Features

- Formerly a KEKO VARICON product
- Six model sizes equivalent to standard disc varistors
- Smaller nominal dimensions than disc varistors
- Broad range of current and energy handling capabilities
- +85 °C Continuous operating temperature
- Low clamping voltage
- Available with straight or crimped leads
- Available in tape and reel packaging for automatic pick-and-place
- RoHS compliant*

SV Series – Special Medium Voltage Varistors

General Information

The SV series is a series of lead style epoxy coated square or rectangular shaped varistors with an AC operating voltage ranging from 60 V to 550 V. This series offers both standard and custom options.

The standard offering consists of square shaped varistors with extremely high current and energy capabilities and a low clamping voltage, providing an increased level of protection for the transients expected in telecommunication and AC power networks. Compared to electrically equivalent disc varistors, SV varistors are produced with smaller nominal dimensions.

In addition to the standard offering, customers are offered the option to design their own customized varistor to suit their specific application needs. 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.

Summary of Custom Varistor Options

- DC operating voltage range (V_{dc}): 85 V to 745 V (up to 1300 V for customized products)
- AC operating voltage range (V_{rms}): 60 V to 550 V (up to 1000 V for customized products)
- Six standard sizes available; other cutomized sizes available upon request
- Broad range of current and energy handling capabilities
- +85 °C Continuous operating temperature
- Available electrical parameter options: AC/DC operating voltage, leakage current, clamping voltage, maximum surge current, energy absorption level, maximum dissipation power and threshold voltage temperature coefficient
- Available in tape and reel packaging for automatic pick-and-place
- Model SVxxxK20 with I_{max} = 1 x 15 kA @ 8/20 μs is available upon request
- Model SVxxxK23 with I_{max} = 1x 20 kA @ 8/20 μs is available upon request

Additional Information

Click these links for more information:

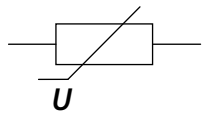
PRODUCT SELECTOR | TECHNICAL LIBRARY | INVENTORY | SAMPLES | CONTACT

Agency Recognition

Standard	UL 1449
File Number	E313168**

**Not all rated voltages are UL recognized; check the file for details.

Varistor Symbol



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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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Absolute Maximum Ratings

Parameter	Standard Types	Units	Custom Designed Types	Units
Continuous:				
Steady State Applied Voltage				
DC Voltage Range (V_{dc})	85 to 745	V	85 to 1300	V
AC Voltage Range (V_{rms})	60 to 550	V	60 to 1000	V
Transient:				
Peak Single Pulse Surge Current, 8/20 μs Waveform (I_{max})	600 to 15,000	A	> 5500	A/cm^2
Single Pulse Surge Energy, 10/1000 μs Waveform (W_{max})	4 to 815	J	> 400	J/cm^2
Operating Ambient Temperature	-40 to +85	°C	-40 to +125	°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	GΩ	> 1	GΩ
Isolation Voltage Capability	> 2.5	kV	> 2.5	kV
Response Time	< 25	ns	< 2.5	μs
Climatic Category	40 / 85 / 56		40 / 125 / 56	

* Valid for epoxy coated components

Device Ratings

Model	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
	V	V	V	V	A	J	W	A	pF
SV 60 K 5	60	85	100	155v	5	4	0.1	600	370
SV 60 K 7	60	85	100	155	10	9	0.25	1750	900
SV 60 K 10	60	85	100	155	25	20	0.4	3500	1380
SV 60 K 14	60	85	100	155	50	42	0.6	8000	2300
SV 60 K 20	60	85	100	155	100	89	1	12000	3400
SV 75 K 5	75	100	120	190	5	5	0.1	600	300
SV 75 K 7	75	100	120	190	10	11	0.25	1750	720
SV 75 K 10	75	100	120	190	25	26	0.4	3500	1080
SV 75 K 14	75	100	120	190	50	51	0.6	8000	1850
SV 75 K 20	75	100	120	190	100	101	1	12000	3100
SV 95 K 5	95	125	150	240	5	7	0.1	600	240
SV 95 K 7	95	125	150	240	10	14	0.25	1750	580
SV 95 K 10	95	125	150	240	25	31	0.4	3500	870
SV 95 K 14	95	125	150	240	50	64	0.6	8000	1480
SV 95 K 20	95	125	150	240	100	133	1	12000	2700
SV 115 K 5	115	150	180	290	5	8	0.1	600	200
SV 115 K 7	115	150	180	290	10	16	0.25	1750	480
SV 115 K 10	115	150	180	290	25	37	0.4	3500	750
SV 115 K 14	115	150	180	290	50	78	0.6	8000	1230
SV 115 K 20	115	150	180	290	100	147	1	12000	2200

Model SVxxxK 20 with I_{max} = 1 x 15 kA @ 8/20 μs available upon request.

Model SVxxxK 23 with I_{max} = 1 x 20 kA @ 8/20 μs available upon request.

