



SIOV metal oxide varistors

Leaded varistors, StandarD series

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

Date: December 2007

Leaded varistors

Standard series

Construction

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

Features

- Wide operating voltage range 11 ... 1100 V_{RMS}
- High surge current ratings up to 8 kA
- No derating up to 85 °C ambient temperature
- PSpice models

Approvals

- UL
- CSA (all types ≥K115)
- SEV
- 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.

Options

S10* types with lead spacing 5.0 mm and S20* types with lead spacing 7.5 mm are also available on request.

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
Standard 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
B72205S0271K101	S05K275	275	350	400	8.6	0.10
B72207S0271K101	S07K275	275	350	1200	21.0	0.25
B72210S0271K101	S10K275	275	350	2500	43.0	0.40
B72214S0271K101	S14K275	275	350	4500	71.0	0.60
B72220S0271K101	S20K275	275	350	8000	151.0	1.00
B72205S0301K101	S05K300	300	385	400	9.6	0.10
B72207S0301K101	S07K300	300	385	1200	23.0	0.25
B72210S0301K101	S10K300	300	385	2500	47.0	0.40
B72214S0301K101	S14K300	300	385	4500	76.0	0.60
B72220S0301K101	S20K300	300	385	8000	173.0	1.00
B72210S0321K101	S10K320	320	420	2500	50.0	0.40
B72214S0321K101	S14K320	320	420	4500	84.0	0.60
B72220S0321K101	S20K320	320	420	8000	184.0	1.00
B72205S0381K101	S05K385	385	505	400	13.0	0.10
B72207S0381K101	S07K385	385	505	1200	28.0	0.25
B72210S0381K101	S10K385	385	505	2500	40.0	0.40
B72214S0381K101	S14K385	385	505	4500	80.0	0.60
B72220S0381K101	S20K385	385	505	8000	150.0	1.00
B72205S0421K101	S05K420	420	560	400	14.0	0.10
B72207S0421K101	S07K420	420	560	1200	32.0	0.25
B72210S0421K101	S10K420	420	560	2500	45.0	0.40
B72214S0421K101	S14K420	420	560	4500	90.0	0.60
B72220S0421K101	S20K420	420	560	8000	175.0	1.00
B72205S0441K101	S05K440	440	585	400	16.0	0.10
B72207S0441K101	S07K440	440	585	1200	34.0	0.25
B72210S0441K101	S10K440	440	585	2500	47.0	0.40
B72214S0441K101	S14K440	440	585	4500	95.0	0.60
B72220S0441K101	S20K440	440	585	8000	185.0	1.00
B72205S0461K101	S05K460	460	615	400	18.0	0.10
B72207S0461K101	S07K460	460	615	1200	36.0	0.25
B72210S0461K101	S10K460	460	615	2500	50.0	0.40
B72214S0461K101	S14K460	460	615	4500	100.0	0.60
B72220S0461K101	S20K460	460	615	8000	195.0	1.00


Leaded varistors
Standard 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
B72205S0271K101	430	±10	710	5.0	50
B72207S0271K101	430	±10	710	10.0	95
B72210S0271K101	430	±10	710	25.0	195
B72214S0271K101	430	±10	710	50.0	320
B72220S0271K101	430	±10	710	100.0	630
B72205S0301K101	470	±10	775	5.0	45
B72207S0301K101	470	±10	775	10.0	90
B72210S0301K101	470	±10	775	25.0	180
B72214S0301K101	470	±10	775	50.0	300
B72220S0301K101	470	±10	775	100.0	580
B72210S0321K101	510	±10	840	25.0	170
B72214S0321K101	510	±10	840	50.0	280
B72220S0321K101	510	±10	840	100.0	540
B72205S0381K101	620	±10	1025	5.0	40
B72207S0381K101	620	±10	1025	10.0	75
B72210S0381K101	620	±10	1025	25.0	150
B72214S0381K101	620	±10	1025	50.0	240
B72220S0381K101	620	±10	1025	100.0	450
B72205S0421K101	680	±10	1120	5.0	35
B72207S0421K101	680	±10	1120	10.0	65
B72210S0421K101	680	±10	1120	25.0	135
B72214S0421K101	680	±10	1120	50.0	220
B72220S0421K101	680	±10	1120	100.0	420
B72205S0441K101	715	±10	1180	5.0	32
B72207S0441K101	715	±10	1180	10.0	60
B72210S0441K101	715	±10	1180	25.0	125
B72214S0441K101	715	±10	1180	50.0	210
B72220S0441K101	715	±10	1180	100.0	400
B72205S0461K101	750	±10	1240	5.0	30
B72207S0461K101	750	±10	1240	10.0	55
B72210S0461K101	750	±10	1240	25.0	120
B72214S0461K101	750	±10	1240	50.0	200
B72220S0461K101	750	±10	1240	100.0	380


Leaded varistors
Standard 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
B72210S0511K101	S10K510	510	670	2500	55.0	0.40
B72214S0511K101	S14K510	510	670	4500	110.0	0.60
B72220S0511K101	S20K510	510	670	6500	190.0	1.00
B72210S0551K101	S10K550	550	745	2500	60.0	0.40
B72214S0551K101	S14K550	550	745	4500	120.0	0.60
B72220S0551K101	S20K550	550	745	6500	210.0	1.00
B72210S0621K101	S10K625	625	825	2500	68.0	0.40
B72214S0621K101	S14K625	625	825	4500	130.0	0.60
B72220S0621K101	S20K625	625	825	6500	230.0	1.00
B72210S0681K101	S10K680	680	895	2500	72.0	0.40
B72214S0681K101	S14K680	680	895	4500	140.0	0.60
B72220S0681K101	S20K680	680	895	6500	250.0	1.00
B72214S0102K101	S14K1000 ¹⁾	1100	1465	4500	230.0	0.60
B72220S0102K101	S20K1000 ¹⁾	1100	1465	6500	410.0	1.00

1) Operating voltage differs from type designation.

