Catalogue - PROTECTIVE DEVICES - Edition 2015

KEKOVARICON

Varistors

SMD, THD, High Energy

Varicons

Multilayer SMD and THD

Dual Function Varicons

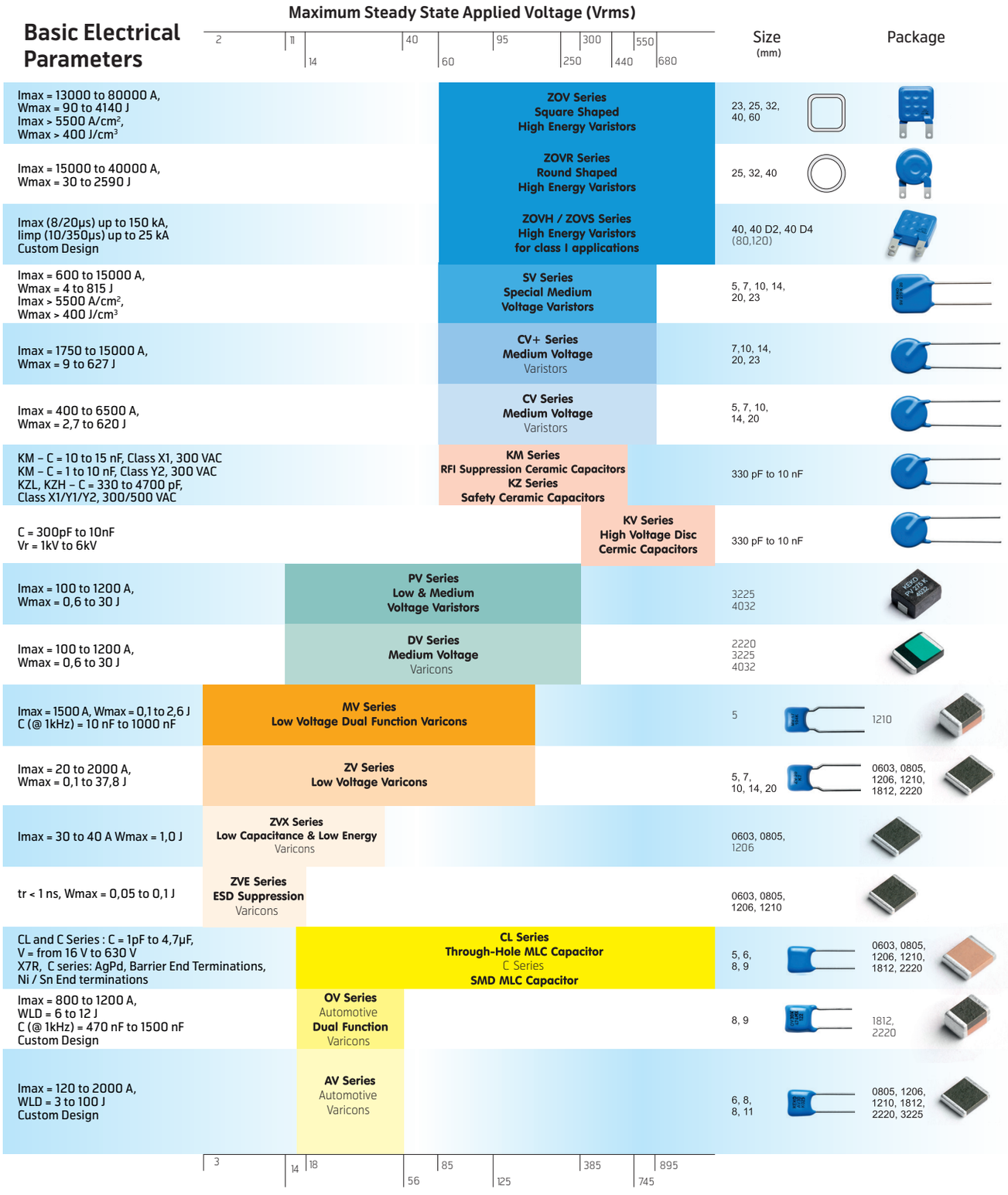
Capacitors

Safety class X and Y disc capacitors

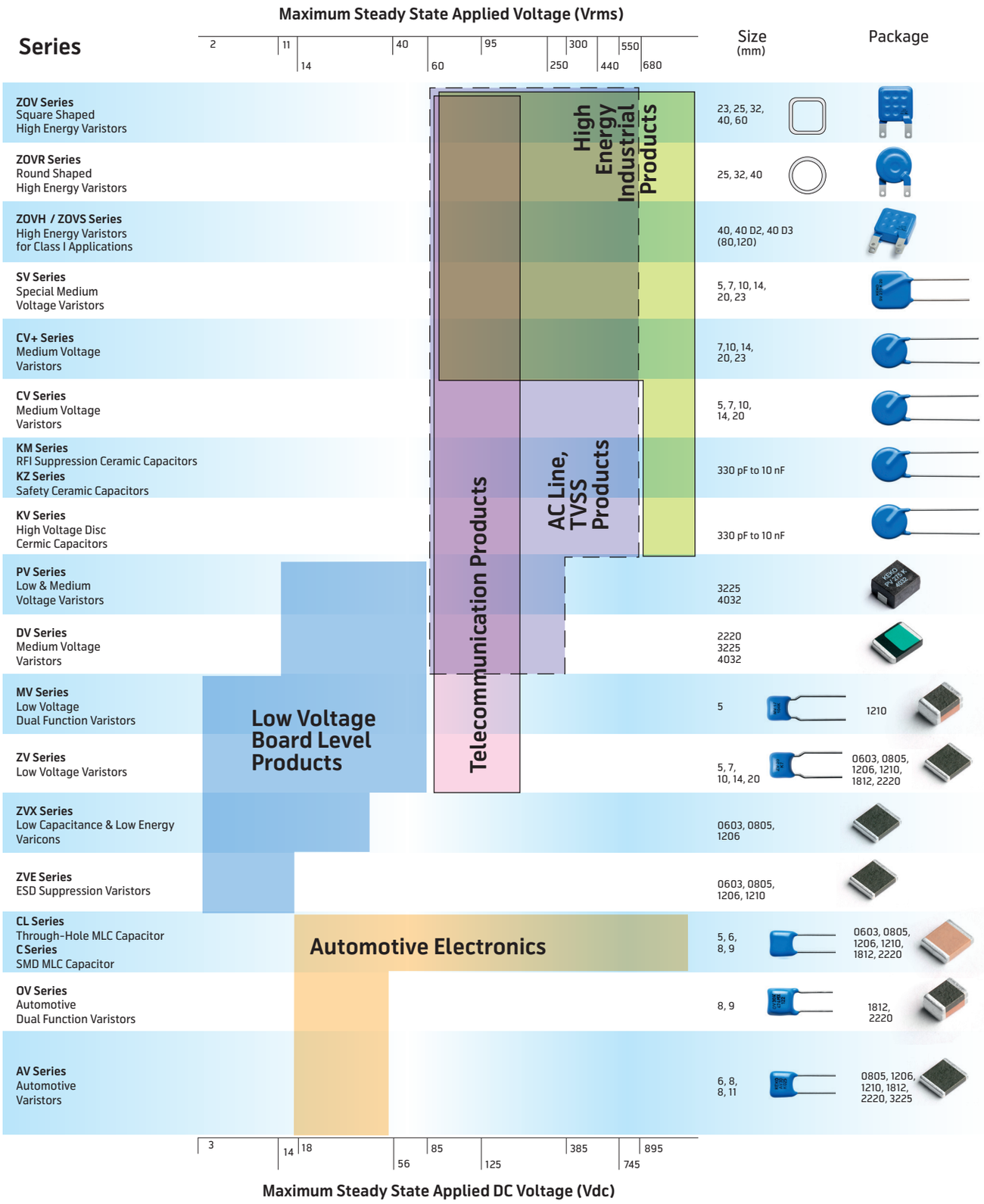
High voltage disc capacitors

www.keko-varicon.si

OVERVIEW OF PROTECTIVE DEVICES



APPLICATION FIELDS



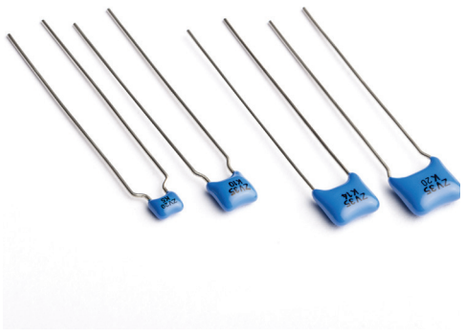
LOW VOLTAGE LEADED STYLE VARISTORS – ZV SERIES

Description

The ZV series of low voltage varistors is designed to protect sensitive electronic devices against high voltage and current surges in the low voltage region.

They offer excellent transient energy absorption due to improved energy volume distribution and power dissipation.

Low voltage varistors cover a wide DC operating voltage range from 3 V to 56 V.



Features

- Operating voltage range V_{dc}.....3 V to 56 V.
- 5 Model sizes available .....5, 7, 10, 14, 20.
- Low clamping voltage.
- Broad range of current and energy handling capabilities.
- + 125 °C continuous operating temperature
- Dimensional and weight savings on the board.
- Available in tape and reel for automatic insertion