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Device Ratings (Continued)

Model	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
	V	V	V	V	A	J	W	A	pF
SV 130 K 5	130	170	205	320	5	9	0.1	600	180
SV 130 K 7	130	170	205	320	10	19	0.25	1750	430
SV 130 K 10	130	170	205	320	25	42	0.4	3500	670
SV 130 K 14	130	170	205	320	50	85	0.6	8000	1100
SV 130 K 20	130	170	205	320	100	177	1	12000	2150
SV 130 K 23	130	170	205	320	100	222	1	15000	3390
SV 140 K 5	140	180	220	340	5	9	0.1	600	170
SV 140 K 7	140	180	220	340	10	22	0.25	1750	400
SV 140 K 10	140	180	220	340	25	46	0.4	3500	620
SV 140 K 14	140	180	220	340	50	94	0.6	8000	1020
SV 140 K 20	140	180	220	340	100	196	1	12000	1900
SV 140 K 23	140	180	220	340	100	247	1	15000	3340
SV 150 K 5	150	200	240	360	5	11	0.1	600	160
SV 150 K 7	150	200	240	360	10	23	0.25	1750	380
SV 150 K 10	150	200	240	360	25	51	0.4	3500	590
SV 150 K 14	150	200	240	360	50	101	0.6	8000	690
SV 150 K 20	150	200	240	360	100	213	1	12000	1740
SV 150 K 23	150	200	240	360	100	270	1	15000	3050
SV 175 K 5	175	225	270	420	5	11	0.1	600	140
SV 175 K 7	175	225	270	420	10	26	0.25	1750	330
SV 175 K 10	175	225	270	420	25	58	0.4	3500	500
SV 175 K 14	175	225	270	420	50	119	0.6	8000	830
SV 175 K 20	175	225	270	420	100	241	1	12000	1630
SV 175 K 23	175	225	270	420	100	305	1	15000	2870
SV 230 K 5	230	300	360	550	5	16	0.1	600	110
SV 230 K 7	230	300	360	550	10	35	0.25	1750	250
SV 230 K 10	230	300	360	550	25	78	0.4	3500	400
SV 230 K 14	230	300	360	550	50	157	0.6	8000	650
SV 230 K 20	230	300	360	550	100	322	1	12000	1220
SV 230 K 23	230	300	360	550	100	407	1	15000	2020
SV 250 K 5	250	320	390	590	5	17	0.1	600	100
SV 250 K 7	250	320	390	590	10	38	0.25	1750	240
SV 250 K 10	250	320	390	590	25	85	0.4	3500	370
SV 250 K 14	250	320	390	590	50	169	0.6	8000	600
SV 250 K 20	250	320	390	590	100	345	1	12000	1130
SV 250 K 23	250	320	390	590	100	437	1	15000	1980

Model SVxxxK 20 with I_{max} = 1 x 15 kA @ 8/20 μs available upon request.

Model SVxxxK 23 with I_{max} = 1 x 20 kA @ 8/20 μs available upon request.

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Device Ratings (Continued)

Model	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
	V	V	V	V	A	J	W	A	pF
SV 275 K 5	275	350	430	680	5	20	0.1	600	90
SV 275 K 7	275	350	430	680	10	44	0.25	1750	220
SV 275 K 10	275	350	430	680	25	97	0.4	3500	350
SV 275 K 14	275	350	430	680	50	187	0.6	8000	550
SV 275 K 20	275	350	430	680	100	380	1	12000	1030
SV 275 K 23	275	350	430	680	100	481	1	15000	1800
SV 300 K 7	300	385	470	700	10	46	0.25	1750	200
SV 300 K 10	300	385	470	700	25	102	0.4	3500	320
SV 300 K 14	300	385	470	700	50	211	0.6	8000	510
SV 300 K 20	300	385	470	700	100	437	1	12000	940
SV 300 K 23	300	385	470	700	100	554	1	15000	1650
SV 320 K 10	320	420	510	760	25	144	0.4	3500	300
SV 320 K 14	320	420	510	760	50	230	0.6	8000	480
SV 320 K 20	320	420	510	760	100	485	1	12000	860
SV 320 K 23	320	420	510	760	100	611	1	15000	1520
SV 385 K 10	385	505	620	900	25	116	0.4	3500	270
SV 385 K 14	385	505	620	900	50	241	0.6	8000	410
SV 385 K 20	385	505	620	900	100	495	1	12000	710
SV 385 K 23	385	505	620	900	100	624	1	15000	1250
SV 420 K 10	420	560	680	980	25	121	0.4	3500	240
SV 420 K 14	420	560	680	980	50	253	0.6	8000	380
SV 420 K 20	420	560	680	980	100	523	1	12000	680
SV 420 K 23	420	560	680	980	100	670	1	15000	1200
SV 460 K 10	460	615	750	1080	25	132	0.4	3500	230
SV 460 K 14	460	615	750	1080	50	275	0.6	8000	350
SV 460 K 20	460	615	750	1080	100	572	1	12000	620
SV 460 K 23	460	615	750	1080	100	728	1	15000	1080
SV 510 K 10	510	670	820	1200	25	144	0.4	3500	210
SV 510 K 14	510	670	820	1200	50	284	0.6	8000	330
SV 510 K 20	510	670	820	1200	100	598	1	12000	570
SV 510 K 23	510	670	820	1200	100	750	1	15000	1000
SV 550 K 10	550	745	910	1350	25	168	0.4	3500	200
SV 550 K 14	550	745	910	1350	50	330	0.6	8000	310
SV 550 K 20	550	745	910	1350	100	644	1	12000	510
SV 550 K 23	550	745	910	1350	100	815	1	15000	900

Model SVxxxK 20 with I_{max} = 1 x 15 kA @ 8/20 µs available upon request.

Model SVxxxK 23 with I_{max} = 1 x 20 kA @ 8/20 µs available upon request.