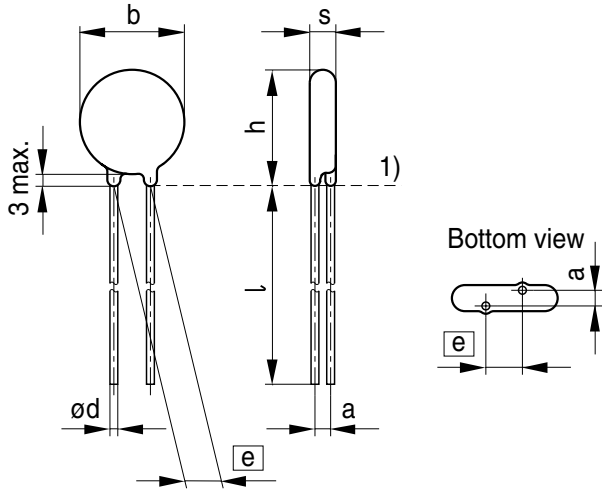

Leaded varistors
Standard series
Characteristics ($T_A = 25\text{ °C}$)

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
B72210S0511K101	820	± 10	1355	25.0	110
B72214S0511K101	820	± 10	1355	50.0	180
B72220S0511K101	820	± 10	1355	100.0	340
B72210S0551K101	910	± 10	1500	25.0	105
B72214S0551K101	910	± 10	1500	50.0	170
B72220S0551K101	910	± 10	1500	100.0	320
B72210S0621K101	1000	± 10	1650	25.0	90
B72214S0621K101	1000	± 10	1650	50.0	150
B72220S0621K101	1000	± 10	1650	100.0	280
B72210S0681K101	1100	± 10	1815	25.0	85
B72214S0681K101	1100	± 10	1815	50.0	140
B72220S0681K101	1100	± 10	1815	100.0	250
B72214S0102K101	1800	± 10	2970	50.0	100
B72220S0102K101	1800	± 10	2970	100.0	170



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Dimensional drawing



1) Seating plane to IEC 60717

VAR0408-C

Weight

Nominal diameter mm	V _{RMS} V	Weight g
5	11 ... 460	0.3 ... 0.7
7	11 ... 460	0.4 ... 1.1
10	11 ... 680	1.0 ... 3.0
14	11 ... 1000	1.4 ... 7.6
20	11 ... 1000	2.7 ... 15.7

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
B72205S0110K101	5.0	1.2	7.0	3.3	8.5	25.0	0.6
B72207S0110K101	5.0	1.2	9.0	3.4	11.0	25.0	0.6
B72210S0110K101	7.5	1.4	12.0	4.0	14.5	25.0	0.8
B72214S0110K101	7.5	1.4	15.5	4.0	18.5	25.0	0.8
B72220S0110K101	10.0	1.5	21.5	4.5	25.5	25.0	1.0
B72205S0140K101	5.0	1.3	7.0	3.4	8.5	25.0	0.6
B72207S0140K101	5.0	1.3	9.0	3.5	11.0	25.0	0.6
B72210S0140K101	7.5	1.5	12.0	4.2	14.5	25.0	0.8
B72214S0140K101	7.5	1.5	15.5	4.2	18.5	25.0	0.8
B72220S0140K101	10.0	1.6	21.5	4.6	25.5	25.0	1.0
B72205S0170K101	5.0	1.4	7.0	3.5	8.5	25.0	0.6
B72207S0170K101	5.0	1.4	9.0	3.6	11.0	25.0	0.6
B72210S0170K101	7.5	1.6	12.0	4.4	14.5	25.0	0.8
B72214S0170K101	7.5	1.7	15.5	4.4	18.5	25.0	0.8
B72220S0170K101	10.0	1.8	21.5	4.8	25.5	25.0	1.0
B72205S0200K101	5.0	1.2	7.0	3.5	8.5	25.0	0.6
B72207S0200K101	5.0	1.2	9.0	3.6	11.0	25.0	0.6
B72210S0200K101	7.5	1.8	12.0	4.5	14.5	25.0	0.8
B72214S0200K101	7.5	1.9	15.5	4.6	18.5	25.0	0.8
B72220S0200K101	10.0	2.1	21.5	5.1	25.5	25.0	1.0