- Lead free components.
- AEC-Q200 qualified Grade 3.
- c UL us UL 1449, 3rd edition & CSA C22.2. File E326499 Section 7.

Applications

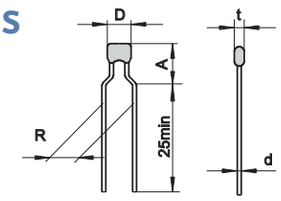
- Suppression of inductive switching or other transient events such as surge voltage at the circuit board level.
- Provides on-board transient voltage protection for ICs and transistors.
- Helps to achieve electromagnetic compliance of end products.
- Replaces larger TVS Zener diodes in many applications.

Absolute Maximum Ratings

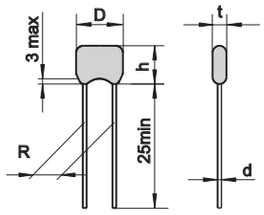
Continuous:	Units	Value
Steady State Applied Voltage:		
DC Voltage Range (V_{dc})	V	3 to 56 *
AC Voltage Range (V_{rms})	V	2 to 40 *
Transient:		
Peak Single Pulse Surge Current, 8/20 µs Waveform (I_{max})	A	100 to 2000
Single Pulse Surge Energy, 10/1000 µs Waveform (W_{max})	J	0,1 to 37,8
Operating Ambient Temperature	°C	-55 to +125
Storage Temperature	°C	-55 to +150
Threshold Voltage Temperature Coefficient	%/°C	< + 0,05
Insulation Resistance	GΩ	> 1
Isolation Voltage Capability	kV	> 1,25
Response Time	ns	< 25
Climatic Category		55 / 125 / 56

* Higher operating voltages are available upon request.