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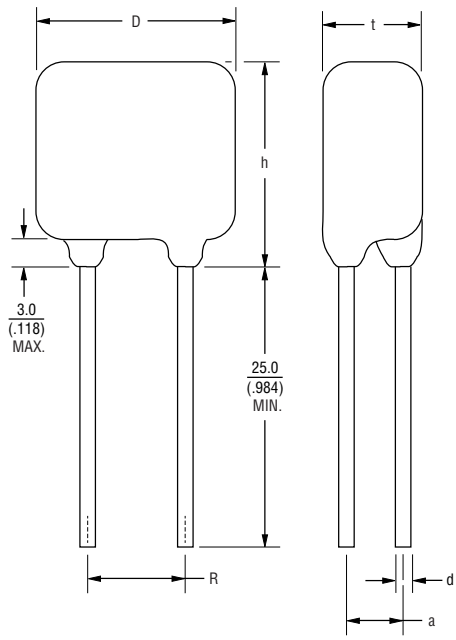
Product Dimensions

Model	Dimension					
	D (Max.)	**t** (Max.)	**R**	**d**	**h** (Max.)	**a**
SV 60 K 5	7 (.276)	2.5 (.098)	5 (.197)	0.6 (.024)	9.5 (.374)	1.1 (.043)
SV 60 K 7	9 (.354)	3.5 (.482)	5 (.197)	0.6 (.024)	11.5 (.453)	1.1 (.043)
SV 60 K 10	12 (.472)	4.1 (.161)	7.5 (.295)	0.8 (.031)	15 (.591)	1.4 (.055)
SV 60 K 14	16 (.630)	4.2 (.165)	7.5 (.295)	0.8 (.031)	19 (.748)	1.5 (.059)
SV 60 K 20	22.5 (.886)	4.5 (.177)	10 (.394)	0.8 (.031)	26 (1.024)	1.5 (.059)
SV 75 K 5	7 (.276)	3.6 (.142)	5 (.197)	0.6 (.024)	9.5 (.374)	1.2 (.047)
SV 75 K 7	9 (.354)	3.6 (.142)	5 (.197)	0.6 (.024)	11.5 (.453)	1.2 (.047)
SV 75 K 10	12 (.472)	4.2 (.165)	7.5 (.295)	0.8 (.031)	15 (.591)	1.5 (.059)
SV 75 K 14	16 (.630)	4.2 (.165)	7.5 (.295)	0.8 (.031)	19 (.748)	1.5 (.059)
SV 75 K 20	22.5 (.886)	4.5 (.181)	10 (.394)	0.8 (.031)	26 (1.024)	1.5 (.059)
SV 95 K 5	7 (.276)	3.8 (.150)	5 (.197)	0.6 (.024)	9.5 (.374)	1.4 (.055)
SV 95 K 7	9 (.354)	3.8 (.150)	5 (.197)	0.6 (.024)	11.5 (.453)	1.4 (.055)
SV 95 K 10	12 (.472)	4.3 (.169)	7.5 (.295)	0.8 (.031)	15 (.591)	1.7 (.067)
SV 95 K 14	16 (.630)	4.3 (.169)	7.5 (.295)	0.8 (.031)	19 (.748)	1.7 (.067)
SV 95 K 20	22.5 (.886)	4.6 (.181)	10 (.394)	0.8 (.031)	26 (1.024)	1.7 (.067)
SV 115 K 5	7 (.276)	4.0 (.157)	5 (.197)	0.6 (.024)	9.5 (.374)	1.6 (.063)
SV 115 K 7	9 (.354)	4.0 (.157)	5 (.197)	0.6 (.024)	11.5 (.453)	1.6 (.063)
SV 115 K 10	12 (.472)	4.3 (.169)	7.5 (.295)	0.8 (.031)	15 (.591)	1.9 (.075)
SV 115 K 14	16 (.630)	4.4 (.173)	7.5 (.295)	0.8 (.031)	19 (.748)	1.9 (.075)
SV 115 K 20	22.5 (.886)	4.8 (.189)	10 (.394)	0.8 (.031)	26 (1.024)	1.9 (.075)
SV 130 K 5	7 (.276)	4.0 (.157)	5 (.197)	0.6 (.024)	9.5 (.374)	1.8 (.071)
SV 130 K 7	9 (.354)	4.0 (.157)	5 (.197)	0.6 (.024)	11.5 (.453)	1.8 (.071)
SV 130 K 10	12 (.472)	4.5 (.177)	7.5 (.295)	0.8 (.031)	15 (.591)	2.0 (.079)
SV 130 K 14	16 (.630)	4.6 (.181)	7.5 (.295)	0.8 (.031)	19 (.748)	2.0 (.079)
SV 130 K 20	22.5 (.886)	5.0 (.197)	10 (.394)	1 (.039)	26 (1.024)	2.2 (.087)
SV 130 K 23	25 (.984)	5.0 (.197)	10 (.394)	1 (.039)	27 (1.063)	2.2 (.087)
SV 140 K 5	7 (.276)	4.1 (.161)	5 (.197)	0.6 (.024)	9.5 (.374)	1.9 (.075)
SV 140 K 7	9 (.354)	4.1 (.161)	5 (.197)	0.6 (.024)	11.5 (.453)	1.9 (.075)
SV 140 K 10	12 (.472)	4.6 (.181)	7.5 (.295)	0.8 (.031)	15 (.591)	2.1 (.083)
SV 140 K 14	16 (.630)	4.7 (.185)	7.5 (.295)	0.8 (.031)	19 (.748)	2.1 (.083)



DIMENSIONS: MM / (INCHES)

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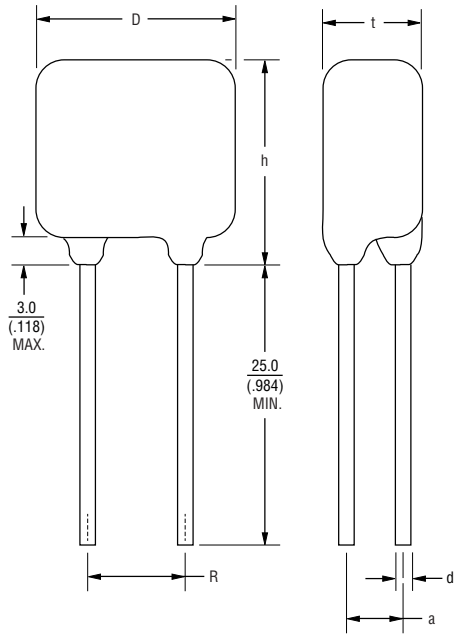
Product Dimensions (Continued)