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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
B72205S0250K101	5.0	1.3	7.0	3.6	8.5	25.0	0.6
B72207S0250K101	5.0	1.3	9.0	3.7	11.0	25.0	0.6
B72210S0250K101	7.5	1.6	12.0	4.2	14.5	25.0	0.8
B72214S0250K101	7.5	1.7	15.5	4.2	18.5	25.0	0.8
B72220S0250K101	10.0	1.8	21.5	4.7	25.5	25.0	1.0
B72205S0300K101	5.0	1.5	7.0	3.6	8.5	25.0	0.6
B72207S0300K101	5.0	1.5	9.0	3.7	11.0	25.0	0.6
B72210S0300K101	7.5	1.7	12.0	4.4	14.5	25.0	0.8
B72214S0300K101	7.5	1.8	15.5	4.4	18.5	25.0	0.8
B72220S0300K101	10.0	2.0	21.5	4.9	25.5	25.0	1.0
B72205S0350K101	5.0	1.6	7.0	3.7	8.5	25.0	0.6
B72207S0350K101	5.0	1.6	9.0	3.9	11.0	25.0	0.6
B72210S0350K101	7.5	1.8	12.0	4.4	14.5	25.0	0.8
B72214S0350K101	7.5	2.0	15.5	4.5	18.5	25.0	0.8
B72220S0350K101	10.0	2.2	21.5	5.1	25.5	25.0	1.0
B72205S0400K101	5.0	1.8	7.0	3.9	8.5	25.0	0.6
B72207S0400K101	5.0	1.8	9.0	4.1	11.0	25.0	0.6
B72210S0400K101	7.5	2.1	12.0	4.8	14.5	25.0	0.8
B72214S0400K101	7.5	2.2	15.5	4.9	18.5	25.0	0.8
B72220S0400K101	10.0	2.4	21.5	5.4	25.5	25.0	1.0
B72205S0500K101	5.0	1.2	7.0	3.3	8.5	25.0	0.6
B72207S0500K101	5.0	1.2	9.0	3.3	11.0	25.0	0.6
B72210S0500K101	7.5	1.4	12.0	3.9	14.5	25.0	0.8
B72214S0500K101	7.5	1.4	15.5	3.9	18.5	25.0	0.8
B72220S0500K101	10.0	1.5	21.5	4.3	25.5	25.0	1.0
B72205S0600K101	5.0	1.2	7.0	3.3	8.5	25.0	0.6
B72207S0600K101	5.0	1.2	9.0	3.3	11.0	25.0	0.6
B72210S0600K101	7.5	1.4	12.0	4.0	14.5	25.0	0.8
B72214S0600K101	7.5	1.5	15.5	4.0	18.5	25.0	0.8
B72220S0600K101	10.0	1.6	21.5	4.4	25.5	25.0	1.0
B72205S0750K101	5.0	1.3	7.0	3.4	8.5	25.0	0.6
B72207S0750K101	5.0	1.3	9.0	3.6	11.0	25.0	0.6
B72210S0750K101	7.5	1.5	12.0	4.2	14.5	25.0	0.8
B72214S0750K101	7.5	1.5	15.5	4.2	18.5	25.0	0.8
B72220S0750K101	10.0	1.6	21.5	4.6	25.5	25.0	1.0


Leaded varistors
Standard 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
B72205S0950K101	5.0	1.3	7.0	3.4	8.5	25.0	0.6
B72207S0950K101	5.0	1.3	9.0	3.4	11.0	25.0	0.6
B72210S0950K101	7.5	1.5	12.0	4.0	14.5	25.0	0.8
B72214S0950K101	7.5	1.5	15.5	4.0	18.5	25.0	0.8
B72220S0950K101	10.0	1.6	21.5	4.5	25.5	25.0	1.0
B72205S0111K101	5.0	1.5	7.0	3.6	8.5	25.0	0.6
B72207S0111K101	5.0	1.5	9.0	3.6	11.0	25.0	0.6
B72210S0111K101	7.5	1.6	12.0	4.2	14.5	25.0	0.8
B72214S0111K101	7.5	1.7	15.5	4.2	18.5	25.0	0.8
B72220S0111K101	10.0	1.8	21.5	4.6	25.5	25.0	1.0
B72205S0131K101	5.0	1.6	7.0	3.6	8.5	25.0	0.6
B72207S0131K101	5.0	1.6	9.0	3.6	11.0	25.0	0.6
B72210S0131K101	7.5	1.8	12.0	4.2	14.5	25.0	0.8
B72214S0131K101	7.5	1.9	15.5	4.2	18.5	25.0	0.8
B72220S0131K101	10.0	2.0	21.5	4.7	25.5	25.0	1.0
B72205S0141K101	5.0	1.7	7.0	3.7	8.5	25.0	0.6
B72207S0141K101	5.0	1.7	9.0	3.7	11.0	25.0	0.6
B72210S0141K101	7.5	1.9	12.0	4.3	14.5	25.0	0.8
B72214S0141K101	7.5	2.0	15.5	4.3	18.5	25.0	0.8
B72220S0141K101	10.0	2.1	21.5	4.8	25.5	25.0	1.0
B72205S0151K101	5.0	1.8	7.0	3.8	8.5	25.0	0.6
B72207S0151K101	5.0	1.8	9.0	3.8	11.0	25.0	0.6
B72210S0151K101	7.5	2.0	12.0	4.4	14.5	25.0	0.8
B72214S0151K101	7.5	2.1	15.5	4.4	18.5	25.0	0.8
B72220S0151K101	10.0	2.2	21.5	4.9	25.5	25.0	1.0
B72205S0171K101	5.0	2.0	7.0	3.9	8.5	25.0	0.6
B72207S0171K101	5.0	2.0	9.0	4.0	11.0	25.0	0.6
B72210S0171K101	7.5	2.2	12.0	4.6	14.5	25.0	0.8
B72214S0171K101	7.5	2.2	15.5	4.6	18.5	25.0	0.8
B72220S0171K101	10.0	2.3	21.5	5.0	25.5	25.0	1.0
B72205S0231K101	5.0	1.8	7.0	4.0	8.5	25.0	0.6
B72207S0231K101	5.0	1.8	9.0	4.0	11.0	25.0	0.6
B72210S0231K101	7.5	2.0	12.0	4.7	14.5	25.0	0.8
B72214S0231K101	7.5	2.0	15.5	4.7	18.5	25.0	0.8
B72220S0231K101	10.0	2.1	21.5	5.1	25.5	25.0	1.0



