



SIOV metal oxide varistors

Leaded varistors, AdvancedD series

Series/Type: S05 ... E2, S07 ... E2, S10 ... E2, S14 ... E2, S20 ... E2

Date: December 2007

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Leaded varistors

AdvancedD series

Construction

- Round varistor element, leaded
- Coating: epoxy resin, flame-retardant to UL 94 V-0
- Terminals: tinned copper wire

Features

- High-energy AdvancedD series E2
- High surge current ratings up to 10 kA
- High energy ratings up to 440 J
- Wide operating voltage range 130 ... 680 V_{RMS}
- PSpice models

Approvals

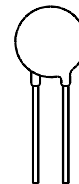
- UL
- CSA
- VDE
- CECC
- CQC S05/07 (K11 ... K460), S10/S14 (K11 ... K680), S20 (K11 ... K1100)
- IEC

Delivery mode

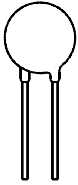
- Bulk (standard), taped versions on reel or in Ammo pack upon request.
- For further details refer to chapter "Taping, packaging and lead configuration" for leaded varistors.

General technical data

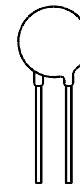
Climatic category	to IEC 60068-1	40/85/56	
Operating temperature	to CECC 42 000	-40 ... + 85	°C
Storage temperature		-40 ... +125	°C
Electric strength	to CECC 42 000	≥2.5	kV _{RMS}
Insulation resistance	to CECC 42 000	≥10	MΩ
Response time		<25	ns


Leaded varistors
Advanced series
Maximum ratings ($T_A = 85\text{ °C}$)

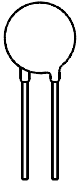
Ordering code	Type (untaped) SIOV-	V_{RMS}	V_{DC}	i_{max} (8/20 μ s)	W_{max} (2 ms)	P_{max}
		V	V	A	J	W
B72205S2131K101	S05K130E2	130	170	800	6.0	0.10
B72207S2131K101	S07K130E2	130	170	1750	12.5	0.25
B72210S2131K101	S10K130E2	130	170	3500	25.0	0.40
B72214S2131K101	S14K130E2	130	170	6000	50.0	0.60
B72220S2131K101	S20K130E2	130	170	10000	100.0	1.00
B72205S2141K101	S05K140E2	140	180	800	6.5	0.10
B72207S2141K101	S07K140E2	140	180	1750	13.5	0.25
B72210S2141K101	S10K140E2	140	180	3500	27.5	0.40
B72214S2141K101	S14K140E2	140	180	6000	55.0	0.60
B72220S2141K101	S20K140E2	140	180	10000	110.0	1.00
B72205S2151K101	S05K150E2	150	200	800	7.5	0.10
B72207S2151K101	S07K150E2	150	200	1750	15.0	0.25
B72210S2151K101	S10K150E2	150	200	3500	30.0	0.40
B72214S2151K101	S14K150E2	150	200	6000	60.0	0.60
B72220S2151K101	S20K150E2	150	200	10000	120.0	1.00
B72205S2171K101	S05K175E2	175	225	800	8.0	0.10
B72207S2171K101	S07K175E2	175	225	1750	17.0	0.25
B72210S2171K101	S10K175E2	175	225	3500	35.0	0.40
B72214S2171K101	S14K175E2	175	225	6000	70.0	0.60
B72220S2171K101	S20K175E2	175	225	10000	135.0	1.00
B72205S2211K101	S05K210E2	210	270	800	9.5	0.10
B72207S2211K101	S07K210E2	210	270	1750	20.0	0.25
B72210S2211K101	S10K210E2	210	270	3500	42.0	0.40
B72214S2211K101	S14K210E2	210	270	6000	80.0	0.60
B72220S2211K101	S20K210E2	210	270	10000	160.0	1.00

**Leaded varistors****Advanced series****Characteristics** ($T_A = 25\text{ °C}$)

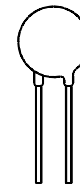
Ordering code	V_V (1 mA) V	ΔV_V (1 mA) %	$V_{c, \max}$ (i_c) V	i_c A	C_{typ} (1 kHz) pF
B72205S2131K101	205	± 10	340	5.0	100
B72207S2131K101	205	± 10	340	10.0	200
B72210S2131K101	205	± 10	340	25.0	400
B72214S2131K101	205	± 10	340	50.0	650
B72220S2131K101	205	± 10	340	100.0	1340
B72205S2141K101	220	± 10	360	5.0	95
B72207S2141K101	220	± 10	360	10.0	180
B72210S2141K101	220	± 10	360	25.0	370
B72214S2141K101	220	± 10	360	50.0	610
B72220S2141K101	220	± 10	360	100.0	1240
B72205S2151K101	240	± 10	395	5.0	90
B72207S2151K101	240	± 10	395	10.0	170
B72210S2151K101	240	± 10	395	25.0	350
B72214S2151K101	240	± 10	395	50.0	570
B72220S2151K101	240	± 10	395	100.0	1160
B72205S2171K101	270	± 10	455	5.0	75
B72207S2171K101	270	± 10	455	10.0	150
B72210S2171K101	270	± 10	455	25.0	300
B72214S2171K101	270	± 10	455	50.0	490
B72220S2171K101	270	± 10	455	100.0	1000
B72205S2211K101	330	± 10	545	5.0	65
B72207S2211K101	330	± 10	545	10.0	125
B72210S2211K101	330	± 10	545	25.0	250
B72214S2211K101	330	± 10	545	50.0	410
B72220S2211K101	330	± 10	545	100.0	835


Leaded varistors
Advanced series
Maximum ratings ($T_A = 85\text{ °C}$)

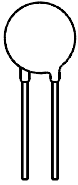
Ordering code	Type (untaped) SIOV-	V_{RMS}	V_{DC}	i_{max} (8/20 μ s)	W_{max} (2 ms)	P_{max}
		V	V	A	J	W
B72205S2231K101	S05K230E2	230	300	800	11.0	0.10
B72207S2231K101	S07K230E2	230	300	1750	23.0	0.25
B72210S2231K101	S10K230E2	230	300	3500	45.0	0.40
B72214S2231K101	S14K230E2	230	300	6000	90.0	0.60
B72220S2231K101	S20K230E2	230	300	10000	180.0	1.00
B72205S2251K101	S05K250E2	250	320	800	12.0	0.10
B72207S2251K101	S07K250E2	250	320	1750	25.0	0.25
B72210S2251K101	S10K250E2	250	320	3500	50.0	0.40
B72214S2251K101	S14K250E2	250	320	6000	100.0	0.60
B72220S2251K101	S20K250E2	250	320	10000	195.0	1.00
B72205S2271K101	S05K275E2	275	350	800	13.5	0.10
B72207S2271K101	S07K275E2	275	350	1750	27.5	0.25
B72210S2271K101	S10K275E2	275	350	3500	55.0	0.40
B72214S2271K101	S14K275E2	275	350	6000	110.0	0.60
B72220S2271K101	S20K275E2	275	350	10000	215.0	1.00
B72205S2301K101	S05K300E2	300	385	800	15.0	0.10
B72207S2301K101	S07K300E2	300	385	1750	30.0	0.25
B72210S2301K101	S10K300E2	300	385	3500	60.0	0.40
B72214S2301K101	S14K300E2	300	385	6000	125.0	0.60
B72220S2301K101	S20K300E2	300	385	10000	250.0	1.00
B72207S2321K101	S07K320E2	320	420	1750	32.0	0.25
B72210S2321K101	S10K320E2	320	420	3500	67.0	0.40
B72214S2321K101	S14K320E2	320	420	6000	136.0	0.60
B72220S2321K101	S20K320E2	320	420	10000	273.0	1.00