Model	Dimension					
	D (Max.)	**t** (Max.)	**R**	**d**	**h** (Max.)	**a**
SV 140 K 20	22.5 (.886)	5.4 (.213)	10 (.394)	1 (.039)	26 (1.024)	2.3 (.091)
SV 140 K 23	25 (.984)	5.4 (.213)	10 (.394)	1 (.039)	27 (1.063)	2.3 (.091)
SV 150 K 5	7 (.276)	4.3 (.169)	5 (.197)	0.6 (.024)	9.5 (.374)	2.0 (.079)
SV 150 K 7	9 (.354)	4.3 (.169)	5 (.197)	0.6 (.024)	11.5 (.453)	2.0 (.079)
SV 150 K 10	12 (.472)	4.8 (.189)	7.5 (.295)	0.8 (.031)	15 (.591)	2.2 (.087)
SV 150 K 14	16 (.630)	4.8 (.189)	7.5 (.295)	0.8 (.031)	19 (.748)	2.2 (.087)
SV 150 K 20	22.5 (.886)	5.6 (.220)	10 (.394)	1 (.039)	26 (1.024)	2.4 (.094)
SV 150 K 23	25 (.984)	5.6 (.220)	10 (.394)	1 (.039)	27 (1.063)	2.4 (.094)
SV 175 K 5	7 (.276)	4.8 (.189)	5 (.197)	0.6 (.024)	9.5 (.374)	2.1 (.083)
SV 175 K 7	9 (.354)	4.8 (.189)	5 (.197)	0.6 (.024)	11.5 (.453)	2.1 (.083)
SV 175 K 10	12 (.472)	5.0 (.197)	7.5 (.295)	0.8 (.031)	15 (.591)	2.3 (.091)
SV 175 K 14	16 (.630)	5.0 (.197)	7.5 (.295)	0.8 (.031)	19 (.748)	2.3 (.091)
SV 175 K 20	22.5 (.886)	5.8 (.228)	10 (.394)	1 (.039)	26 (1.024)	2.5 (.098)
SV 175 K 23	25 (.984)	5.8 (.228)	10 (.394)	1 (.039)	27 (1.063)	2.5 (.098)
SV 230 K 5	7 (.276)	4.8 (.189)	5 (.197)	0.6 (.024)	9.5 (.374)	2.6 (.102)
SV 230 K 7	9 (.354)	4.8 (.189)	5 (.197)	0.6 (.024)	11.5 (.453)	2.6 (.102)
SV 230 K 10	12 (.472)	5.4 (.213)	7.5 (.295)	0.8 (.031)	15 (.591)	2.8 (.110)
SV 230 K 14	16 (.630)	5.5 (.217)	7.5 (.295)	0.8 (.031)	19 (.748)	2.8 (.110)
SV 230 K 20	22.5 (.886)	5.9 (.232)	10 (.394)	1 (.039)	26 (1.024)	3.0 (.118)
SV 230 K 23	25 (.984)	5.9 (.232)	10 (.394)	1 (.039)	27 (1.063)	3.0 (.118)
SV 250 K 5	7 (.276)	5.0 (.197)	5 (.197)	0.6 (.024)	9.5 (.374)	2.8 (.110)
SV 250 K 7	9 (.354)	5.0 (.197)	5 (.197)	0.6 (.024)	11.5 (.453)	2.8 (.110)
SV 250 K 10	12 (.472)	5.6 (.220)	7.5 (.295)	0.8 (.031)	15 (.591)	3.0 (.118)
SV 250 K 14	16 (.630)	5.7 (.224)	7.5 (.295)	0.8 (.031)	19 (.748)	3.0 (.118)
SV 250 K 20	22.5 (.886)	6.1 (.240)	10 (.394)	1 (.039)	26 (1.024)	3.2 (.126)
SV 250 K 23	25 (.984)	6.1 (.240)	10 (.394)	1 (.039)	27 (1.063)	3.2 (.126)
SV 275 K 5	7 (.276)	5.6 (.220)	5 (.197)	0.6 (.024)	9.5 (.374)	3.0 (.118)
SV 275 K 7	9 (.354)	5.6 (.220)	5 (.197)	0.6 (.024)	11.5 (.453)	3.0 (.118)
SV 275 K 10	12 (.472)	6.0 (.236)	7.5 (.295)	0.8 (.031)	15 (.591)	3.2 (.126)
SV 275 K 14	16 (.630)	6.0 (.236)	7.5 (.295)	0.8 (.031)	19 (.748)	3.2 (.126)



DIMENSIONS: MM / (INCHES)

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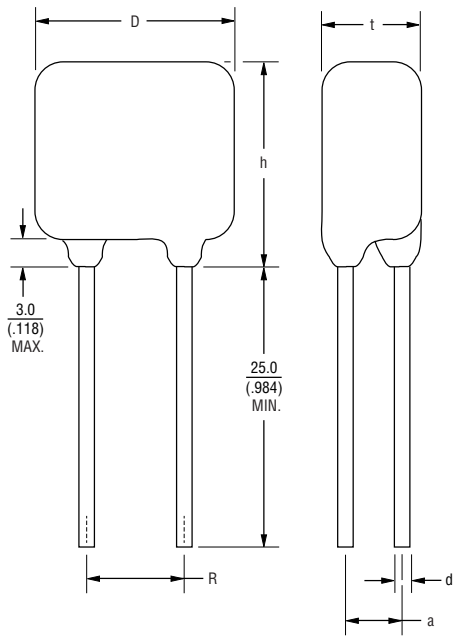
Product Dimensions (Continued)