Leaded varistors

Standard 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
B72205S0251K101	5.0	1.8	7.0	4.2	8.5	25.0	0.6
B72207S0251K101	5.0	1.8	9.0	4.2	11.0	25.0	0.6
B72210S0251K101	7.5	2.0	12.0	4.8	14.5	25.0	0.8
B72214S0251K101	7.5	2.0	15.5	4.8	18.5	25.0	0.8
B72220S0251K101	10.0	2.2	21.5	5.3	25.5	25.0	1.0
B72205S0271K101	5.0	2.0	7.0	4.3	8.5	25.0	0.6
B72207S0271K101	5.0	2.0	9.0	4.4	11.0	25.0	0.6
B72210S0271K101	7.5	2.2	12.0	5.0	14.5	25.0	0.8
B72214S0271K101	7.5	2.2	15.5	5.0	18.5	25.0	0.8
B72220S0271K101	10.0	2.3	21.5	5.4	25.5	25.0	1.0
B72205S0301K101	5.0	2.1	7.0	4.5	8.5	25.0	0.6
B72207S0301K101	5.0	2.1	9.0	4.5	11.0	25.0	0.6
B72210S0301K101	7.5	2.3	12.0	5.1	14.5	25.0	0.8
B72214S0301K101	7.5	2.3	15.5	5.2	18.5	25.0	0.8
B72220S0301K101	10.0	2.4	21.5	5.6	25.5	25.0	1.0
B72210S0321K101	7.5	2.4	12.0	5.4	15.0	25.0	0.8
B72214S0321K101	7.5	2.4	15.5	5.4	19.0	25.0	0.8
B72220S0321K101	10.0	2.6	21.5	5.8	25.5	25.0	1.0
B72205S0381K101	5.0	2.5	7.0	5.1	9.0	25.0	0.6
B72207S0381K101	5.0	2.5	9.0	5.2	11.5	25.0	0.6
B72210S0381K101	7.5	2.7	12.0	5.8	15.0	25.0	0.8
B72214S0381K101	7.5	2.7	15.5	5.9	19.0	25.0	0.8
B72220S0381K101	10.0	2.8	21.5	6.3	26.0	25.0	1.0
B72205S0421K101	5.0	2.8	7.0	5.4	9.0	25.0	0.6
B72207S0421K101	5.0	2.8	9.0	5.4	11.5	25.0	0.6
B72210S0421K101	7.5	2.9	12.0	6.1	15.0	25.0	0.8
B72214S0421K101	7.5	2.9	15.5	6.1	19.0	25.0	0.8
B72220S0421K101	10.0	3.1	21.5	6.5	26.0	25.0	1.0
B72205S0441K101	5.0	2.8	7.0	5.5	9.0	25.0	0.6
B72207S0441K101	5.0	2.8	9.0	5.5	11.5	25.0	0.6
B72210S0441K101	7.5	3.0	12.0	6.2	15.0	25.0	0.8
B72214S0441K101	7.5	3.0	15.5	6.3	19.0	25.0	0.8
B72220S0441K101	10.0	3.1	21.5	6.7	26.0	25.0	1.0


Leaded varistors
Standard 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
B72205S0461K101	5.0	3.0	7.0	5.7	9.0	25.0	0.6
B72207S0461K101	5.0	3.0	9.0	5.7	11.5	25.0	0.6
B72210S0461K101	7.5	3.1	12.0	6.3	15.0	25.0	0.8
B72214S0461K101	7.5	3.1	15.5	6.4	19.0	25.0	0.8
B72220S0461K101	10.0	3.3	21.5	6.8	26.0	25.0	1.0
B72210S0511K101	7.5	3.4	12.0	6.7	15.0	25.0	0.8
B72214S0511K101	7.5	3.4	15.5	6.8	19.0	25.0	0.8
B72220S0511K101	10.0	3.5	21.5	7.1	26.0	25.0	1.0
B72210S0551K101	7.5	3.7	12.0	7.1	15.0	25.0	0.8
B72214S0551K101	7.5	3.7	15.5	7.2	19.0	25.0	0.8
B72220S0551K101	10.0	3.9	21.5	7.5	26.0	25.0	1.0
B72210S0621K101	7.5	4.0	12.0	7.5	15.0	25.0	0.8
B72214S0621K101	7.5	4.0	15.5	7.5	19.0	25.0	0.8
B72220S0621K101	10.0	4.2	21.5	7.9	26.0	25.0	1.0
B72210S0681K101	7.5	4.4	12.0	7.9	15.0	25.0	0.8
B72214S0681K101	7.5	4.4	15.5	8.0	19.0	25.0	0.8
B72220S0681K101	10.0	4.5	21.5	8.4	26.0	25.0	1.0
B72214S0102K101	7.5	6.7	15.5	11.0	20.5	25.0	0.8
B72220S0102K101	10.0	6.9	21.5	11.4	28.5	25.0	1.0



Leaded varistors

Standard 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 μs) 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 μs	CECC 42 000, test C 2.1 100 surge currents (8/20 μs), unipolar, interval 30 s, amplitude corresponding to derating curve for 100 impulses at 20 μs	$ \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 ±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

Standard 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
Standard 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 ...

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



Leaded varistors

Standard 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-S07 ...



Leaded varistors
Standard 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-S10 ...