**Leaded varistors****Advanced series****Characteristics** ($T_A = 25\text{ °C}$)

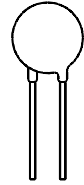
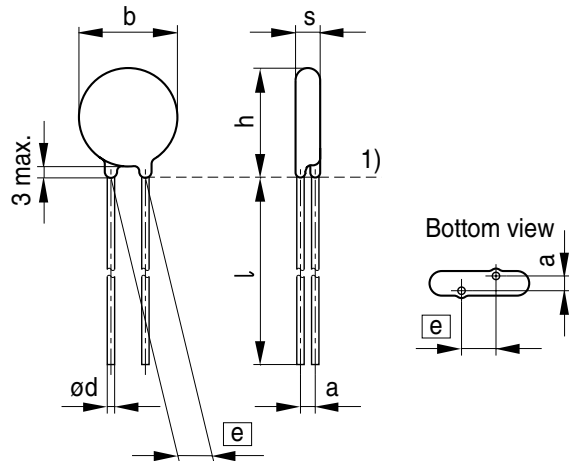
Ordering code	V_V (1 mA) V	ΔV_V (1 mA) %	$V_{c, \max}$ (i_c) V	i_c A	C_{typ} (1 kHz) pF
B72205S2231K101	360	± 10	595	5.0	60
B72207S2231K101	360	± 10	595	10.0	115
B72210S2231K101	360	± 10	595	25.0	230
B72214S2231K101	360	± 10	595	50.0	380
B72220S2231K101	360	± 10	595	100.0	760
B72205S2251K101	390	± 10	650	5.0	55
B72207S2251K101	390	± 10	650	10.0	105
B72210S2251K101	390	± 10	650	25.0	215
B72214S2251K101	390	± 10	650	50.0	350
B72220S2251K101	390	± 10	650	100.0	700
B72205S2271K101	430	± 10	710	5.0	50
B72207S2271K101	430	± 10	710	10.0	95
B72210S2271K101	430	± 10	710	25.0	195
B72214S2271K101	430	± 10	710	50.0	320
B72220S2271K101	430	± 10	710	100.0	630
B72205S2301K101	470	± 10	775	5.0	45
B72207S2301K101	470	± 10	775	10.0	90
B72210S2301K101	470	± 10	775	25.0	180
B72214S2301K101	470	± 10	775	50.0	300
B72220S2301K101	470	± 10	775	100.0	580
B72207S2321K101	510	± 10	840	10.0	85
B72210S2321K101	510	± 10	840	25.0	170
B72214S2321K101	510	± 10	840	50.0	280
B72220S2321K101	510	± 10	840	100.0	540


Leaded varistors
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Maximum ratings ($T_A = 85\text{ °C}$)

Ordering code	Type (untaped) SIOV-	V_{RMS}	V_{DC}	i_{max} (8/20 μ s)	W_{max} (2 ms)	P_{max}
		V	V	A	J	W
B72210S2381K101	S10K385E2	385	505	3500	67.0	0.40
B72214S2381K101	S14K385E2	385	505	5000	136.0	0.60
B72220S2381K101	S20K385E2	385	505	10000	273.0	1.00
B72210S2421K101	S10K420E2	420	560	3500	67.0	0.40
B72214S2421K101	S14K420E2	420	560	5000	136.0	0.60
B72220S2421K101	S20K420E2	420	560	10000	273.0	1.00
B72210S2461K101	S10K460E2	460	615	3500	70.0	0.40
B72214S2461K101	S14K460E2	460	615	5000	150.0	0.60
B72220S2461K101	S20K460E2	460	615	10000	300.0	1.00
B72210S2511K101	S10K510E2	510	670	3500	80.0	0.40
B72214S2511K101	S14K510E2	510	670	5000	165.0	0.60
B72220S2511K101	S20K510E2	510	670	10000	325.0	1.00
B72210S2551K101	S10K550E2	550	745	3500	90.0	0.40
B72214S2551K101	S14K550E2	550	745	5000	180.0	0.60
B72220S2551K101	S20K550E2	550	745	10000	360.0	1.00
B72210S2621K101	S10K625E2	625	825	3500	100.0	0.40
B72214S2621K101	S14K625E2	625	825	5000	200.0	0.60
B72220S2621K101	S20K625E2	625	825	10000	400.0	1.00
B72210S2681K101	S10K680E2	680	895	3500	110.0	0.40
B72214S2681K101	S14K680E2	680	895	5000	220.0	0.60
B72220S2681K101	S20K680E2	680	895	10000	440.0	1.00

**Leaded varistors****AdvancedD series****Characteristics** ($T_A = 25\text{ °C}$)

Ordering code	V_V (1 mA) V	ΔV_V (1 mA) %	$V_{c, \max}$ (i_c) V	i_c A	C_{typ} (1 kHz) pF
B72210S2381K101	620	± 10	1025	25.0	150
B72214S2381K101	620	± 10	1025	50.0	240
B72220S2381K101	620	± 10	1025	100.0	450
B72210S2421K101	680	± 10	1120	25.0	135
B72214S2421K101	680	± 10	1120	50.0	220
B72220S2421K101	680	± 10	1120	100.0	420
B72210S2461K101	750	± 10	1240	25.0	120
B72214S2461K101	750	± 10	1240	50.0	200
B72220S2461K101	750	± 10	1240	100.0	380
B72210S2511K101	820	± 10	1355	25.0	110
B72214S2511K101	820	± 10	1355	50.0	180
B72220S2511K101	820	± 10	1355	100.0	340
B72210S2551K101	910	± 10	1500	25.0	105
B72214S2551K101	910	± 10	1500	50.0	170
B72220S2551K101	910	± 10	1500	100.0	320
B72210S2621K101	1000	± 10	1650	25.0	90
B72214S2621K101	1000	± 10	1650	50.0	150
B72220S2621K101	1000	± 10	1650	100.0	280
B72210S2681K101	1100	± 10	1815	25.0	85
B72214S2681K101	1100	± 10	1815	50.0	140
B72220S2681K101	1100	± 10	1815	100.0	250


Dimensional drawing


1) Seating plane to IEC 60717

VAR0408-C

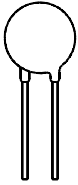
Weight

Nominal diameter mm	V _{RMS} V	Weight g
5	130 ... 300	0.4 ... 0.5
7	130 ... 320	0.6 ... 0.8
10	130 ... 680	1.2 ... 2.8
14	130 ... 680	1.8 ... 4.8
20	130 ... 680	3.3 ... 9.6

The weight of varistors in between these voltage classes can be interpolated.

Dimensions

Ordering code	e ±1 mm	a ±1 mm	b _{max} mm	s _{max} mm	h _{max} mm	l _{min} mm	d ±0.05 mm
B72205S2131K101	5.0	1.6	7.0	3.9	8.5	25.0	0.6
B72207S2131K101	5.0	1.6	9.0	3.9	11.0	25.0	0.6
B72210S2131K101	7.5	1.8	12.0	4.5	14.5	25.0	0.8
B72214S2131K101	7.5	1.9	15.5	4.6	18.5	25.0	0.8
B72220S2131K101	10.0	2.0	21.5	5.0	25.5	25.0	1.0
B72205S2141K101	5.0	1.7	7.0	4.0	8.5	25.0	0.6
B72207S2141K101	5.0	1.7	9.0	4.0	11.0	25.0	0.6
B72210S2141K101	7.5	1.9	12.0	4.6	14.5	25.0	0.8
B72214S2141K101	7.5	2.0	15.5	4.7	18.5	25.0	0.8
B72220S2141K101	10.0	2.1	21.5	5.1	25.5	25.0	1.0
B72205S2151K101	5.0	1.8	7.0	4.1	8.5	25.0	0.6
B72207S2151K101	5.0	1.8	9.0	4.1	11.0	25.0	0.6
B72210S2151K101	7.5	2.0	12.0	4.7	14.5	25.0	0.8
B72214S2151K101	7.5	2.1	15.5	4.8	18.5	25.0	0.8
B72220S2151K101	10.0	2.2	21.5	5.2	25.5	25.0	1.0
B72205S2171K101	5.0	2.0	7.0	4.3	8.5	25.0	0.6
B72207S2171K101	5.0	2.0	9.0	4.3	11.0	25.0	0.6
B72210S2171K101	7.5	2.2	12.0	4.9	14.5	25.0	0.8
B72214S2171K101	7.5	2.2	15.5	4.9	18.5	25.0	0.8
B72220S2171K101	10.0	2.3	21.5	5.3	25.5	25.0	1.0