Device Ratings and Characteristics



Size 5, 7, 10



Size 14, 20

ZV 2 M 5.....ZV 40 K 20

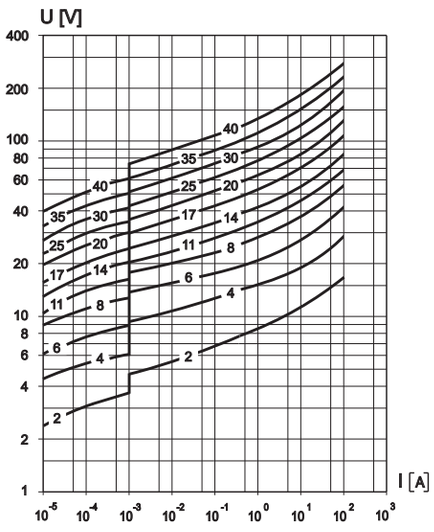
Type	V_{rms}	V_{dc}	V_n @ 1 mA	V_c	I_c	W_{max} 10/1000 µs	P max	I_{max} 8/20 µs	C typ. @ 1 kHz	D max	t max	R	d	h max
	V	V	V	V	A	J	W	A	pF	mm	mm	mm	mm	mm
ZV 2 M 5	2	3	4	10	1	0,1	0,005	100	1300	6	3,5	5	0,6	7
ZV 2 M 7	2	3	4	10	2,5	0,2	0,008	200	5000	7	3,5	5	0,6	8
ZV 4 M 5	4	5,5	8	14	1	0,1	0,005	100	1066	6	3,5	5	0,6	7
ZV 4 M 7	4	5,5	8	14	2,5	0,3	0,008	200	3720	7	3,5	5	0,6	8
ZV 4 M 10	4	5,5	8	14	5	0,4	0,010	300	5000	7	3,5	5	0,6	9
ZV 4 M 14	4	5,5	8	14	10	0,8	0,015	500	10000	8	3,5	5	0,6	12
ZV 4 M 20	4	5,5	8	14	20	1,5	0,020	1000	17000	9	3,5	5	0,6	12
ZV 6 M 5	6	8	11	21	1	0,2	0,005	100	1066	6	3,5	5	0,6	7
ZV 6 M 7	6	8	11	21	2,5	0,5	0,008	200	3720	7	3,5	5	0,6	8
ZV 6 M 10	6	8	11	21	5	0,8	0,010	300	5000	7	3,5	5	0,6	9
ZV 6 M 14	6	8	11	21	10	1	0,015	500	10000	8	3,5	5	0,6	12
ZV 6 M 20	6	8	11	21	20	3,8	0,020	1000	17000	9	3,5	5	0,6	12
ZV 8 L 5	8	11	15	25	1	0,2	0,005	100	650	6	3,5	5	0,6	7
ZV 8 L 7	8	11	15	25	2,5	0,6	0,008	250	2020	7	3,5	5	0,6	8
ZV 8 L 10	8	11	15	25	5	1,1	0,010	500	3200	7	3,5	5	0,6	9
ZV 8 L 14	8	11	15	25	10	1,9	0,015	800	6260	8	3,5	5	0,6	12
ZV 8 L 20	8	11	15	25	20	4,3	0,020	1500	11070	9	3,5	5	0,6	12
ZV 11 M 5	11	14	18	33	1	0,3	0,005	100	480	6	3,5	5	0,6	7
ZV 11 M 7	11	14	18	33	2,5	0,8	0,008	250	1400	7	3,5	5	0,6	8
ZV 11 M 10	11	14	18	33	5	1,7	0,010	500	2420	7	3,5	5	0,6	9
ZV 11 M 14	11	14	18	33	10	3,3	0,015	1000	5000	8	3,5	5	0,6	12
ZV 11 M 20	11	14	18	33	20	10,5	0,020	2000	9270	9	3,5	5	0,6	12
ZV 14 M 5	14	18	22	38	1	0,4	0,005	100	377	6	3,5	5	0,6	7
ZV 14 M 7	14	18	22	38	2,5	0,9	0,008	250	1050	7	3,5	5	0,6	8
ZV 14 M 10	14	18	22	38	5	2,2	0,010	500	1770	7	3,5	5	0,6	9
ZV 14 M 14	14	18	22	38	10	4,2	0,015	1000	3850	8	3,5	5	0,6	12
ZV 14 M 20	14	18	22	38	20	12	0,020	2000	7670	9	3,5	5	0,6	12
ZV 17 M 5	17	22	27	44	1	0,5	0,005	100	335	6	3,5	5	0,6	7
ZV 17 M 7	17	22	27	44	2,5	1,2	0,008	250	850	7	3,5	5	0,6	8
ZV 17 M 10	17	22	27	44	5	2,6	0,010	500	1370	7	3,5	5	0,6	9
ZV 17 M 14	17	22	27	44	10	5,2	0,015	1000	3050	8	3,5	5	0,6	12
ZV 17 M 20	17	22	27	44	20	14,2	0,020	2000	6600	9	3,5	5	0,6	12
ZV 20 M 5	20	26	33	54	1	0,6	0,005	100	325	6	4,5	5	0,6	7
ZV 20 M 7	20	26	33	54	2,5	1,4	0,008	250	790	7	4,5	5	0,6	8
ZV 20 M 10	20	26	33	54	5	3,2	0,010	500	1090	7	4,5	5	0,6	9
ZV 20 M 14	20	26	33	54	10	6,4	0,015	1000	2490	8	4,5	5	0,6	12
ZV 20 M 20	20	26	33	54	20	18,2	0,020	2000	5670	9	4,5	5	0,6	12
ZV 25 M 5	25	31	39	65	1	0,7	0,005	100	315	6	4,5	5	0,6	7
ZV 25 M 7	25	31	39	65	2,5	1,6	0,008	250	790	7	4,5	5	0,6	8
ZV 25 M 10	25	31	39	65	5	3,8	0,010	500	870	7	4,5	5	0,6	9
ZV 25 M 14	25	31	39	65	10	7,2	0,015	1000	1890	8	4,5	5	0,6	12
ZV 25 M 20	25	31	39	65	20	22,4	0,020	2000	4670	9	4,5	5	0,6	12
ZV 30 M 5	30	38	47	77	1	0,9	0,005	100	315	6	4,5	5	0,6	7
ZV 30 M 7	30	38	47	77	2,5	2,2	0,008	250	790	7	4,5	5	0,6	8
ZV 30 M 10	30	38	47	77	5	4,4	0,010	500	770	7	4,5	5	0,6	9
ZV 30 M 14	30	38	47	77	10	9,4	0,015	1000	1530	8	4,5	5	0,6	12
ZV 30 M 20	30	38	47	77	20	25,8	0,020	2000	3870	9	4,5	5	0,6	12
ZV 35 M 5	35	45	56	90	1	1,2	0,005	100	315	6	4,5	5	0,6	7
ZV 35 M 7	35	45	56	90	2,5	2,6	0,008	250	790	7	4,5	5	0,6	8
ZV 35 M 10	35	45	56	90	5	5,4	0,010	500	680	7	4,5	5	0,6	9
ZV 35 M 14	35	45	56	90	10	10,2	0,015	1000	1260	8	4,5	5	0,6	12
ZV 35 M 20	35	45	56	90	20	33,4	0,020	2000	3470	9	4,5	5	0,6	12
ZV 40 M 5	40	56	68	110	1	1,4	0,005	100	315	6	4,5	5	0,6	7
ZV 40 M 7	40	56	68	110	2,5	3,2	0,008	250	790	7	4,5	5	0,6	8
ZV 40 M 10	40	56	68	110	5	6,4	0,010	500	660	7	4,5	5	0,6	9
ZV 40 M 14	40	56	68	110	10	13,4	0,015	1000	1070	8	4,5	5	0,6	12
ZV 40 M 20	40	56	68	110	20	37,8	0,020	2000	3130	9	4,5	5	0,6	12

