for the 8/20 μs pulse
Voltage Clamping Ratio	V_c/V_{app}	A figure of merit measure of the varistor clamping effectiveness as defined by the symbols V_c/V_{app}, where (V_{app} = V_{rms} or V_{dc})
Jump Start Transient	V_{jump}	The jump start transient results from the temporary application of an overvoltage in excess of the rated battery voltage. The circuit power supply may be subjected to a temporary overvoltage condition due to the voltage regulation failing or it may be deliberately generated when it becomes necessary to boost start the car.
Rated Single Pulse Transient Energy	W_{max}	Energy which may be dissipated for a single 10/1000 μs pulse of a maximum rated current, with rated AC voltage or rated DC voltage also applied, without causing device failure
Load Dump Transient	WLD	Load Dump is a transient which occurs in automotive environments. It is an exponentially decaying positive voltage which occurs in the event of a battery disconnect while the alternator is still generating charging current with other loads remaining on the alternator circuit at the time of battery disconnect.
Rated Peak Single Pulse Transient Current	I_{max}	Maximum peak current which may be applied for a single 8/20 μs pulse, with rated line voltage also applied, without causing device failure
Rated Transient Average Power Dissipation	P	Maximum average power which may be dissipated due to a group of pulses occurring within a specified isolated time period, without causing device failure at 25 °C
Capacitance	C	Capacitance between two terminals of the varistor measured @ 1 kHz
Non-linearity Exponent	α	A measure of varistor nonlinearity between two given operating currents, I_n and I_1 as described by I = k V exp(a), where: - k is a device constant, - $I_1 < I < I_n$ and - a log (I_1/I_n)/log(V_1/V_n) = 1/log (V_1/V_n), where: - I_r is reference current (1 mA) and V_n is varistor voltage - I_1 = 10 I_n, V_1 is the voltage measured at I_1
Response Time	tr	The time lag between application of a surge and varistor's "turn-on" conduction action
Varistor Voltage Temperature Coefficient	TC	(V_n @ 85 °C - V_n @ 25 °C) / (V_n @ 25 °C) x 60 °C) x 100
Insulation Resistance	IR	Minimum resistance between shorted terminals and varistor surface
Isolation Voltage		The maximum peak voltage which may be applied under continuous operating conditions between the varistor terminations and any conducting mounting surface
Operating Temperature		The range of ambient temperature for which the varistor is designed to operate continuously as defined by the temperature limits of its climatic category
Climatic Category	LCT/UCT/DHD	LCT & UCT = Lower and Upper Category Temperature - the minimum and maximum ambient temperatures for which a varistor has been designed to operate continuously. DHD = Dump Heat Test Duration
Storage Temperature		Storage temperature range without voltage applied
Current/Energy Derating		Derating of maximum values when operated above UCT

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