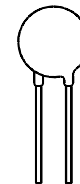


Leaded varistors

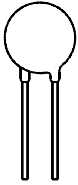
AdvancedD series

Dimensions

Ordering code	$e \pm 1$ mm	$a \pm 1$ mm	b_{\max} mm	s_{\max} mm	h_{\max} mm	l_{\min} mm	$d \pm 0.05$ mm
B72205S2211K101	5.0	1.7	7.0	4.2	8.5	25.0	0.6
B72207S2211K101	5.0	1.7	9.0	4.2	11.0	25.0	0.6
B72210S2211K101	7.5	1.9	12.0	5.0	14.5	25.0	0.8
B72214S2211K101	7.5	1.9	15.5	5.0	18.5	25.0	0.8
B72220S2211K101	10.0	2.2	21.5	5.4	25.5	25.0	1.0
B72205S2231K101	5.0	1.8	7.0	4.4	8.5	25.0	0.6
B72207S2231K101	5.0	1.8	9.0	4.4	11.0	25.0	0.6
B72210S2231K101	7.5	2.0	12.0	5.0	14.5	25.0	0.8
B72214S2231K101	7.5	2.0	15.5	5.1	18.5	25.0	0.8
B72220S2231K101	10.0	2.3	21.5	5.5	25.5	25.0	1.0
B72205S2251K101	5.0	1.9	7.0	4.5	8.5	25.0	0.6
B72207S2251K101	5.0	1.9	9.0	4.5	11.0	25.0	0.6
B72210S2251K101	7.5	2.1	12.0	5.2	14.5	25.0	0.8
B72214S2251K101	7.5	2.1	15.5	5.2	18.5	25.0	0.8
B72220S2251K101	10.0	2.4	21.5	5.7	25.5	25.0	1.0
B72205S2271K101	5.0	2.0	7.0	4.6	8.5	25.0	0.6
B72207S2271K101	5.0	2.0	9.0	4.6	11.0	25.0	0.6
B72210S2271K101	7.5	2.2	12.0	5.4	14.5	25.0	0.8
B72214S2271K101	7.5	2.2	15.5	5.4	18.5	25.0	0.8
B72220S2271K101	10.0	2.6	21.5	5.8	25.5	25.0	1.0
B72205S2301K101	5.0	2.1	7.0	4.7	8.5	25.0	0.6
B72207S2301K101	5.0	2.1	9.0	4.7	11.0	25.0	0.6
B72210S2301K101	7.5	2.3	12.0	5.6	14.5	25.0	0.8
B72214S2301K101	7.5	2.3	15.5	5.6	18.5	25.0	0.8
B72220S2301K101	10.0	2.8	21.5	6.1	25.5	25.0	1.0
B72207S2321K101	5.0	2.3	9.0	4.6	11.0	25.0	0.6
B72210S2321K101	7.5	2.4	12.0	5.8	15.0	25.0	0.8
B72214S2321K101	7.5	2.4	15.5	5.8	19.0	25.0	0.8
B72220S2321K101	10.0	2.9	21.5	6.2	25.5	25.0	1.0
B72210S2381K101	7.5	3.3	12.0	7.1	15.0	25.0	0.8
B72214S2381K101	7.5	3.4	15.5	7.1	19.0	25.0	0.8
B72220S2381K101	10.0	3.9	21.5	7.6	26.0	25.0	1.0
B72210S2421K101	7.5	3.5	12.0	7.4	15.0	25.0	0.8
B72214S2421K101	7.5	3.6	15.5	7.5	19.0	25.0	0.8
B72220S2421K101	10.0	4.2	21.5	7.9	26.0	25.0	1.0


Dimensions

Ordering code	$e \pm 1$ mm	$a \pm 1$ mm	b_{\max} mm	s_{\max} mm	h_{\max} mm	l_{\min} mm	$d \pm 0.05$ mm
B72210S2461K101	7.5	3.7	12.0	7.7	15.0	25.0	0.8
B72214S2461K101	7.5	3.8	15.5	7.8	19.0	25.0	0.8
B72220S2461K101	10.0	4.5	21.5	8.2	26.0	25.0	1.0
B72210S2511K101	7.5	4.0	12.0	8.0	15.0	25.0	0.8
B72214S2511K101	7.5	4.0	15.5	8.1	19.0	25.0	0.8
B72220S2511K101	10.0	4.6	21.5	8.6	26.0	25.0	1.0
B72210S2551K101	7.5	4.3	12.0	8.4	15.0	25.0	0.8
B72214S2551K101	7.5	4.7	15.5	8.5	19.0	25.0	0.8
B72220S2551K101	10.0	4.8	21.5	9.0	26.0	25.0	1.0
B72210S2621K101	7.5	5.0	12.0	8.8	15.0	25.0	0.8
B72214S2621K101	7.5	5.1	15.5	8.9	19.0	25.0	0.8
B72220S2621K101	10.0	5.4	21.5	9.4	26.0	25.0	1.0
B72210S2681K101	7.5	5.4	12.0	9.2	15.0	25.0	0.8
B72214S2681K101	7.5	5.5	15.5	9.3	19.0	25.0	0.8
B72220S2681K101	10.0	5.8	21.5	9.8	26.0	25.0	1.0

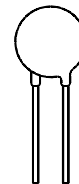


Leaded varistors

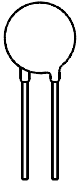
AdvancedD series

Reliability data

Test	Test methods/conditions	Requirement
Varistor voltage	The voltage between two terminals with the specified measuring current applied is called V_V (1 mA _{DC} @ 0.2 ... 2 s).	To meet the specified value.
Clamping voltage	The maximum voltage between two terminals with the specified standard impulse current (8/20 μ s) applied.	To meet the specified value.
Max. AC operating voltage	CECC 42 000, test 4.20 1000 h at UCT After having continuously applied the maximum allowable voltage at UCT ± 2 °C for 1000 h, the specimen shall be stored at room temperature and normal humidity for 1 to 2 h. Thereafter, the change of V_V shall be measured.	$ \Delta V/V (1 \text{ mA}) \leq 10\%$
Surge current derating, 8/20 μ s	CECC 42 000, test C 2.1 100 surge currents (8/20 μ s), unipolar, interval 30 s, amplitude corresponding to derating curve for 100 impulses at 20 μ s	$ \Delta V/V (1 \text{ mA}) \leq 10\%$ (measured in direction of surge current) No visible damage
Surge current derating, 2 ms	CECC 42 000, test C 2.1 100 surge currents (2 ms), unipolar, interval 120 s, amplitude corresponding to derating curve for 100 impulses at 2 ms	$ \Delta V/V (1 \text{ mA}) \leq 10\%$ (measured in direction of surge current) No visible damage
Electric strength	CECC 42 000, test 4.7 Metal balls method, 2500 V _{RMS} , 60 s The varistor is placed in a container holding 1.6 \pm 0.2 mm diameter metal balls such that only the terminations of the varistor are protruding. The specified voltage shall be applied between both terminals of the specimen connected together and the electrode inserted between the metal balls.	No breakdown


Reliability data

Test	Test methods/conditions	Requirement
Climatic sequence	CECC 42 000, test 4.16 The specimen shall be subjected to: a) dry heat at UCT, 16 h b) damp heat, 1st cycle: 55 °C, 93% r. H., 24 h c) cold, LCT, 2 h d) damp heat, additional 5 cycles: 55 °C/25 °C, 93% r. H., 24 h/cycle. Then the specimen shall be stored at room temperature and normal humidity for 1 to 2 h. Thereafter, the change of V_v shall be measured. Thereafter, insulation resistance R_{ins} shall be measured according to CECC 42 000, test 4.8 at $V = 500$ V.	$ \Delta V/V (1 \text{ mA}) \leq 10\%$ $R_{ins} \geq 1 \text{ M}\Omega$
Fast temperature cycling	IEC 60068-2-14, test Na, LCT/UCT, dwell time 30 min, 5 cycles	$ \Delta V/V (1 \text{ mA}) \leq 5\%$ No visible damage
Damp heat, steady state	The specimen shall be subjected to 40 ± 2 °C, 90 to 95% r. H. for 56 days without load / with 10% of the maximum continuous DC operating voltage V_{DC} . Then stored at room temperature and normal humidity for 1 to 2 h. Thereafter, the change of V_v shall be measured. Thereafter, insulation resistance R_{ins} shall be measured according to CECC 42 000, test 4.8 at $V = 500$ V.	$ \Delta V/V (1 \text{ mA}) \leq 10\%$ $R_{ins} \geq 1 \text{ M}\Omega$
Solderability	IEC 60068-2-20, test Ta, method 1 with modified conditions for lead-free solder alloys: 245 °C, 3 s: After dipping the terminals to a depth of approximately 3 mm from the body in a soldering bath of 245 °C for 3 s, the terminals shall be visually examined.	The inspection shall be carried out under adequate light with normal eyesight or with the assistance of a magnifier capable of giving a magnification of 4 to 10 times. The dipped surface shall be covered with a smooth and bright solder coating with no more than small amounts of scattered imperfections such as pinholes or un-wetted or de-wetted areas. These imperfections shall not be concentrated in one area.