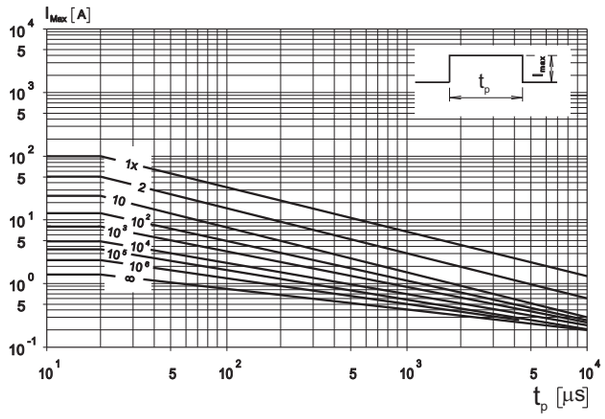
Protection Level

* With the worst-case condition in the tolerance region

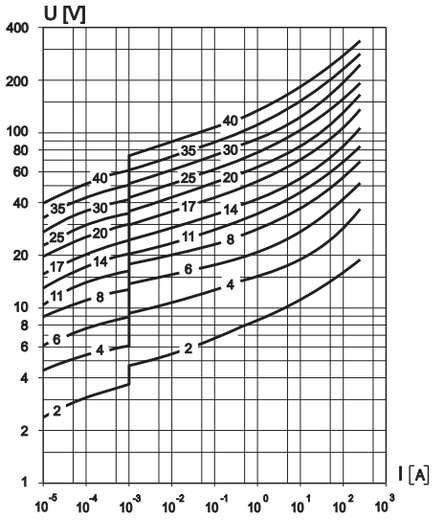
Pulse Rating Curves

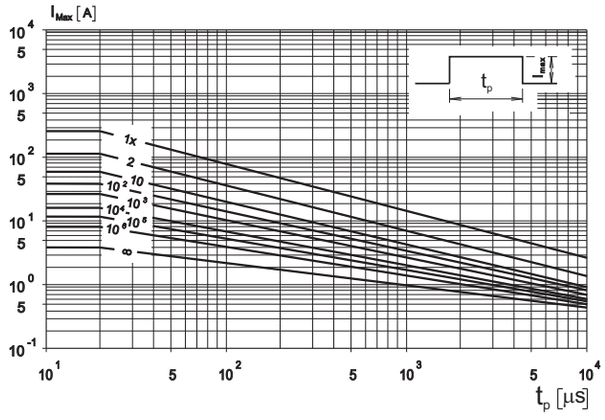
Model Size 5
ZV 2...40



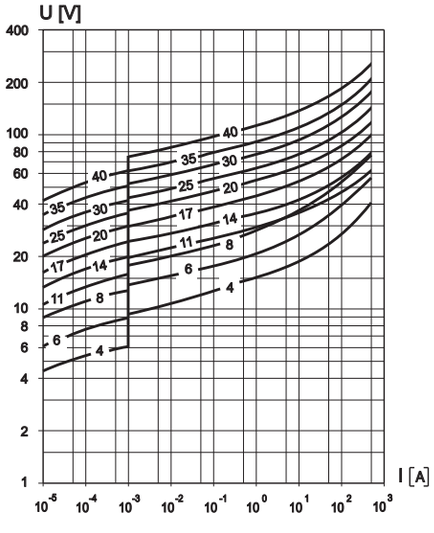


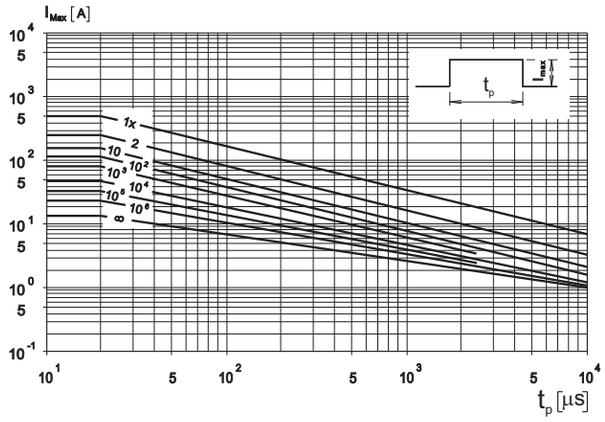
Model Size 7
ZV 2...40





Model Size 10
ZV 4...40



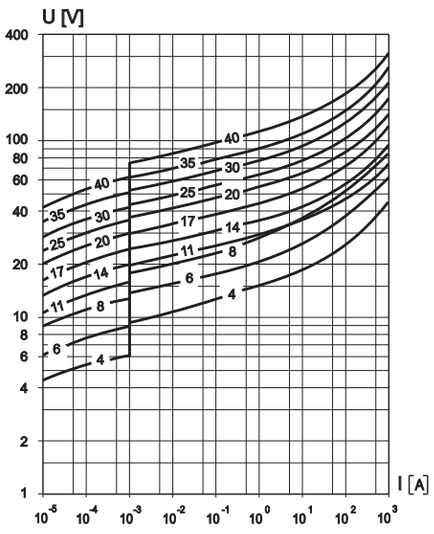


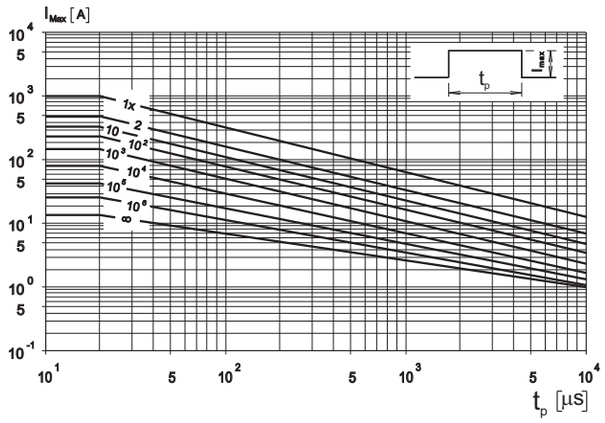
Protection Level

* With the worst-case condition in the tolerance region

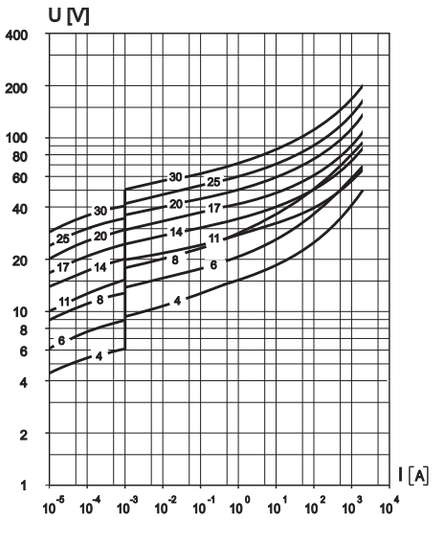
Pulse Rating Curves

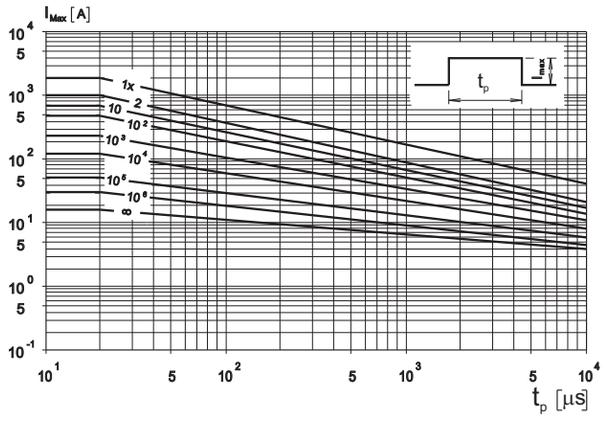
Model Size 14
ZV 4...40



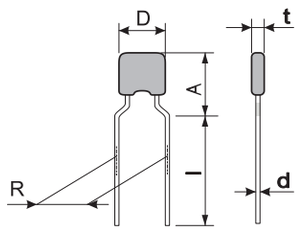
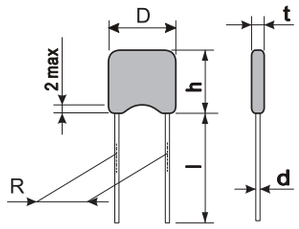
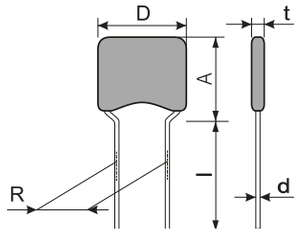
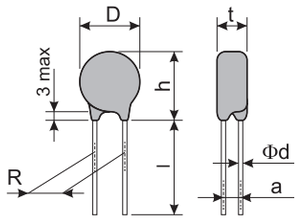
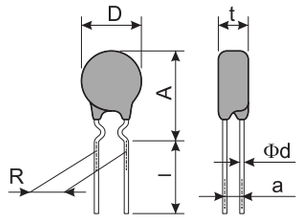
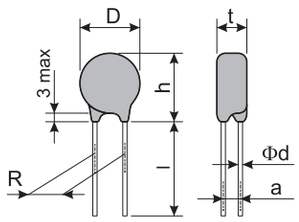