Model	Dimension					
	D (Max.)	**t** (Max.)	**R**	**d**	**h** (Max.)	**a**
SV 275 K 20	22.5 (.886)	6.3 (.248)	10 (.394)	1 (.039)	26 (1.024)	3.4 (.134)
SV 275 K 23	25 (.984)	6.3 (.248)	10 (.394)	1 (.039)	27 (1.063)	3.4 (.134)
SV 300 K 7	7 (.276)	5.8 (.228)	5 (.197)	0.6 (.024)	11.5 (.453)	3.2 (.126)
SV 300 K 10	12 (.472)	6.1 (.240)	7.5 (.295)	0.8 (.031)	15 (.591)	3.4 (.134)
SV 300 K 14	16 (.630)	6.1 (.240)	7.5 (.295)	0.8 (.031)	19 (.748)	3.4 (.134)
SV 300 K 20	22.5 (.886)	6.6 (.260)	10 (.394)	1 (.039)	27 (1.063)	3.6 (.141)
SV 300 K 23	25 (.984)	6.6 (.260)	10 (.394)	1 (.039)	29 (1.142)	3.6 (.141)
SV 320 K 10	12 (.472)	6.5 (.256)	7.5 (.295)	0.8 (.031)	15 (.591)	3.6 (.141)
SV 320 K 14	16 (.630)	6.8 (.268)	7.5 (.295)	0.8 (.031)	19 (.748)	3.6 (.141)
SV 320 K 20	22.5 (.886)	6.8 (.268)	10 (.394)	1 (.039)	27 (1.063)	3.8 (.150)
SV 320 K 23	25 (.984)	6.8 (.268)	10 (.394)	1 (.039)	29 (1.142)	3.8 (.150)
SV 385 K 10	12 (.472)	6.9 (.272)	7.5 (.295)	0.8 (.031)	15 (.591)	4.2 (.165)
SV 385 K 14	16 (.630)	6.9 (.272)	7.5 (.295)	0.8 (.031)	19 (.748)	4.2 (.165)
SV 385 K 20	22.5 (.886)	7.5 (.295)	10 (.394)	1 (.039)	27 (1.063)	4.4 (.173)
SV 385 K 23	25 (.984)	7.5 (.295)	10 (.394)	1 (.039)	29 (1.142)	4.4 (.173)
SV 420 K 10	12 (.472)	7.3 (.287)	7.5 (.295)	0.8 (.031)	15 (.591)	4.4 (.173)
SV 420 K 14	16 (.630)	7.4 (.291)	7.5 (.295)	0.8 (.031)	19 (.748)	4.4 (.173)
SV 420 K 20	22.5 (.886)	7.8 (.307)	10 (.394)	1 (.039)	27 (1.063)	4.6 (.181)
SV 420 K 23	25 (.984)	7.8 (.307)	10 (.394)	1 (.039)	29 (1.142)	4.6 (.181)
SV 460 K 10	12 (.472)	7.8 (.307)	7.5 (.295)	0.8 (.031)	15 (.591)	4.8 (.189)
SV 460 K 14	16 (.630)	7.8 (.307)	7.5 (.295)	0.8 (.031)	19 (.748)	4.8 (.189)
SV 460 K 20	22.5 (.886)	8.2 (.323)	10 (.394)	1 (.039)	27 (1.063)	5.0 (.197)
SV 460 K 23	25 (.984)	8.2 (.323)	10 (.394)	1 (.039)	29 (1.142)	5.0 (.197)
SV 510 K 10	12 (.472)	8.2 (.323)	7.5 (.295)	0.8 (.031)	15 (.591)	5.1 (.201)
SV 510 K 14	16 (.630)	8.2 (.323)	7.5 (.295)	0.8 (.031)	19 (.748)	5.1 (.201)
SV 510 K 20	22.5 (.886)	8.7 (.343)	10 (.394)	1 (.039)	27 (1.063)	5.3 (.209)
SV 510 K 23	25 (.984)	8.7 (.343)	10 (.394)	1 (.039)	29 (1.142)	5.3 (.209)
SV 550 K 10	12 (.472)	8.8 (.346)	7.5 (.295)	0.8 (.031)	15 (.591)	5.7 (.224)
SV 550 K 14	16 (.630)	8.8 (.346)	7.5 (.295)	0.8 (.031)	19 (.748)	5.7 (.224)
SV 550 K 20	22.5 (.886)	9.2 (.362)	10 (.394)	1 (.039)	27 (1.063)	5.8 (.228)
SV 550 K 23	25 (.984)	9.2 (.362)	10 (.394)	1 (.039)	29 (1.142)	5.8 (.228)



DIMENSIONS: MM / (INCHES)

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SV Series – Special Medium Voltage Varistors

BOURNS®

Full Custom Parameter Designed Medium Voltage Varistors

The SV series of full custom parameter designed varistors consists of square and rectangular shaped varistors, available either as epoxy coated lead style components or as metalized pellets.

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 fit the available housing. The customer has our full engineering support to help realize his specific protection requirement.