Leaded varistors

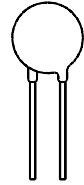
AdvancedD series

Reliability data

Test	Test methods/conditions	Requirement
Resistance to soldering heat	IEC 60068-2-20, test Tb, method 1A, 260 °C, 10 s: Each lead shall be dipped into a solder bath having a temperature of 260 ± 5 °C to a point 2.0 to 2.5 mm from the body of the specimen, be held there for 10 ± 1 s and then be stored at room temperature and normal humidity for 1 to 2 h. The change of V_v shall be measured and the specimen shall be visually examined.	$ \Delta V/V (1 \text{ mA}) \leq 5\%$ No visible damage
Tensile strength	IEC 60068-2-21, test Ua1 After gradually applying the force specified below and keeping the unit fixed for 10 s, the terminal shall be visually examined for any damage. Force for wire diameter: 0.6 mm = 10 N 0.8 mm = 10 N 1.0 mm = 20 N	$ \Delta V/V (1 \text{ mA}) \leq 5\%$ No break of solder joint, no wire break
Vibration	IEC 60068-2, test Fc Frequency range: 10 ... 55 Hz Amplitude: 0.75 mm or 98 m/s ² Duration: 6 h (3 · 2 h) Pulse: sine wave After repeatedly applying a single harmonic vibration according to the table above. The change of V_v shall be measured and the specimen shall be visually examined.	$ \Delta V/V (1 \text{ mA}) \leq 5\%$ No visible damage
Bump	IEC 60068-2-29, test Eb Pulse duration: 6 ms Max. acceleration: 400 m/s ² Number of bumps: 4000 Pulse: half sine	$ \Delta V/V (1 \text{ mA}) \leq 5\%$ No visible damage
Flammability	IEC 60695-2-2 (needle flame test) Severity: vertical 10 s	5 s max.

Note:

UCT = Upper category temperature / LCT = Lower category temperature / R_{ins} = Insulation resistance to CECC 42 000, test 4.8

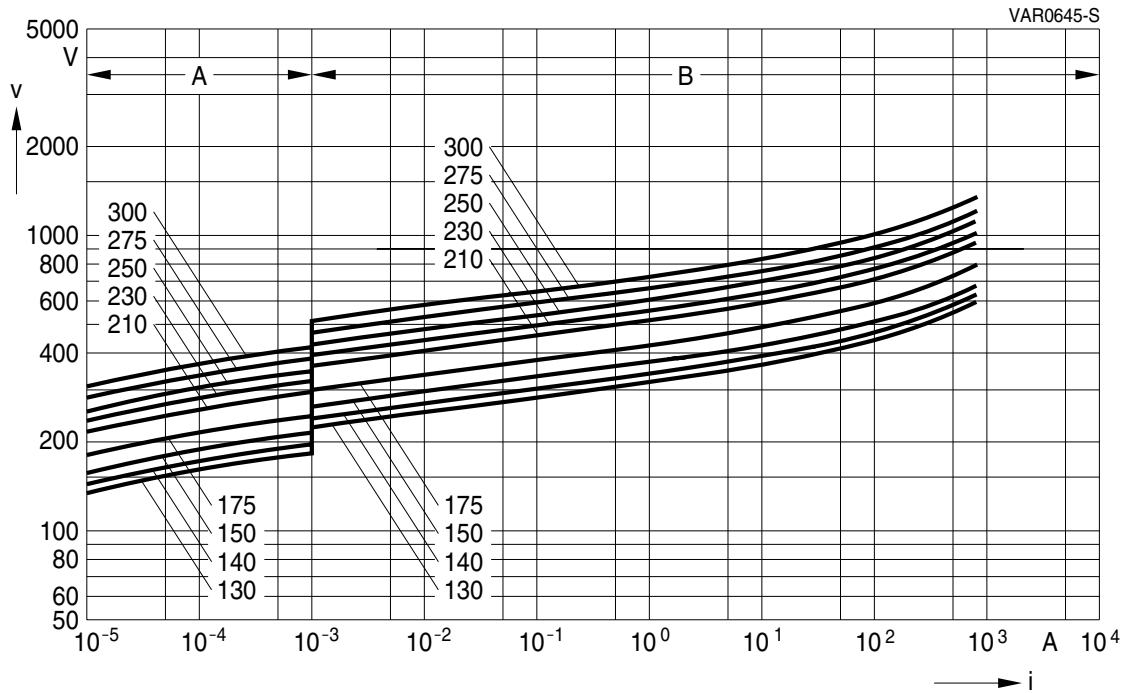


Leaded varistors
AdvancedD series

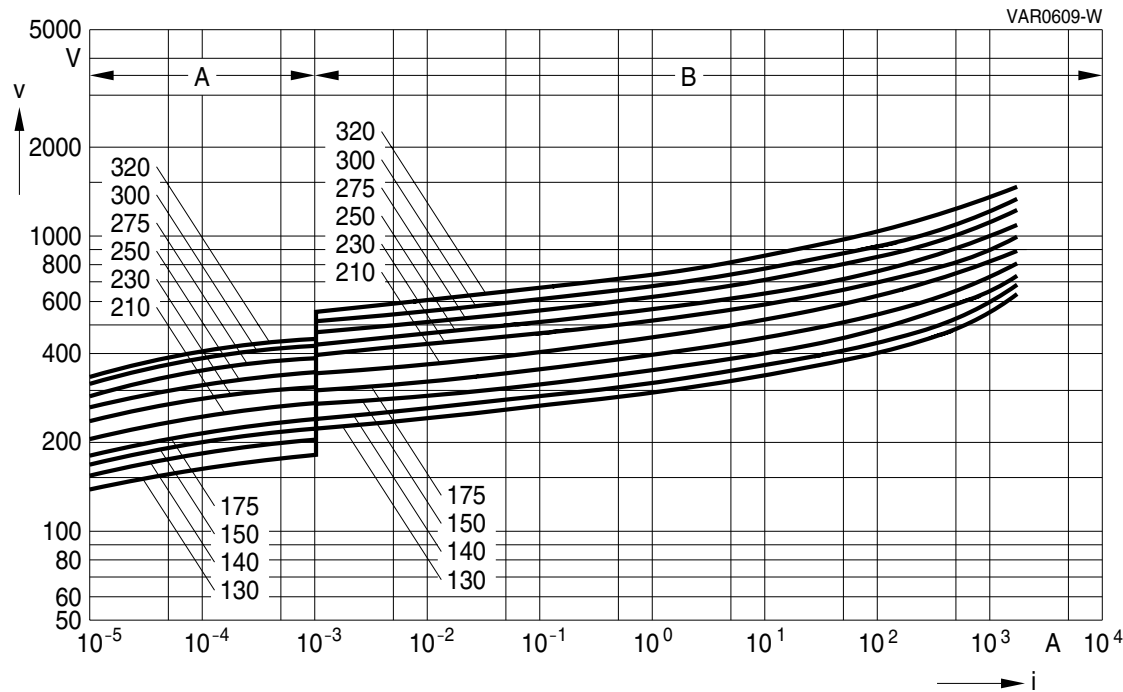
v/i characteristics

$v = f(i)$ – for explanation of the characteristics refer to “General technical information”, 1.6.3

A = Leakage current { for worst-case
B = Protection level { varistor tolerances

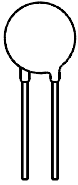


SIOV-S05 ... E2



SIOV-S07 ... E2

Please read *Cautions and warnings* and *Important notes* at the end of this document.