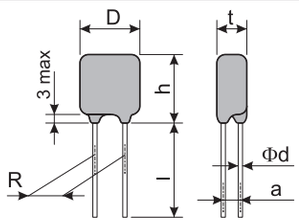
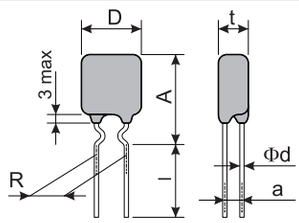
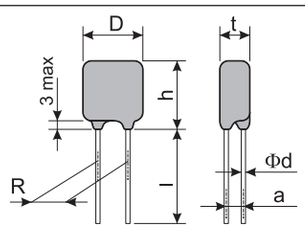


Model Size 20
ZV 4...40



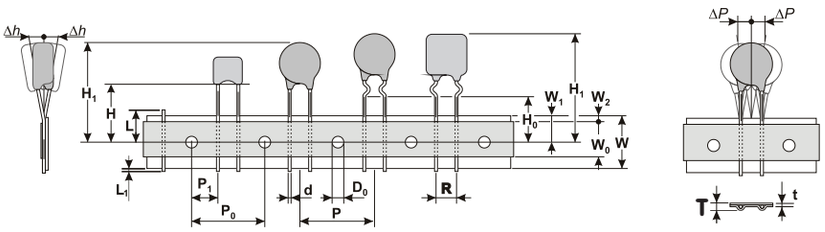


Lead Styles

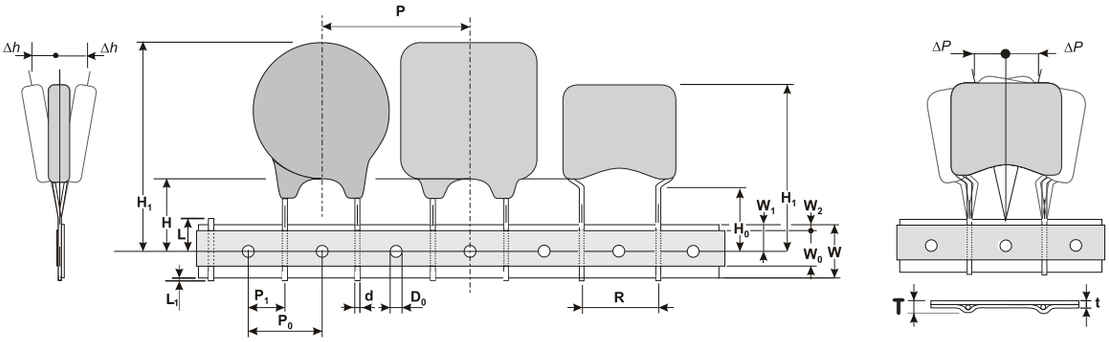
Type	R (mm)	h_{max} (mm)	A_{max} (mm)	Version 1	Version 5
ZV 2...40 K 5 ZV 2...40 K 7 ZV 2...40 K 10 AV 14...40 K 602 003	5 5 5 5		7 8 9 7		
ZV 4...40 K14 AV 14...40 K 802 006	5 5	9 9	12 9		
ZV 4...40 K 20 AV 14...40 K 902 012...025 AV 14...20 K 1103 050	5 5 7,5		12 12 12		
CV 50...300 K 5 CV 50...300 K 7 CV+ 60...275 K 7	5 5 5	9,5 11,5 11,5	12,5 14,5 14,5		
CV 50...680 K 10 CV 50...680 K 14 CV 50...680 K 20 CV+ 60...550 K 10 CV+ 60...550 K 14 CV+ 60...550 K 20 CV+ 130...550 K 23	7,5 7,5 10 7,5 7,5 10 10	15 20 26 15 20 26 27			
SV 60...300 K 5 SV 60...300 K 7	5 5	9,5 11,5	12,5 14,5		
SV 60...550 K 10 SV 60...550 K 14 SV 60...550 K 20 SV 130...550 K 23	7,5 7,5 10 10	15 19 26 27			