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



Leaded varistors

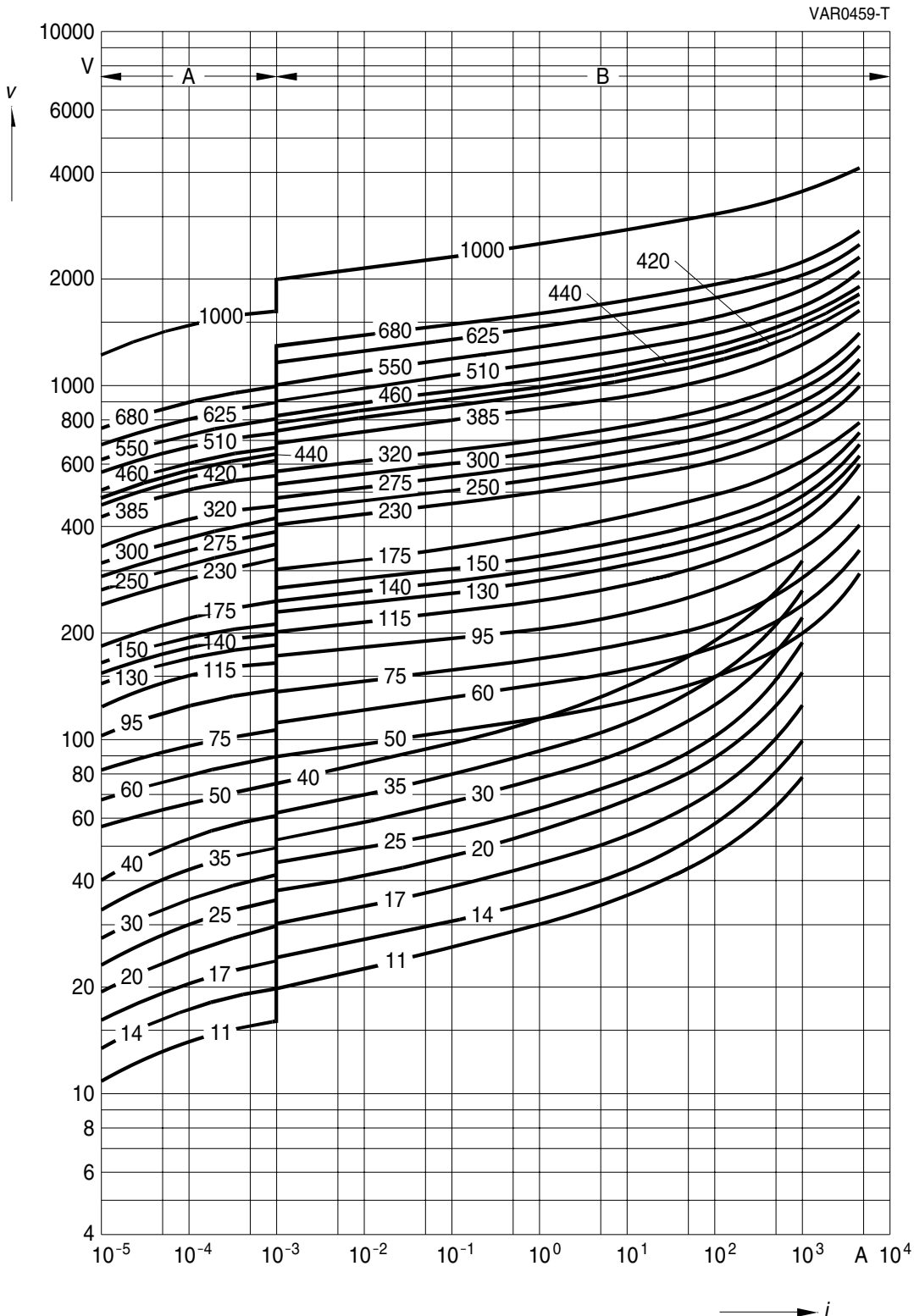
Standard series

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-S14 ...

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



Leaded varistors
Standard 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 varistor tolerances
B = Protection level



SIOV-S20 ...

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



Leaded varistors

Standard 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-S05K11 ... K40



SIOV-S05K50 ... K460



Leaded varistors
Standard 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-S07K11 ... K40