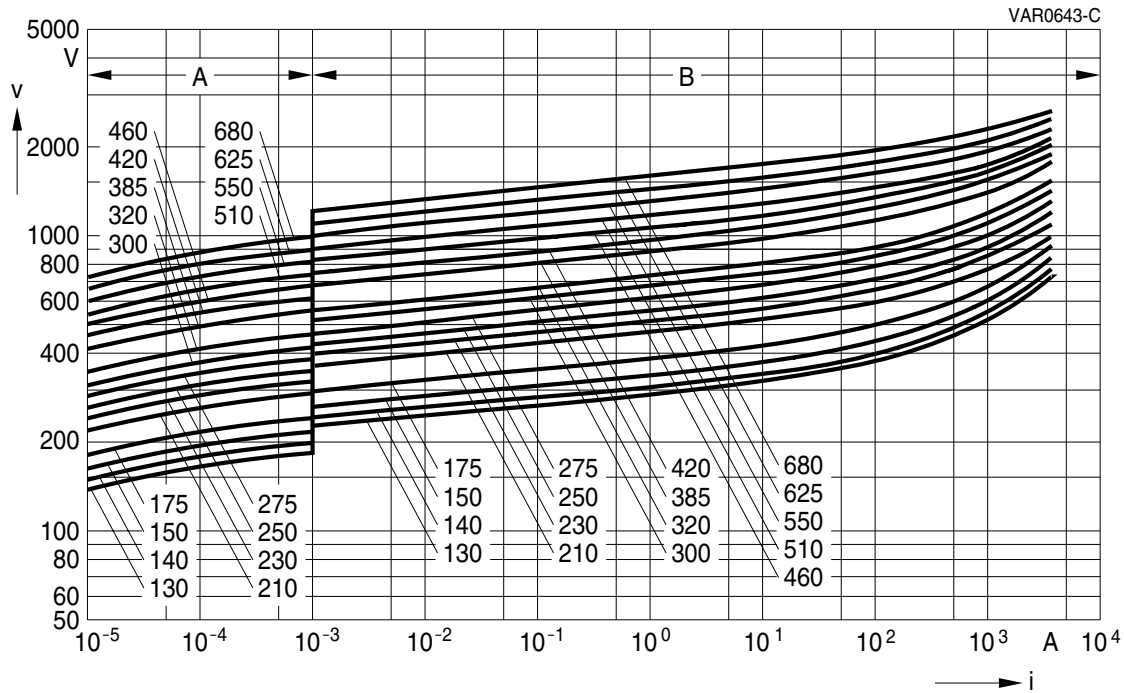


Leaded varistors
AdvancedD series

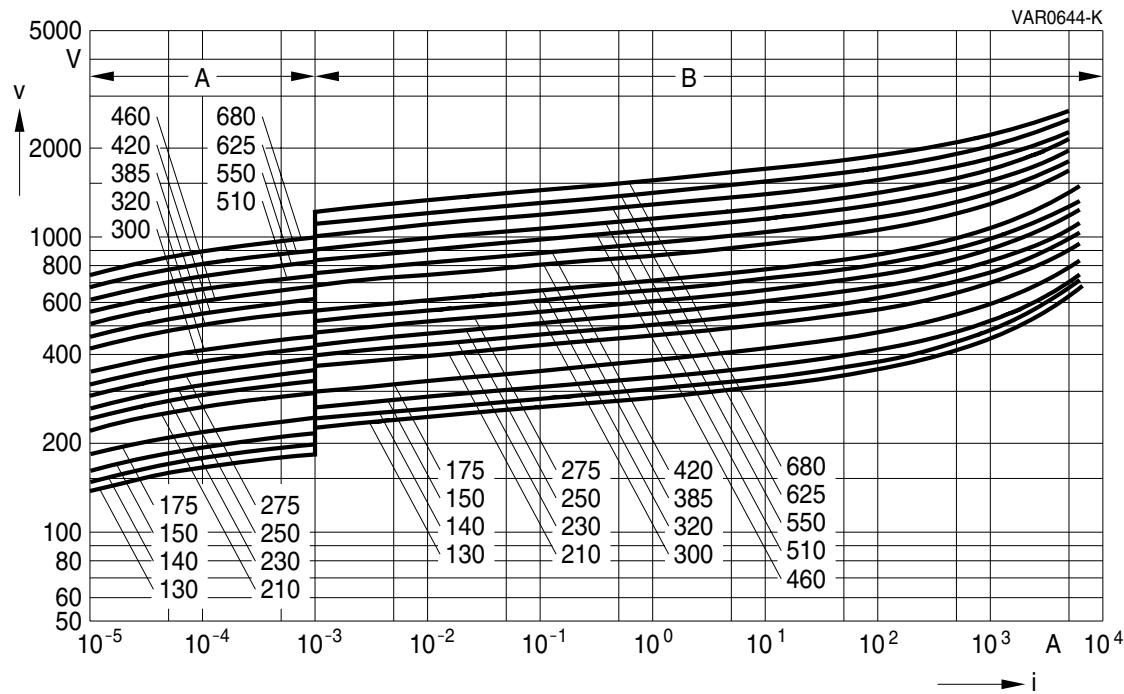
v/i characteristics

$v = f(i)$ – for explanation of the characteristics refer to “General technical information”, 1.6.3

A = Leakage current { for worst-case
B = Protection level { varistor tolerances

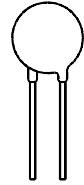


SIOV-S10 ... E2



SIOV-S14 ... E2

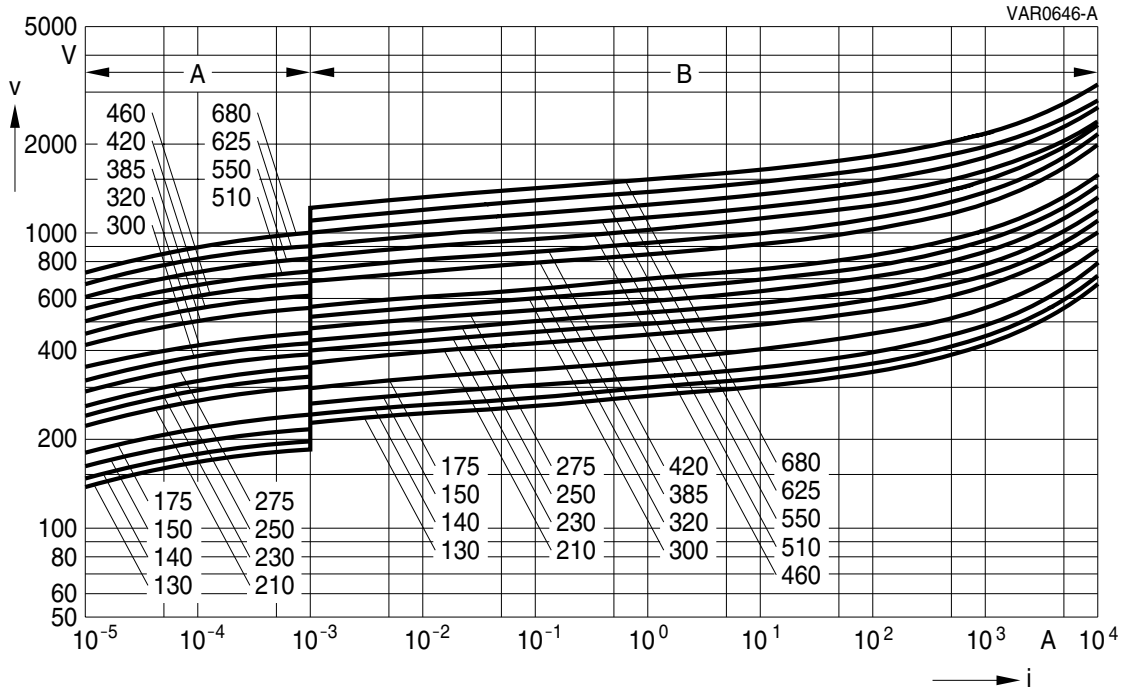
Please read *Cautions and warnings* and *Important notes* at the end of this document.