Protection Level

Customs to IES Publication 286-2 Ed.3: 2008-03



R = 5 mm

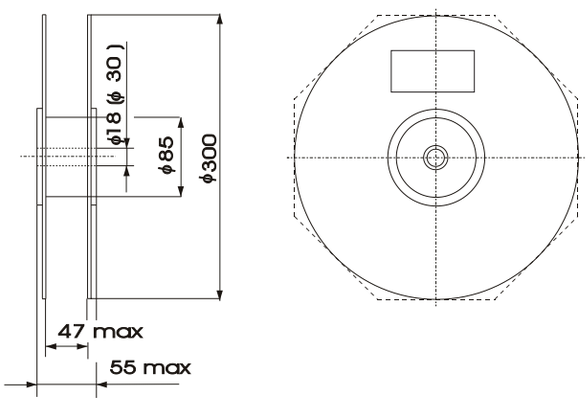


R = 7,5 mm, 10 mm

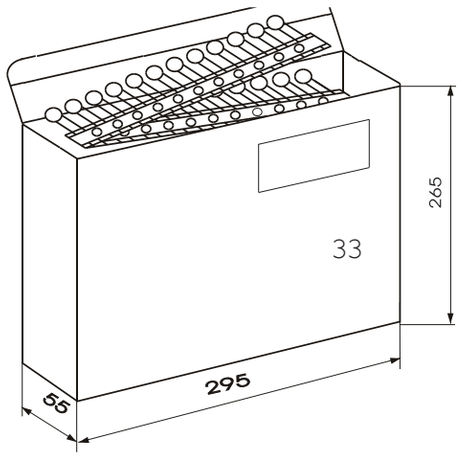
Symbol	Parameter	Model Size				
		Φ 5	Φ 7	Φ 10	Φ 14	Φ 20
		602 / 802 / 902		1103		
		Dimension (mm)				
W	Carrier tape with	18 +1,0/-0,5	18 +1,0/-0,5	18 +1,0/-0,5	18 +1,0/-0,5	18 +1,0/-0,5
Wo	Hold down tape width	5 min	5 min	5 min	5 min	5 min
W1	Sprocket hole position	9 +0,75/-0,5	9 +0,75/-0,5	9 +0,75/-0,5	9 +0,75/-0,5	9 +0,75/-0,5
W2	Distance between the upper edges of the carrier tape and hold-down tape	3 max	3 max	3 max	3 max	3 max
T	Total tape thickness	1,5 max	1,5 max	1,7 max	1,7 max	1,9 max
t	Tape thickness	0,9 max	0,9 max	0,9 max	0,9 max	0,9 max
P	Pitch of component	12,7 ± 1,0	12,7 ± 1,0	12,7 ± 1,0	25,4 ± 1,0	25,4 ± 1,0
Po	Feed hole pitch	12,7 ± 0,3	12,7 ± 0,3	12,7 ± 0,3	12,7 ± 0,3	12,7 ± 0,3
P1	Feed hole center to pitch	3,85 ± 0,7	3,85 ± 0,7	8,95 ± 0,7	8,95 ± 0,7	7,7 ± 0,7
R	Lead Spacing	5 +0,5/-0,2	5 +0,5/-0,2	7,5 +0,5/-0,2	7,5 +0,5/-0,2	10 +0,5/-0,2
ΔP	Component alignment	± 1,3 max	± 1,3 max	± 1,3 max	± 1,3 max	± 1,3 max
Δh	Component alignment	± 2 max	± 2 max	± 2 max	± 2 max	± 2 max
d	Wire diameter	0,6 max	0,6 max	0,8 max	0,8 max	1 max
Do	Feed hole diameter	4 ± 0,2	4 ± 0,2	4 ± 0,2	4 ± 0,2	4 ± 0,2
H	Height from tape center to comp. base	18 +2,0/-0,0	18 +2,0/-0,0	18 +2,0/-0,0	18 +2,0/-0,0	18 +2,0/-0,0
Ho	Seating plane height	16 ± 0,5	16 ± 0,5	16 ± 0,5	16 ± 0,5	16 ± 0,5
H1	Component height	32,2 max	32,2 max	46,5 max	46,5 max	46,5 max
L	Protrusion - cut out	11 max	11 max	11 max	11 max	11 max
L1	Protrusion - cut off	0,5 max	0,5 max	0,5 max	0,5 max	0,5 max

Packaging

Reel



Ammo pack



Package units

Bulk

V	5				7				10				14				20					23	
	ZV	AV/ 602	SV	CV/ CV+	ZV	AV/ 802	SV	CV/ CV+	ZV	AV/ 902	SV	CV/ CV+	ZV	AV/ 1103	SV	CV/ CV+	ZV	AV 20	AV 40	SV	CV/ CV+	SV	CV/ CV+
2	1500				1500				1500				1000				1000						
4	1500				1500				1500				1000				1000						
6	1500				1500				1500				1000				1000						
8	1500				1500				1500				1000				1000						
11	1500			1500	1500			1500	1500				1000				1000						
14	1500	1500		1500	1500	1500		1500	1500	1000		600	1000	800			1000						
17	1500	1500		1500	1500	1500		1500	1500	1000		600	1000	800			1000						
20	1500	1500		1500	1500	1500		1500	1500	1000		600	1000	800			1000						
25	1500	1500		1500	1500	1500		1500	1500	1000		600	1000				1000	300	300				
30	1500	1500		1500	1500	1500		1500	1500	1000		600	1000				1000	300	300				
35	1500	1500		1500	1500	1500		1500	1500	1000		600	1000				1000	300	300				
40	1500	1500		1500	1500	1500		1500	1500	1000		600	1000				1000	300	300				
50				1500				1500				600				400					300		
60			1300	1500			1000	1500			500	600			400	400				250	300		
75			1300	1500			1000	1500			500	600			400	400				250	300		
95			1300	1500			900	1000			500	600			400	400				250	300		
115			1300	1500			900	1000			400	500			400	400				250	300		
130			1300	1500			900	1000			400	500			400	400				250	300	150	250
140			1300	1500			900	1000			400	500			400	400				250	300	150	250
150			1300	1500			900	1000			400	500			400	400				250	300	150	250
175			1300	1500			900	1000			400	500			400	400				250	300	150	250
230			900	1000			900	1000			400	500			250	300				250	200	150	150
250			900	1000			900	1000			400	500			250	300				250	200	150	150
275			900	1000			900	1000			400	500			250	300				250	200	150	150
300				1000			900	1000			400	500			250	300				150	200	100	150
320											400	500			250	300				150	200	100	150
385											300	400			250	300				150	200	100	150
420											300	400			250	300				150	200	100	150
460											300	400			250	300				150	200	100	150
510											300	400			250	300				150	200	100	150
550*											300	400			250	300				150	200	100	150