General Technical Data

Electrical Parameters	Value	Units
Varistor Threshold Voltage (V_n) Range at 1 mA	100 to 910	V
Continuous:		
Steady State Applied Voltage:		
DC Voltage Range (V_{dc})	85 to 745	V
AC Voltage Range (V_{rms})	60 to 550	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 Parameters		
Clamping Voltage	< 1.9 x V_{dc}	V
Coefficient of non-linearity:		
Minimum	45	
Typical	60	
Leakage Current Level:		
@ 25 °C	0.5	μA/cm^2
@ 85 °C	10	μA/cm^2
Environmental Parameters		
Operating Ambient Temperature	-40 to +85	°C
Storage Temperature Range	-40 to +125	°C
Minimum Threshold Voltage Temperature Coefficient	-0.001	%/°C
Design Parameters		
Leaded		
Coating	Epoxy resin	
Lead Style	Straight or crimped	
Metalized Pallet	Solderable electrode finish	
Shape	Square, rectangular	
Packaging	Bulk, tape and reel	
Size Parameters		
Minimum Size	5 x 5	mm
Maximum Size	23 x 23	mm
Lead Spacing	5.0, 7.5, 10	mm
Wire Diameter	0.6, 0.8, 1.0	mm

How to Order

SV250K20BL1YY

Series Designator
SV = SV Series

Max. Continuous Operating Voltage (V_{rms})

V_n Tolerance
K = ±10 % (Standard)
J = ±5 % (Available on Request)

Model Size
5 = 5 mm
7 = 7 mm
10 = 10 mm
14 = 14 mm
20 = 20 mm
23 = 23 mm

Packaging
R = Reel (Standard)*
B = Bulk (Standard)
A = Ammo Pack (Available on Request)*
**Reel and Ammo Pack options not available for Model Sizes 20 and 23.*

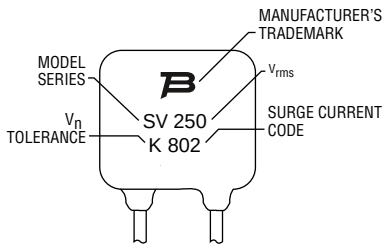
Lead Style
1 = Straight Leads
5 = Crimped Leads
M = Metalized pellet (Available upon request)

Special Parameters
YY = Unique two digit suffix is 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: SV250K20).
2) Add Packaging: Bulk (example part number becomes SV250K20B).
3) Add Lead Style: 1 (example part number becomes SV250K20BL1).
4) Part number can have no spaces or lower case letters.

Typical Part Marking



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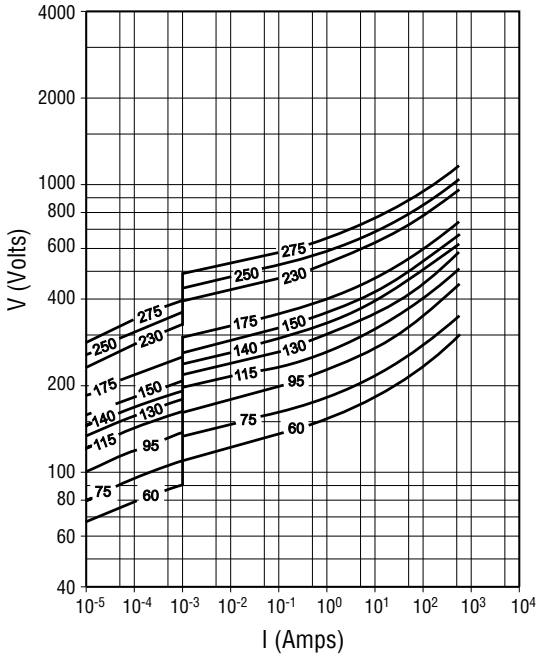
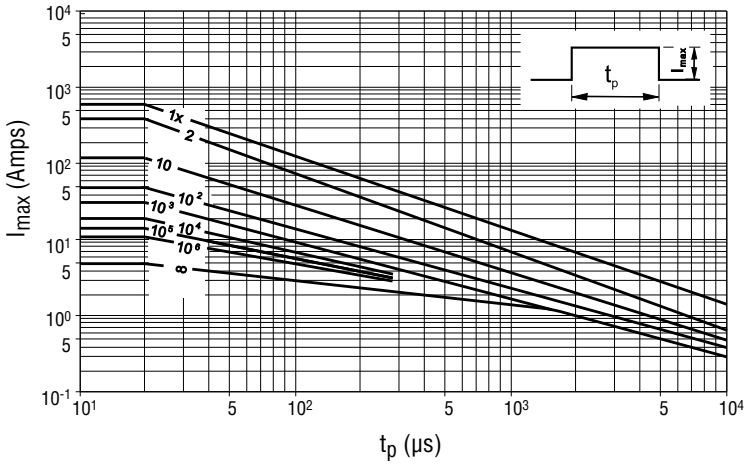
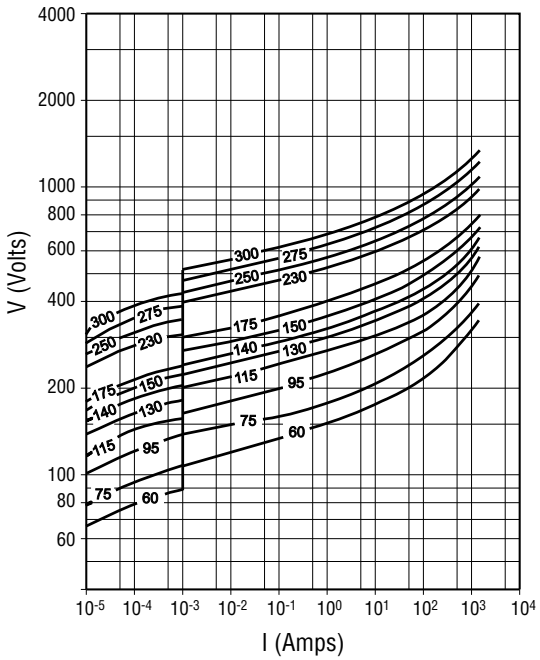
Pulse Ratiing Curves - Protection level with worst-case condition in the tolerance region