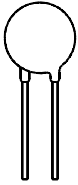
Leaded varistors
AdvancedD series

v/i characteristics

$v = f(i)$ – for explanation of the characteristics refer to “General technical information”, 1.6.3 A = Leakage current B = Protection level { for worst-case varistor tolerances



SIOV-S20 ... E2

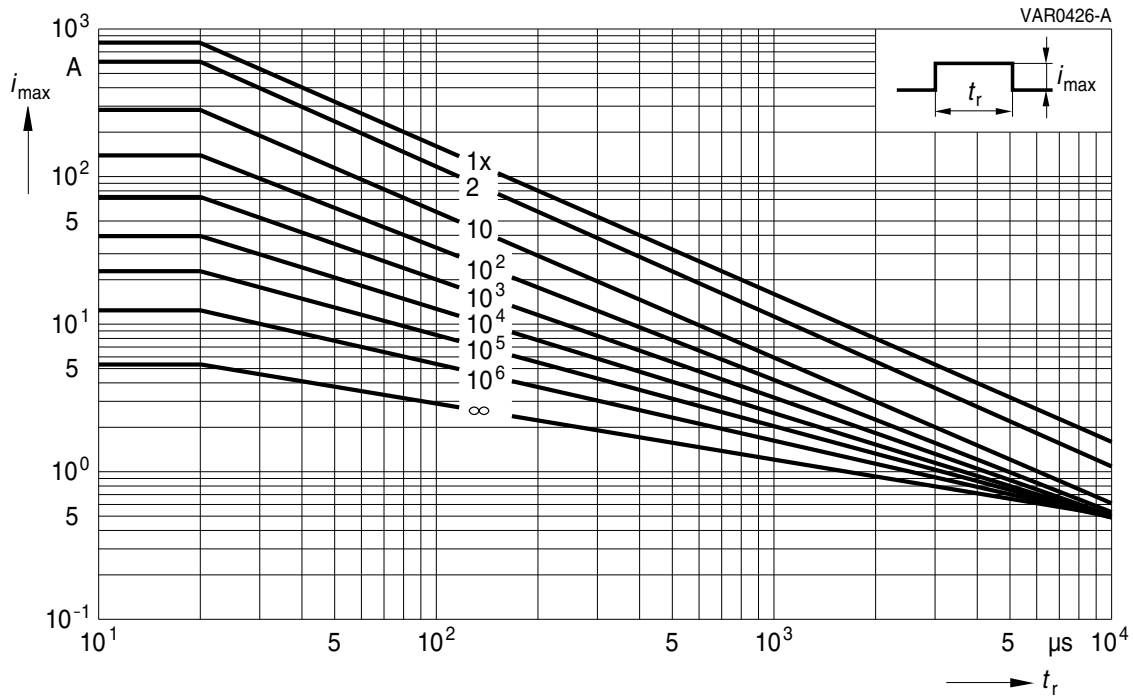


Leaded varistors
AdvancedD series

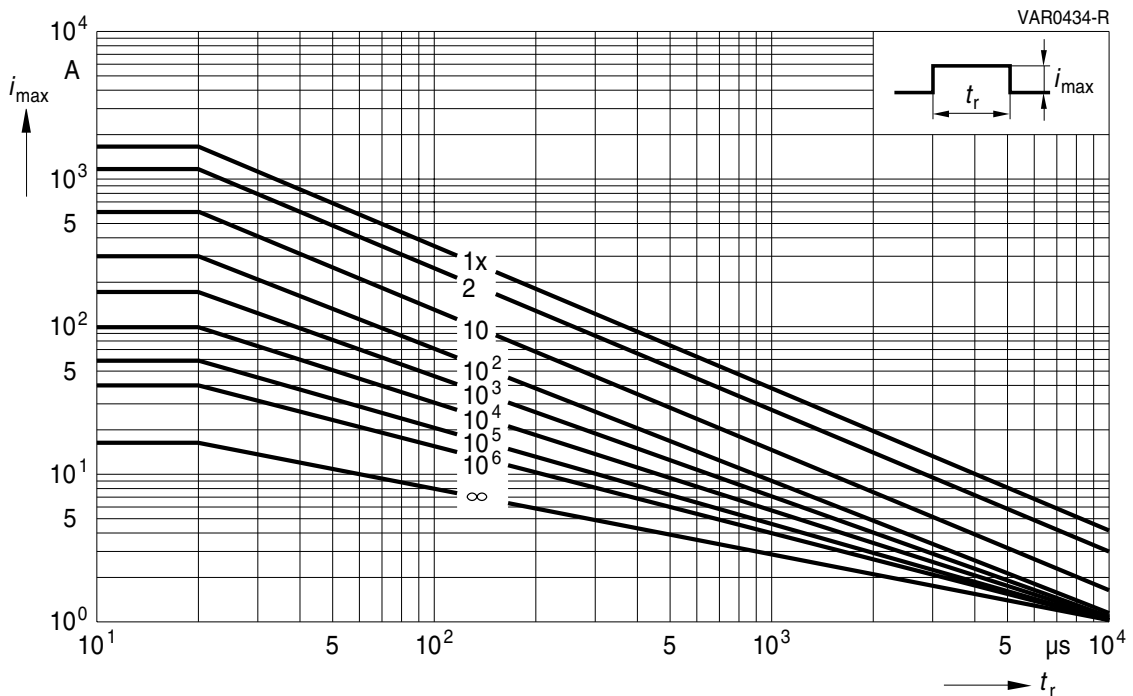
Derating curves

Maximum surge current $i_{max} = f(t_r, \text{pulse train})$

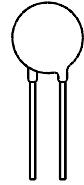
For explanation of the derating curves refer to "General technical information", section 1.8.1