Packaging

Reel

V	5				7				10				14				20					23	
	ZV	AV/ 602	SV	CV/ CV+	ZV	AV/ 802	SV	CV/ CV+	ZV	AV/ 902	SV	CV/ CV+	ZV	AV/ 1103	SV	CV/ CV+	ZV	AV 20	AV 40	SV	CV/ CV+	SV	CV/ CV+
2	1500				1500				1500				1500				1500						
4	1500				1500				1500				1500				1500						
6	1500				1500				1500				1500				1500						
8	1500				1500				1500				1500				1500						
11	1500			1800	1500			1500	1500				1500				1500						
14	1500	1500		1800	1500	1500		1500	1500	1500		1300	1500	1300			1500						
17	1500	1500		1800	1500	1500		1500	1500	1300		1300	1500	1300			1500						
20	1500	1500		1500	1500	1500		1500	1500	1300		1300	1500	1300			1500						
25	1500	1300		1500	1500	1300		1500	1500	1300		1300	1500				1500	500	400				
30	1500	1300		1500	1500	1300		1500	1500	1300		1300	1500				1500	500	400				
35	1500	1300		1500	1500	1300		1500	1500	1300		1300	1500				1500	500	400				
40	1500	1300		1500	1500	1300		1500	1500	1300		1300	1500				1500	500	400				
50				1500				1500				1300				700					600		
60			1500	1500			1500	1500			1300	1300			600	700				600	600		
75			1300	1500			1300	1500			1300	1300			600	700				600	600		
95			1300	1500			1300	1000			1200	1300			600	600				500	600		
115			1300	1300			1300	1000			1200	1000			500	600				500	500		
130			1300	1300			1300	1000			1200	1000			500	600				500	500	150	250
140			1300	1200			1300	1000			1200	1000			500	600				500	500	150	250
150			1200	1200			1200	1000			1000	1000			500	600				500	500	150	250
175			1200	1200			1200	1000			1000	1000			500	500				500	500	150	250
230			1000	1000			1000	1000			1000	1000			500	500				500	400	150	150
250			1000	1000			1000	1000			900	800			400	400				400	400	150	150
275			1000	1000			1000	1000			900	800			400	400				400	400	150	150
300				900			900	1000			800	800			400	400				400	400	100	150
320											800	800			400	400				300	400	100	150
385											700	700			300	400				300	300	100	150
420											700	700			300	300				300	300	100	150
460											600	600			300	300				300	300	100	150
510											600	600			300	300				300	300	100	150
550*											600	600			300	300				300	300	100	150

* For voltages to 680 - same as for 550.

Ammo

V	5				7				10				14				20					23	
	ZV	AV/ 602	SV	CV/ CV+	ZV	AV/ 802	SV	CV/ CV+	ZV	AV/ 902	SV	CV/ CV+	ZV	AV/ 1103	SV	CV/ CV+	ZV	AV 20	AV 40	SV	CV/ CV+	SV	CV/ CV+
2	2000				2000				2000				2000				2000						
4	2000				2000				2000				2000				2000						
6	2000				2000				2000				2000				2000						
8	2000				2000				2000				2000				2000						
11	2000			2000	2000			2000	2000				2000				2000						
14	2000	2000		2000	2000	2000		2000	2000	1800		1800	2000	1500			2000						
17	2000	2000		2000	2000	2000		2000	2000	1800		1800	2000	1800			2000						
20	1800	2000		2000	1800	2000		2000	1800	1800		1800	1800	1800			1800						
25	1800	1800		2000	1800	1800		2000	1800	1800		1800	1800				1800	600	400				
30	1800	1800		2000	1800	1800		2000	1800	1800		1500	1800				1800	600	400				
35	1800	1800		2000	1800	1800		2000	1800	1800		1500	1800				1800	600	400				
40	1800	1800		1800	1800	1800		1800	1800	1800		1500	1800				1800	600	400				
50				2000				2000				1800				800					700		
60			1800	2000			1800	2000			1600	1600			800	800				700	700		
75			1800	2000			1800	2000			1600	1600			800	800				700	700		
95			1600	1800			1600	1800			1500	1600			700	700				700	700		
115			1600	1600			1600	1600			1300	1500			700	700				600	600		
130			1600	1600			1600	1600			1300	1300			700	700				600	600	150	250
140			1600	1600			1600	1600			1300	1300			700	700				600	600	150	250
150			1500	1500			1500	1500			1300	1300			700	700				600	600	150	250
175			1500	1500			1500	1500			1300	1300			600	600				600	600	150	250
230			1200	1200			1200	1200			1200	1200			600	600				500	500	150	150
250			1200	1200			1200	1200			1000	1000			500	500				500	500	150	150
275			1200	1200			1200	1200			1000	1000			500	500				500	500	150	150
300				1000			1000	1000			1000	1000			500	500				500	500	100	150
320											1000	1000			500	500				400	400	100	150
385											900	900			400	400				400	400	100	150
420											900	800			400	400				400	400	100	150
460											800	800			400	400				400	400	100	150
510											800	800			400	400				300	400	100	150
550*											700	700			300	400				300	400	100	150

* For voltages to 680 - same as for 550.

Ordering Information

ZV Series

ZV 40 K 20 R L1 YY

ZV - Series Name
40 - Maximum Continuous Working Voltage - V_{rms}
K V_n Tolerance: K = ± 10 %, L = ± 15%, M = ± 20 %
20 - Size: 5, 7, 10, 14, 20
R - Packaging: R = Reel, A = Ammo Pack, B = Bulk
L1 - Lead Style; 1 = straight, 5 = crimped
YY - Special requirements

AV Series

AV 20 K 802 006 R L1 YY

AV - Series Name
20 - Maximum Continuous Working Voltage - V_{rms}
K - V_n Tolerance: K = ± 10 %, S = special
80 - Size: 60, 80, 90, 110; 80 = 8 mm
2 - Leas spacing Code: 2 = 5 mm, 3 = 7,5 mm
006 - WLD - Load Dump Energy Code: 006 = 6 J
R - Packaging: R = Reel, A = Ammo Pack, B = Bulk
L1 - Lead Style; 1 = straight, 5 = crimped
YY - Special requirements