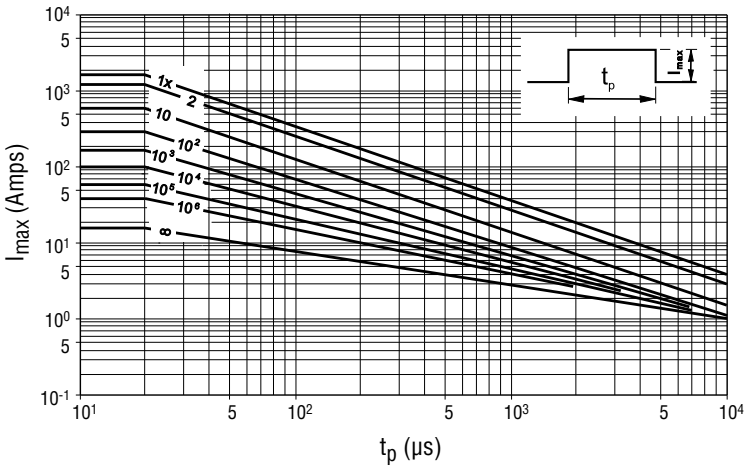
Model Size 5 - (SV60 ~ SV275)





Model Size 7 - (SV60 ~ SV300)





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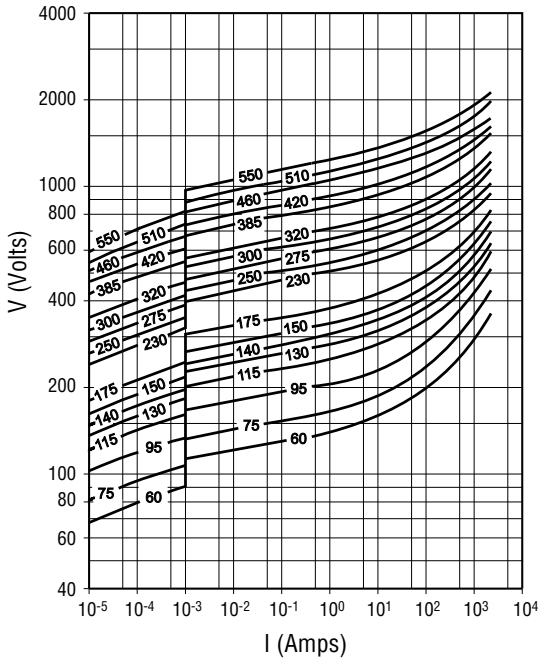
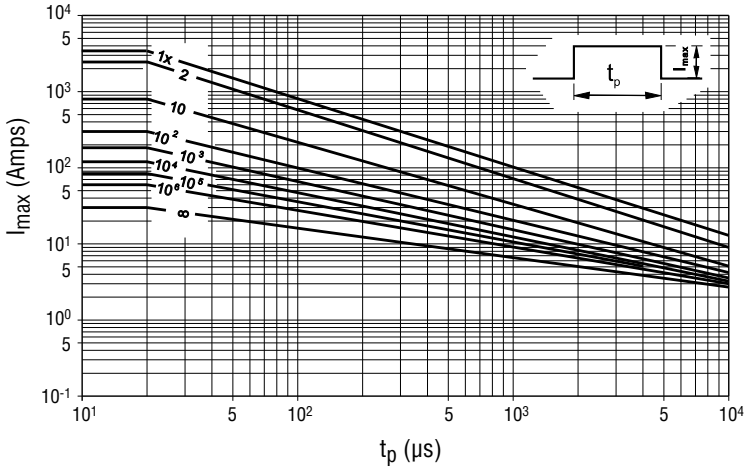
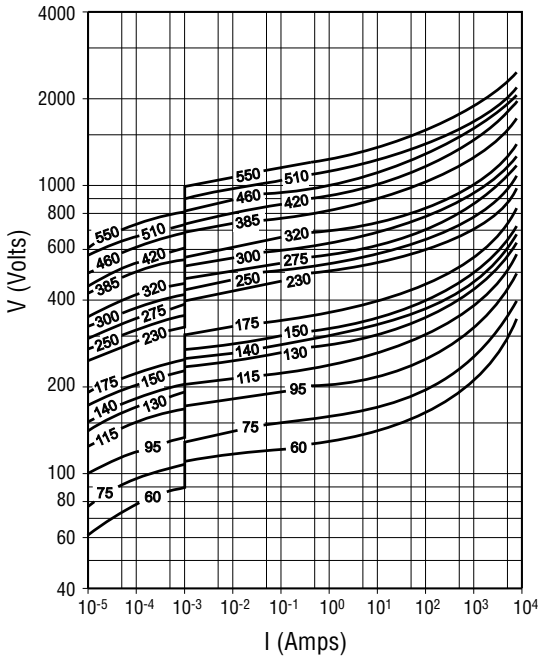
Pulse Rating Curves (Continued) - Protection level with worst-case condition in the tolerance region

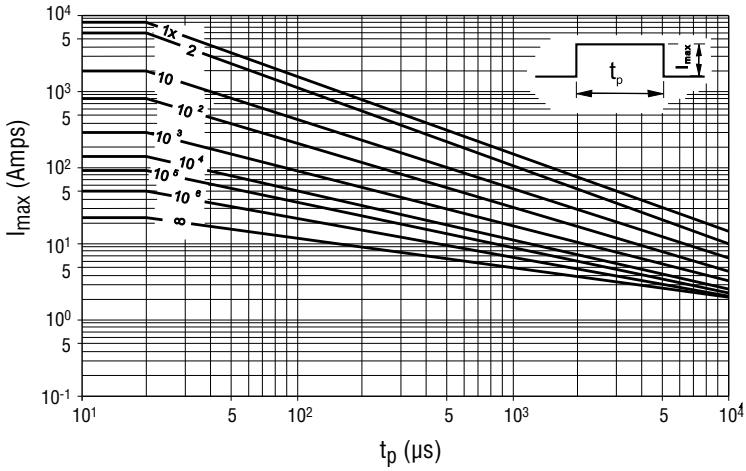
Model Size 10 - (SV60 ~ SV550)





Model Size 14 - (SV60 ~ SV550)