SIOV-S05K130 ... K300E2



SIOV-S07K130 ... K320E2

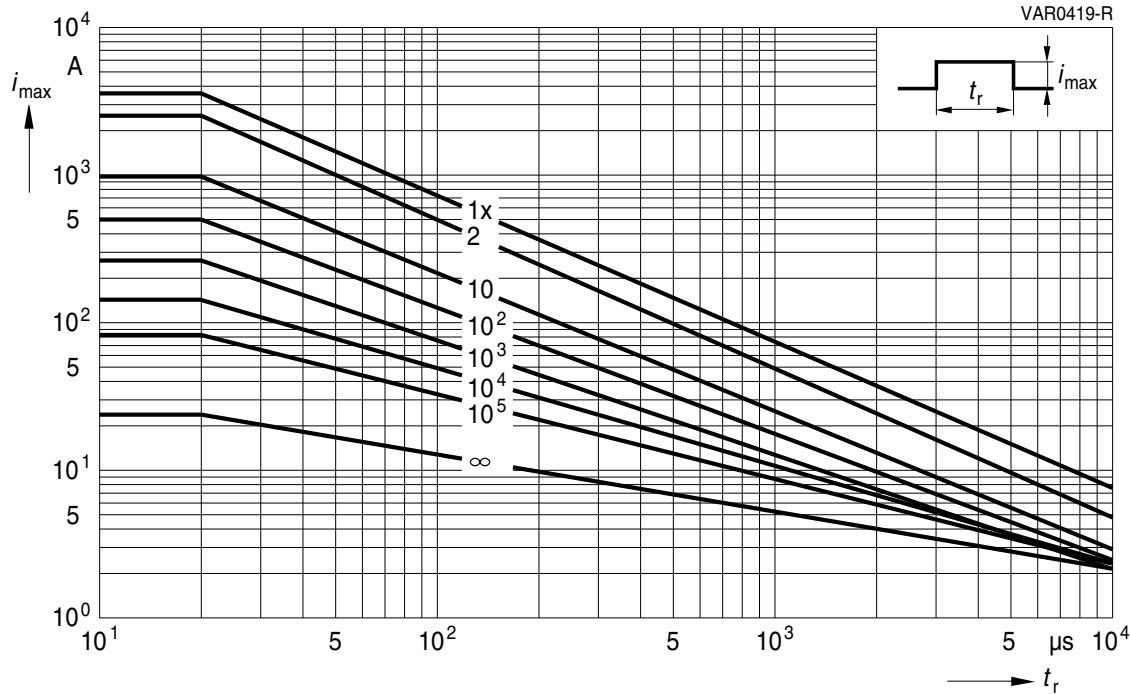


Leaded varistors
AdvancedD series

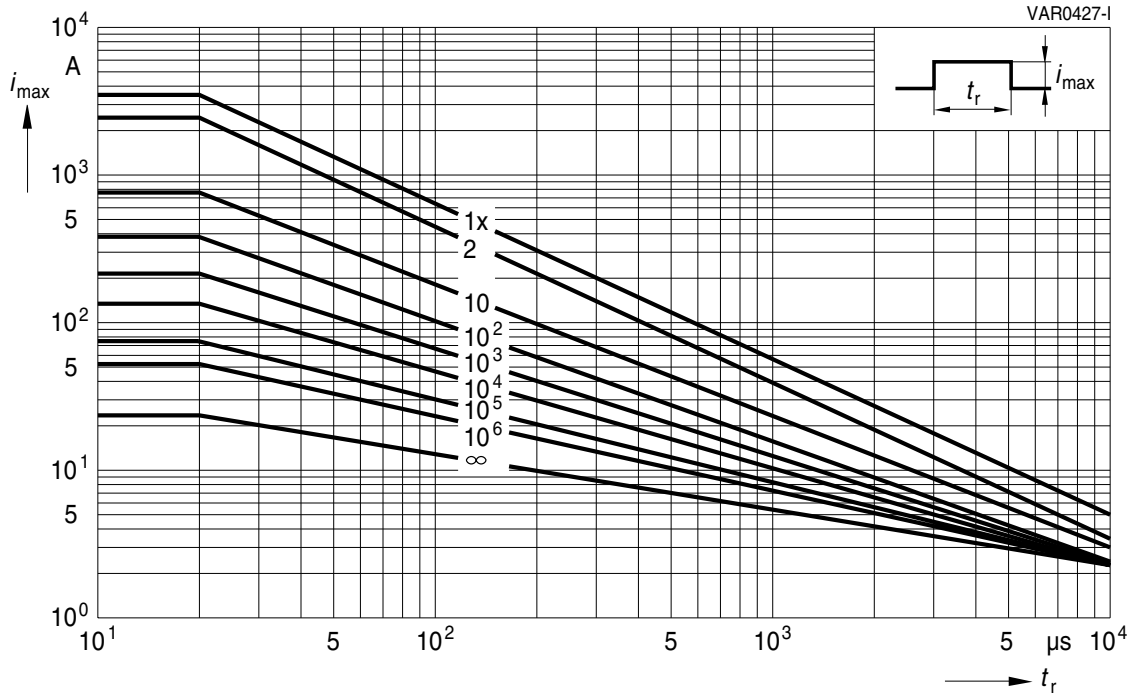
Derating curves

Maximum surge current $i_{max} = f(t_r, \text{pulse train})$

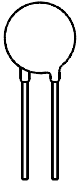
For explanation of the derating curves refer to "General technical information", section 1.8.1



SIOV-S10K130 ... K320E2



SIOV-S10K385 ... K680E2

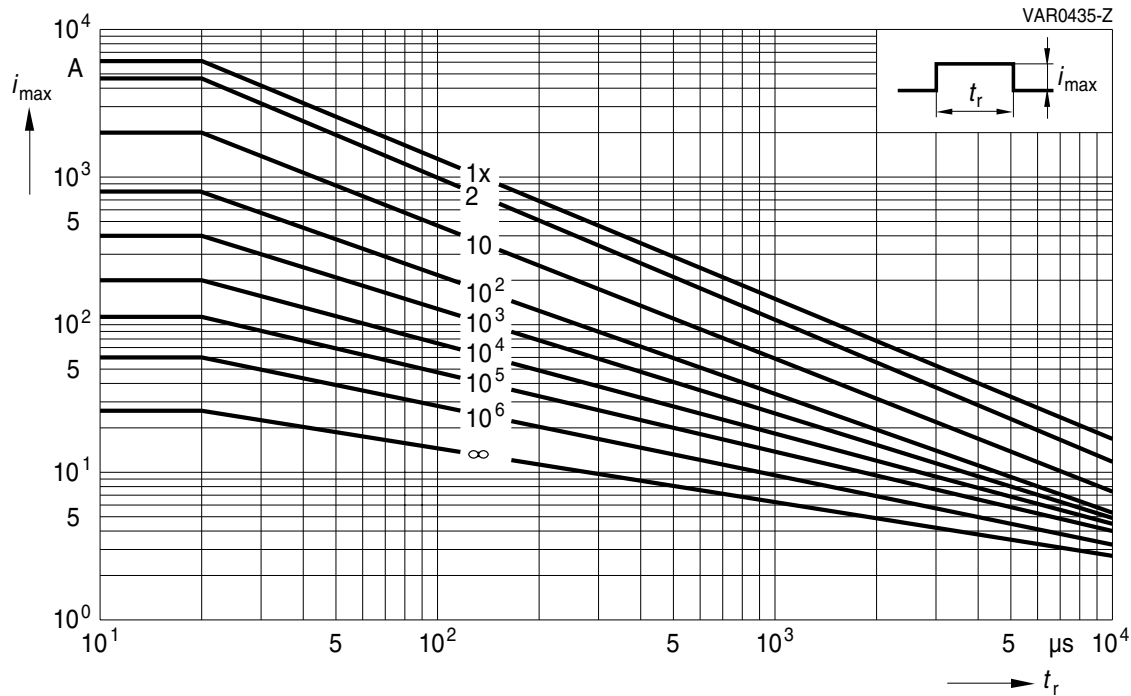


Leaded varistors
AdvancedD series

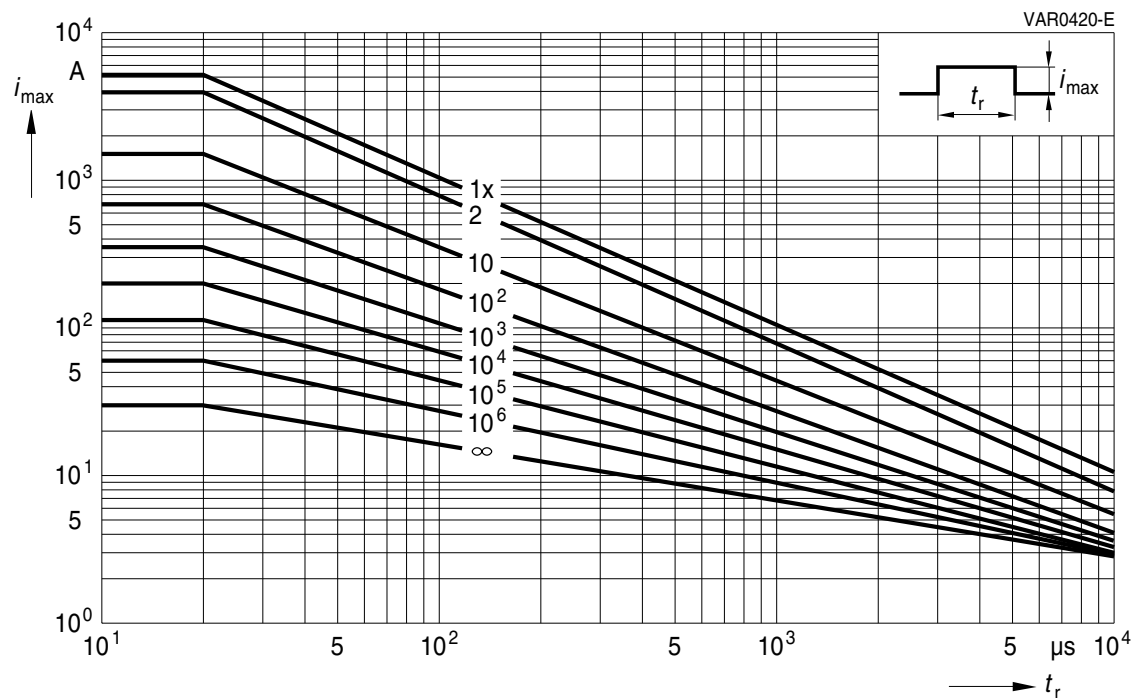
Derating curves

Maximum surge current $i_{max} = f(t_r, \text{pulse train})$

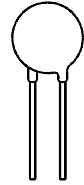
For explanation of the derating curves refer to "General technical information", section 1.8.1