CV / CV+ / SV Series

CV 130 K 14 R L1 YY

CV - Series Name
130 - Maximum Continuous Working Voltage - V_{rms}
K - V_n Tolerance: K = ± 10 %, J = ± 5%, S = special
14 - Size: 5, 7, 10, 14, 20, 23
R - Packaging: R = Reel, A = Ammo Pack, B = Bulk
L1 - Lead Style; 1 = straight, 5 = crimped
YY - Speciaa requirements

Varistor Marking for ZV / AV / CV / CV+ / SV Series

For Model Size 5, 7

14Z5

14 - V_{rms}
Z - the first letter of Series Name ZV
5 - Model Size: 5, 7

For Model Size 602

20A
003

20 - V_{rms}
A - the first letter of Series Name AV
003 - WLD Code: 003

For Model Size 5

CV
130K5

130 - V_{rms}
CV - Series Name
K - V_n Tolerance
5 - Model Size: 5

For Model Size 10, 14

ZV 40
K10

40 - V_{rms}
K - V_n Tolerance
10 - Model Size: 10, 14

For Model Size 802

AV 17
K 006

AV - Series Name
17 - V_{rms}
K - V_n Tolerance
006 - WLD Code: 006

For Model Size 20

KEKO
ZV 11
K20

KEKO - Tradename
ZV - Series Name
11 - V_{rms}
K - V_n Tolerance
20 - Model Size: 20

For Model Size 902,1103

KEKO
AV 30
K 100

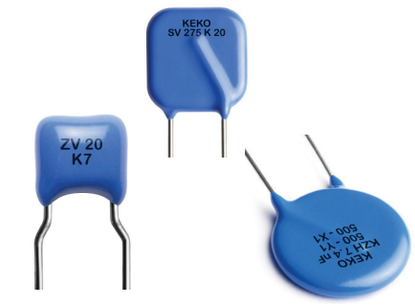
KEKO - Tradename
AV - Series Name
30 - V_{rms}
K - V_n Tolerance
100 - WLD Code: 012, 025, 050, 100

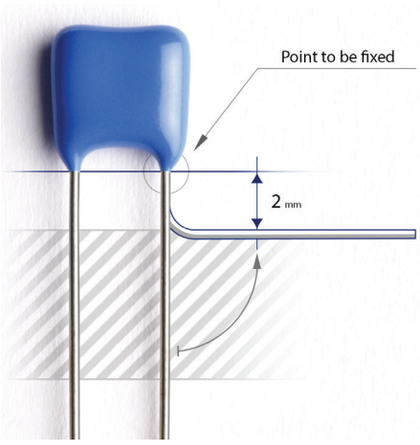
For Model Size 7, 10, 14, 20, 23

KEKO
CV 300 K 20
XX

KEKO - Tradename
CV - Series Name: Cv, Cv+, SV
300 - V_{rms}
K - V_n Tolerance
20 - Model Size: 7, 10, 14, 20, 23
xx - Approvals

ASSEMBLY RECOMMENDATIONS FOR TH COMPONENTS





Very often before soldering through-hole components, their leads get bent. It is important not to damage the component during lead bending. Typical damage incurred during bending is cracks in epoxy parts, which can lead to increased humidity sensitivity of a component and consequentially to a shorter life time.

In order to avoid epoxy parts damage it is necessary to:

- fix the most sensitive point (epoxy parts) of a component body

- bend the wire at least 2 mm below the end of epoxy parts

Other potential damage to a component which can lead to component failure or a shorter life time is thermal shock during manual soldering with a soldering iron. This can occur in the case when a soldering iron is placed too close to one point of the component body and most often it happens if the solder joint is too close to the varistor body.

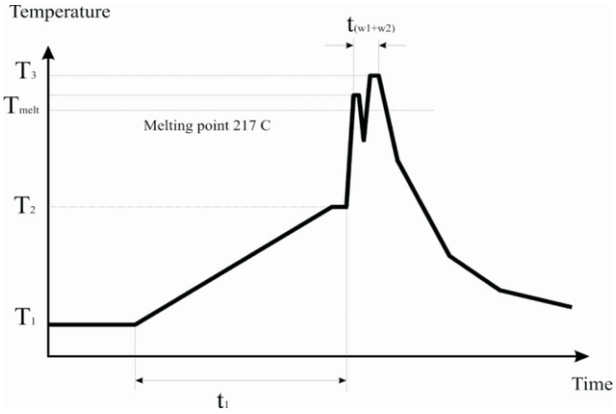
° Resistance to Soldering Heat

In the case of automatic wave soldering, it is important to provide sufficient resistance to soldering heat. In order to prevent any potential problems KEKO VARICON decided to introduce their own internal standard for testing the resistance to soldering heat of through-hole components: 300 °C, 10s.

° Pb-free Wave Soldering Profile Recommendations

Recommended soldering profiles for all above components are in accordance with JEDEC standard curves (J-STD-020D) and therefore compatible with the new Pb-free process.

° lead-fee Wave Soldering Profile



Pb-free wave soldering profile requirements for soldering heat resistance of components

Parameters	Symbol	Specification
preheating temparture gradient		4°C/s max.
Preheating time	t1	2 to 5 min
Min. preheating temperature	T1	130 °C
Max. preheating temperature	T2	180 °C
Melting temperature/point	T_{meltv}	217 °C
Time in wave soldering phase (w_1+w_2)	t_{w1+w2}	10s
Max. wave temperature (w_1+w_2)	T_3	265 °C +0/-5 °C
Cooling tempeature gradient		6° C/s max.
Tempearature jump form T_2 to T_3 (w_1)	$T_{3(w1)}$ - T_2	120 °C max
Time from 25°C to T_3 (wave temperature)		8 min max.

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 °C or at any other specified temperature
Varistor Voltage	V_n	Voltage across the varistor measured at a given reference current In
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/ Vapp, 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 miaximum 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 environment. It is an exponentially decaying positive voltage which occurs in the event of a battery disconect while the alternator is still generating charging current with other loads remaining on the alternator circuit at the time of battery disconect.
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 applies, 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 at @ 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 0 log (I_1/I_n)/log(V_1/V_n) = 1/log(V1/V_n), where: - I_n is reference current (1 mA) and V_n is varistor voltage - I_1 = 10 In, 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 at 85 °C - V_n at 25 °C) / (V_n at 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 varistro 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	UCT = Upper Category Temperature - the maximum ambient temperature for which a varistor has been designed to operate continuously, LCT = Lower Category Temperature - the minimum ambient temperature at 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 (85 °C for PV and 125 °C for DV)

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