SIOV-S07K50 ... K460



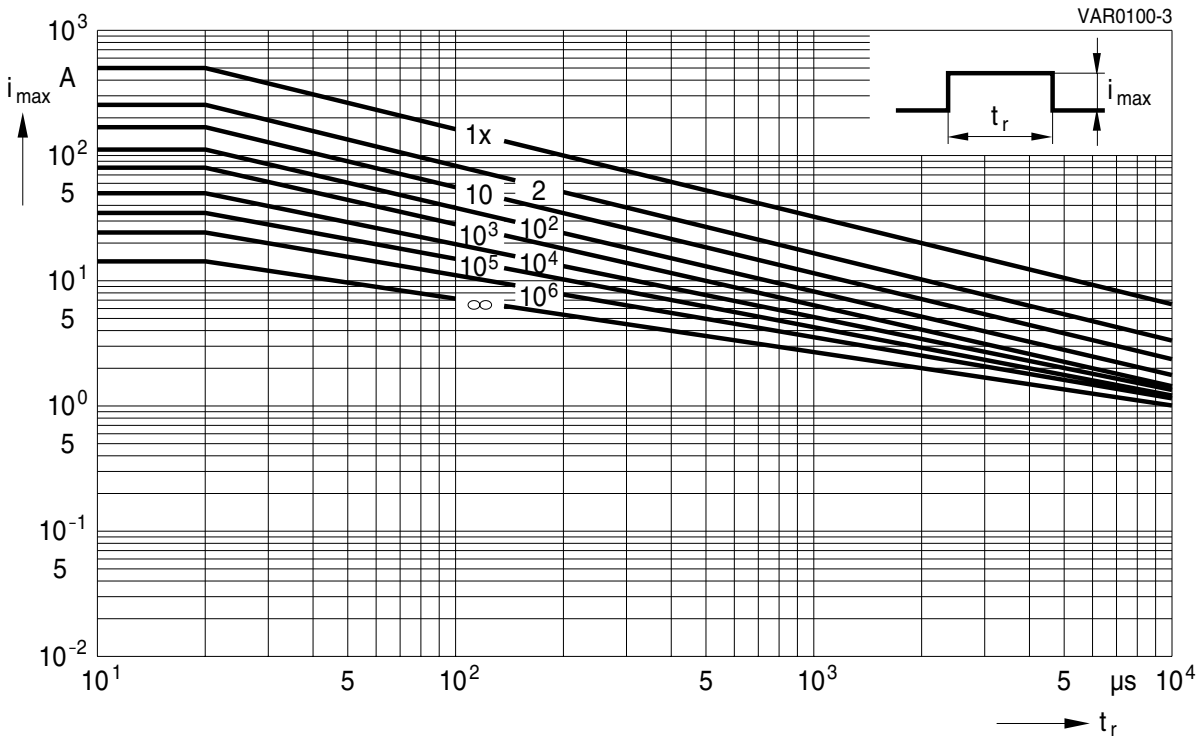
Leaded varistors

Standard series

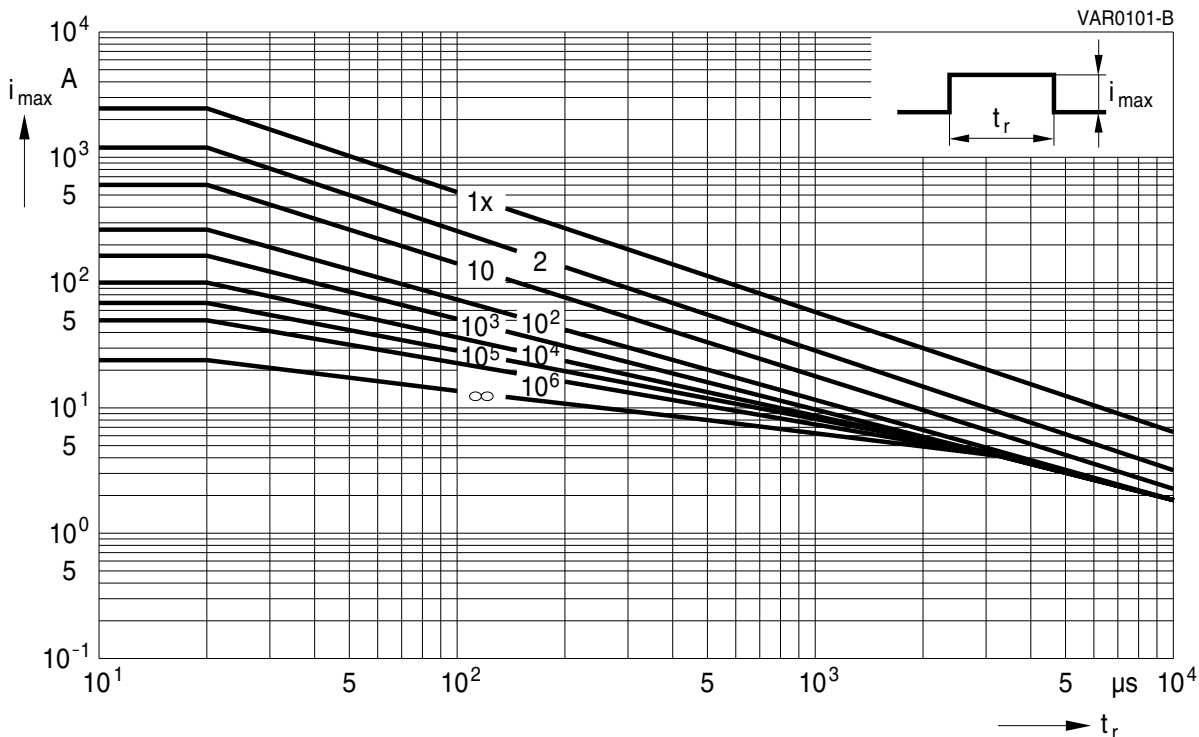
Derating curves

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-S10K11 ... K40



SIOV-S10K50 ... K320



Leaded varistors
Standard 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-S10K385 ... K680