SIOV-S14K130 ... K320E2



SIOV-S14K385 ... K680E2

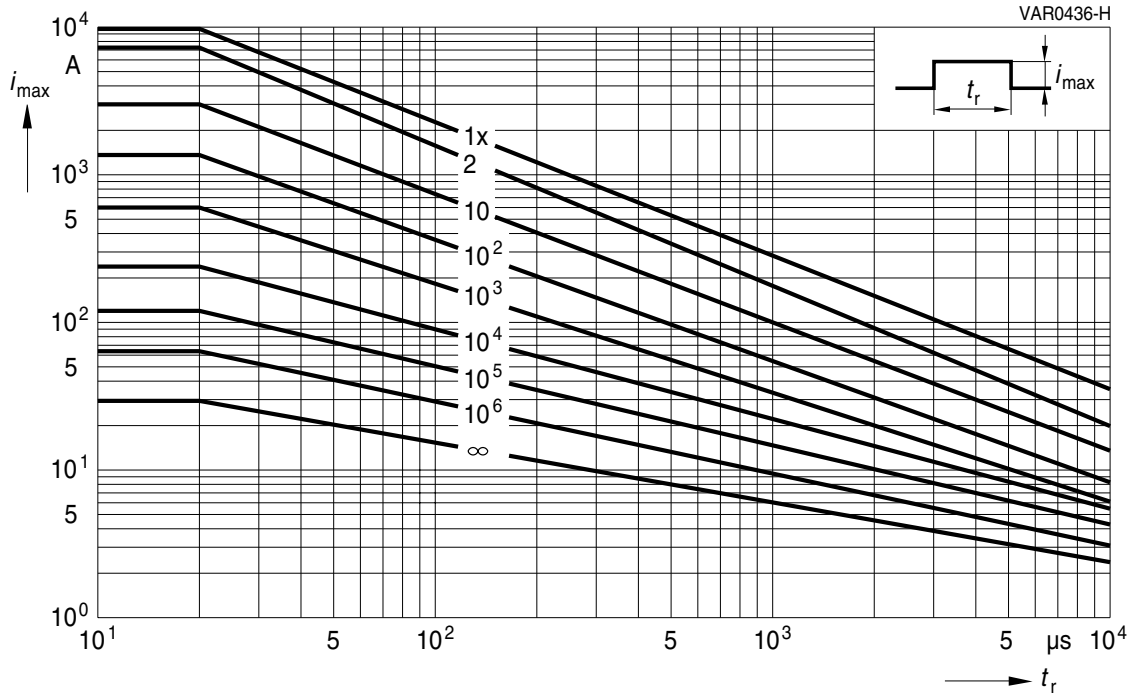


Leaded varistors
AdvancedD series

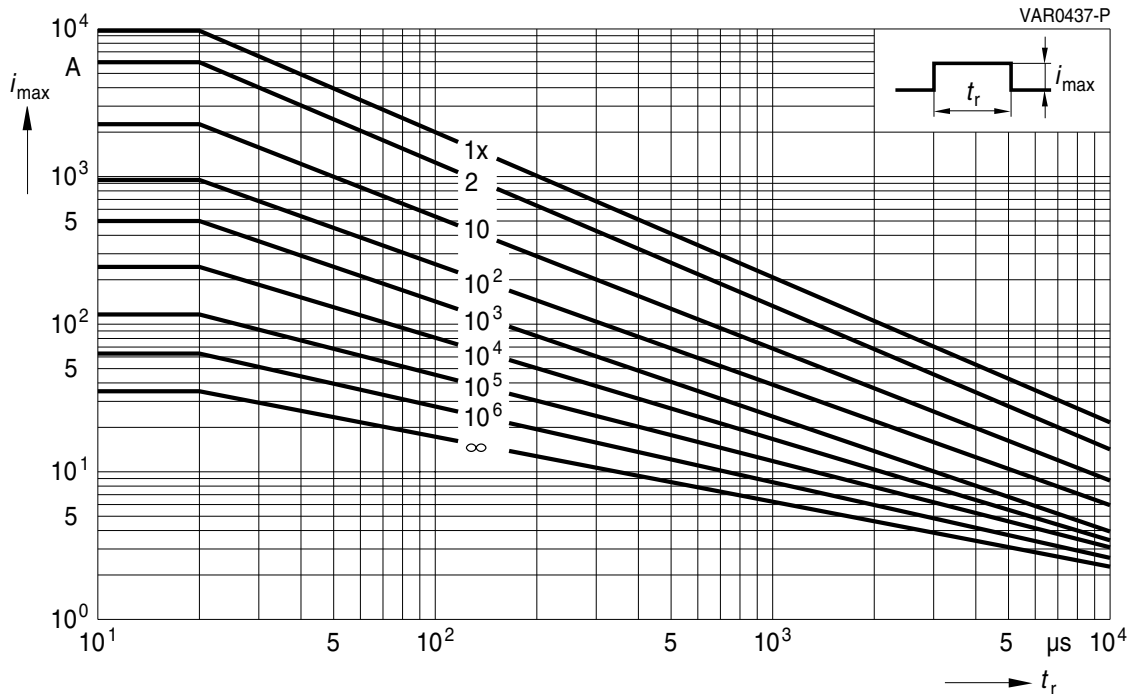
Derating curves

Maximum surge current $i_{max} = f(t_r, \text{pulse train})$

For explanation of the derating curves refer to "General technical information", section 1.8.1



SIOV-S20K130 ... K320E2



SIOV-S20K385 ... K680E2

Cautions and warnings

General

1. EPCOS metal oxide varistors (SIOVs) are designed for specific applications and should not be used for purposes not identified in our specifications, application notes and data books unless otherwise agreed with EPCOS during the design-in-phase.
2. Ensure suitability of SIOVs through reliability testing during the design-in phase. SIOVs should be evaluated taking into consideration worst-case conditions.
3. For applications of SIOVs in line-to-ground circuits based on various international and local standards there are restrictions existing or additional safety measures required.

Storage

1. Store SIOVs only in original packaging. Do not open the package before storage.
2. Storage conditions in original packaging:
Storage temperature: $-25\text{ °C} \dots +45\text{ °C}$
Relative humidity: $<75\%$ annual average,
 $<95\%$ on maximum 30 days a year.
Dew precipitation: Is to be avoided.
3. Avoid contamination of an SIOV's surface during storage, handling and processing.
4. Avoid storage of SIOVs in harmful environments that can affect the function during long-term operation (examples given under operation precautions).
5. The SIOV type series should be soldered within the time specified:
SIOV-S, -Q, -LS 24 months
ETFV and SFS types 12 months.

Handling

1. SIOVs must not be dropped.
2. Components must not be touched with bare hands. Gloves are recommended.
3. Avoid contamination of the surface of SIOV electrodes during handling, be careful of the sharp edge of SIOV electrodes.

Soldering (where applicable)

1. Use rosin-type flux or non-activated flux.
2. Insufficient preheating may cause ceramic cracks.
3. Rapid cooling by dipping in solvent is not recommended.
4. Complete removal of flux is recommended.

Leaded varistors

AdvancedD series

Mounting

1. Potting, sealing or adhesive compounds can produce chemical reactions in the SIOV ceramic that will degrade the component's electrical characteristics.
2. Overloading SIOVs may result in ruptured packages and expulsion of hot materials. For this reason SIOVs should be physically shielded from adjacent components.

Operation

1. Use SIOVs only within the specified temperature operating range.
2. Use SIOVs only within the specified voltage and current ranges.
3. Environmental conditions must not harm SIOVs. Use SIOVs only in normal atmospheric conditions. Avoid use in the presence of deoxidizing gases (chlorine gas, hydrogen sulfide gas, ammonia gas, sulfuric acid gas, etc), corrosive agents, humid or salty conditions. Avoid contact with any liquids and solvents.

Important notes

The following applies to all products named in this publication:

1. Some parts of this publication contain **statements about the suitability of our products for certain areas of application**. These statements are based on our knowledge of typical requirements that are often placed on our products in the areas of application concerned. We nevertheless expressly point out **that such statements cannot be regarded as binding statements about the suitability of our products for a particular customer application**. As a rule, EPCOS is either unfamiliar with individual customer applications or less familiar with them than the customers themselves. For these reasons, it is always ultimately incumbent on the customer to check and decide whether an EPCOS product with the properties described in the product specification is suitable for use in a particular customer application.
2. We also point out that **in individual cases, a malfunction of passive electronic components or failure before the end of their usual service life cannot be completely ruled out in the current state of the art, even if they are operated as specified**. In customer applications requiring a very high level of operational safety and especially in customer applications in which the malfunction or failure of a passive electronic component could endanger human life or health (e.g. in accident prevention or life-saving systems), it must therefore be ensured by means of suitable design of the customer application or other action taken by the customer (e.g. installation of protective circuitry or redundancy) that no injury or damage is sustained by third parties in the event of malfunction or failure of a passive electronic component.
3. **The warnings, cautions and product-specific notes must be observed.**
4. In order to satisfy certain technical requirements, **some of the products described in this publication may contain substances subject to restrictions in certain jurisdictions (e.g. because they are classed as hazardous)**. Useful information on this will be found in our Material Data Sheets on the Internet (www.epcos.com/material). Should you have any more detailed questions, please contact our sales offices.
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