SIOV-S14K11 ... K40



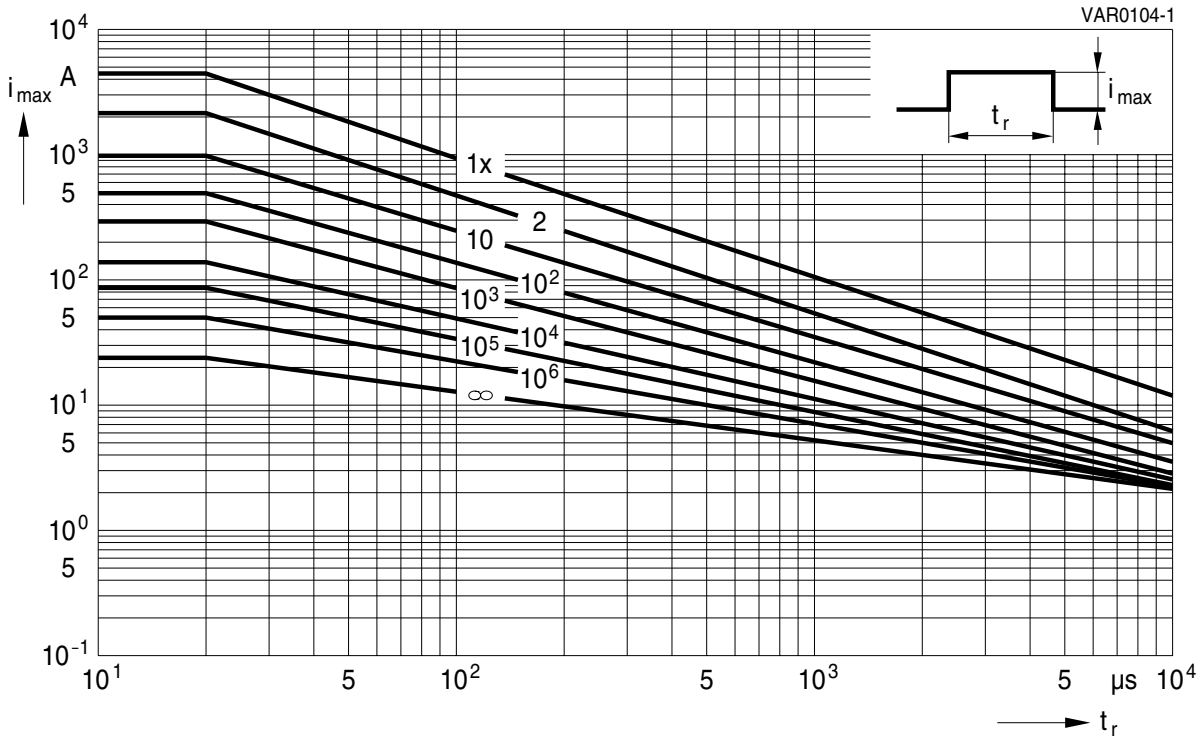
Leaded varistors

Standard series

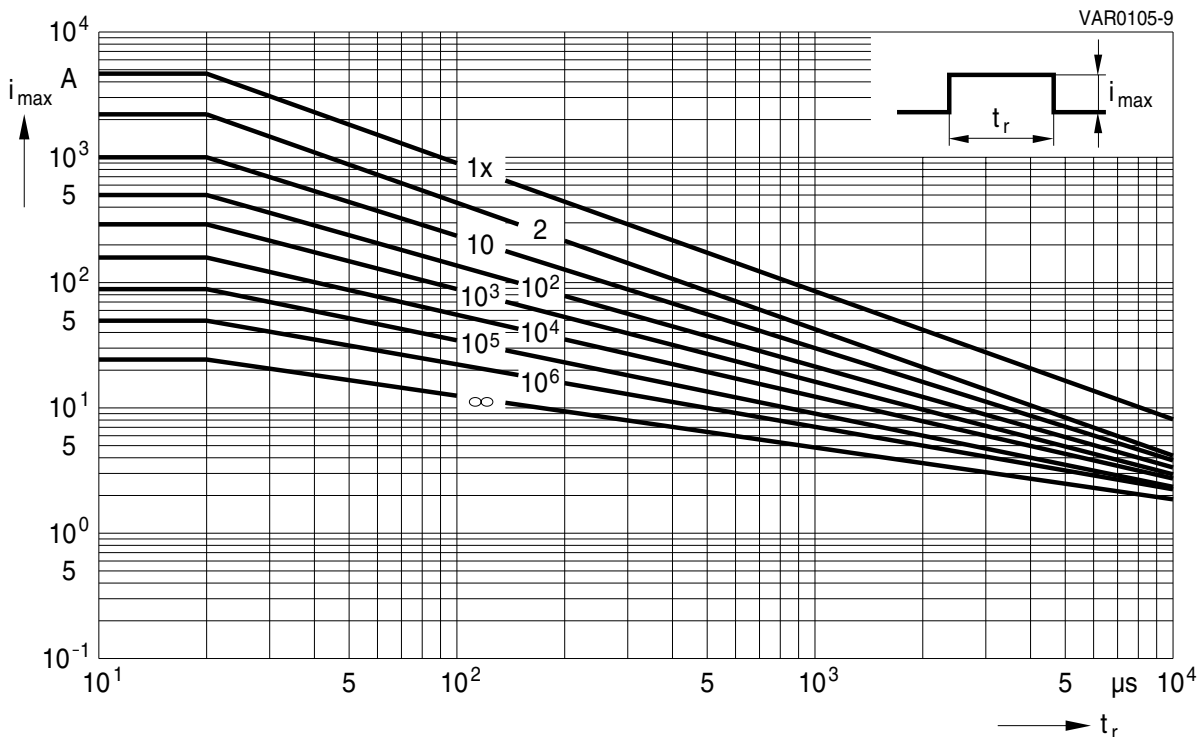
Derating curves

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-S14K50 ... K320



SIOV-S14K385 ... K1000

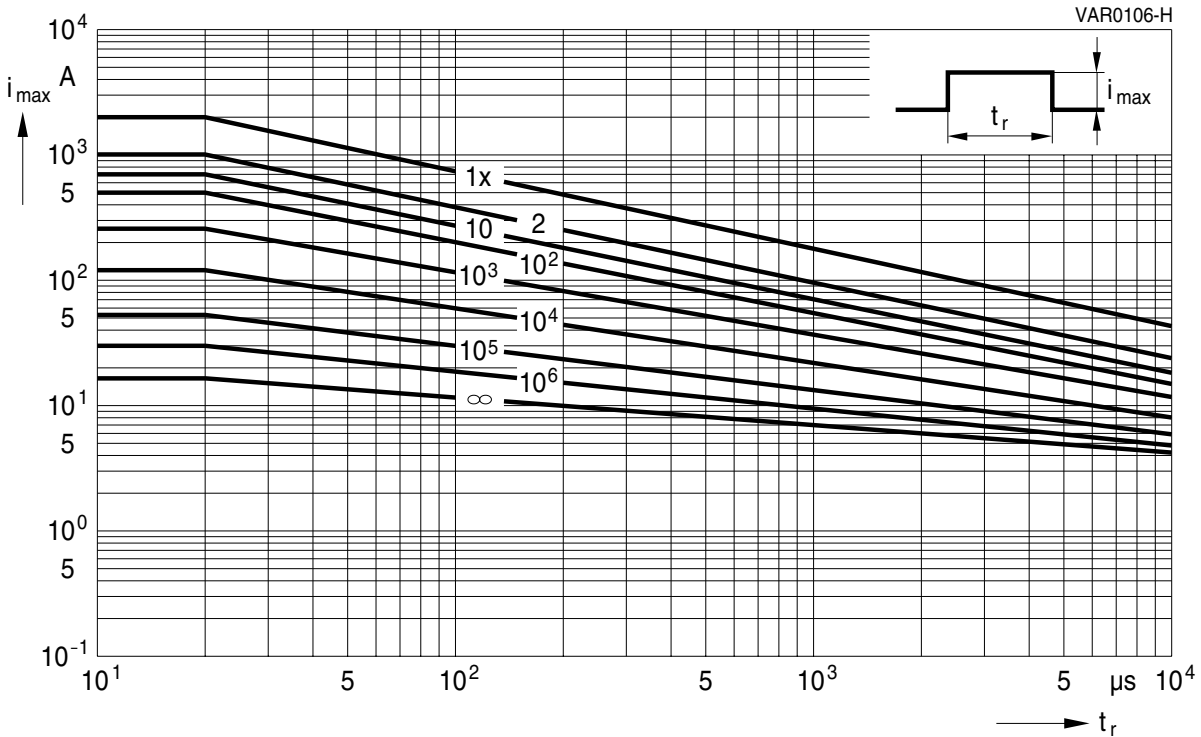


Leaded varistors
Standard series

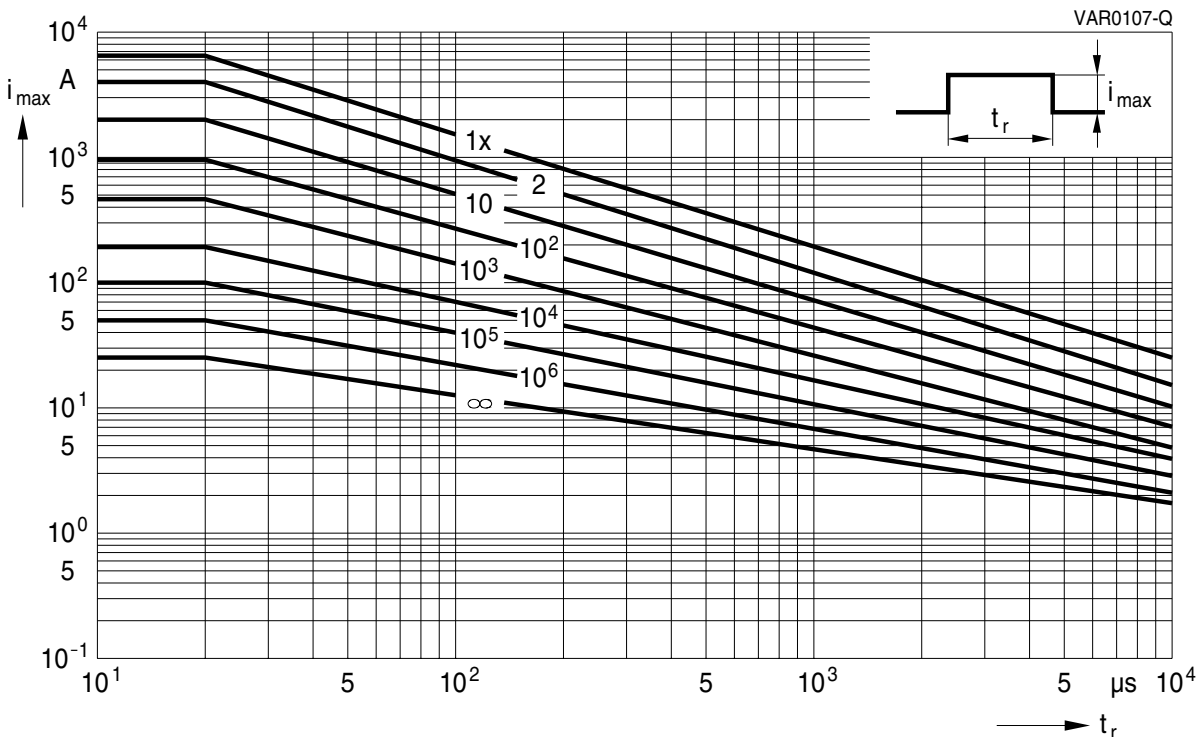
Derating curves

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-S20K11 ... K40



SIOV-S20K50 ... K115



Leaded varistors

Standard 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 ... K320



SIOV-S20K385 ... K460



Leaded varistors
Standard 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-S20K510 ... K1000

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

Standard 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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