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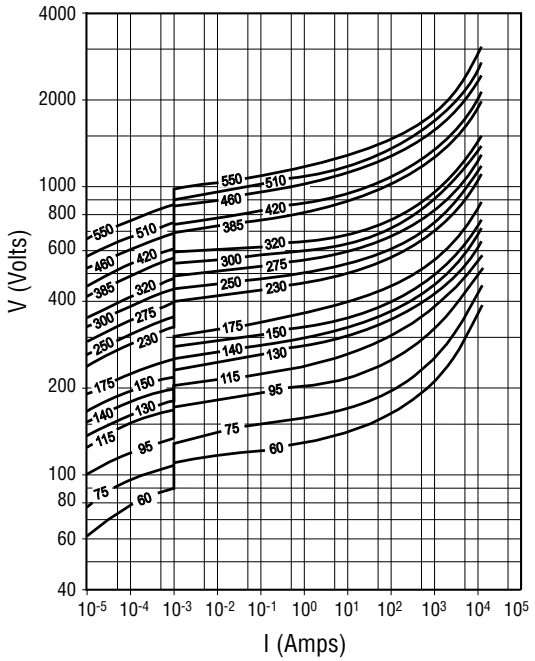
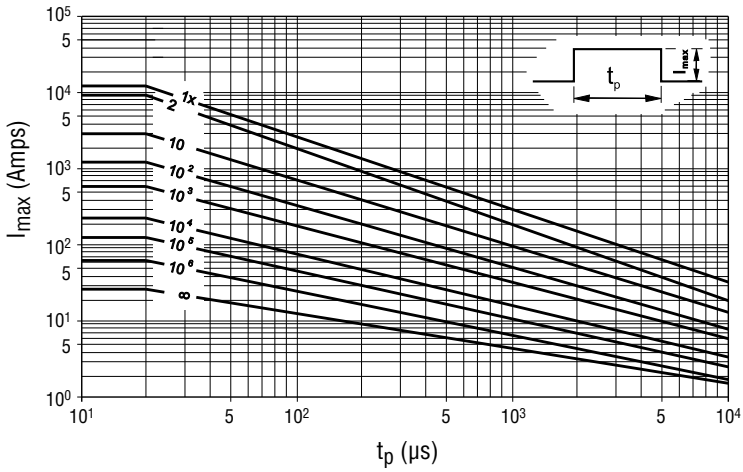
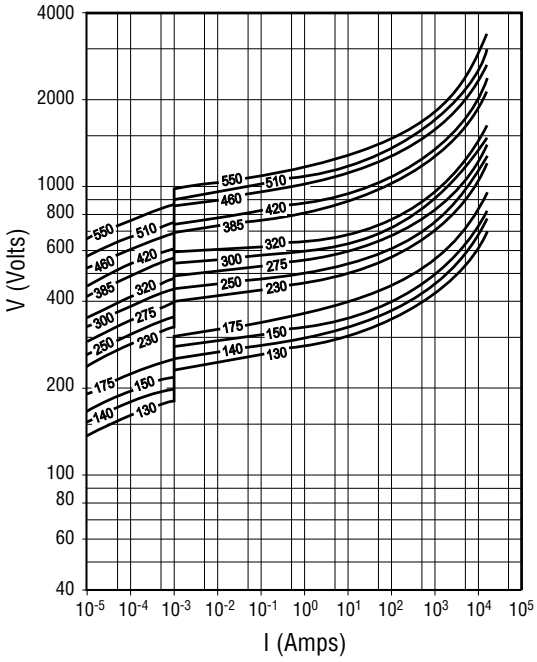
Pulse Rating Curves (Continued) - Protection level with worst-case condition in the tolerance region

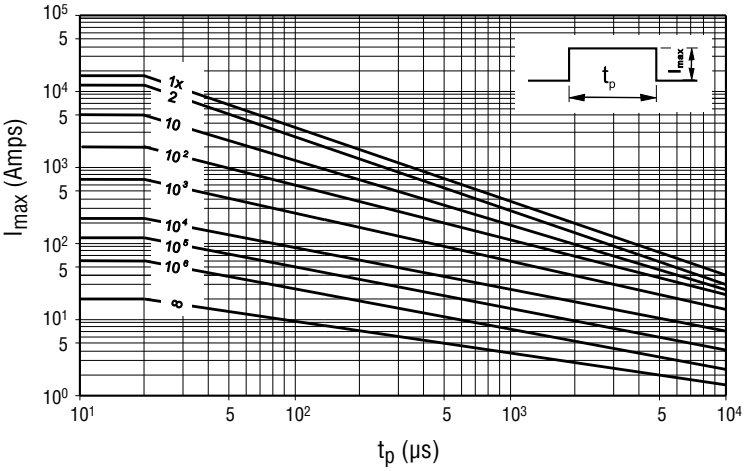
Model Size 20 - (SV60 ~ SV550)





Model Size 23 - (SV130 ~ SV550)





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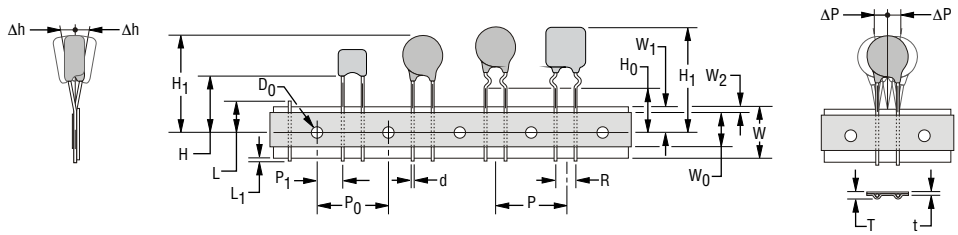
Packaging Specifications - Tape

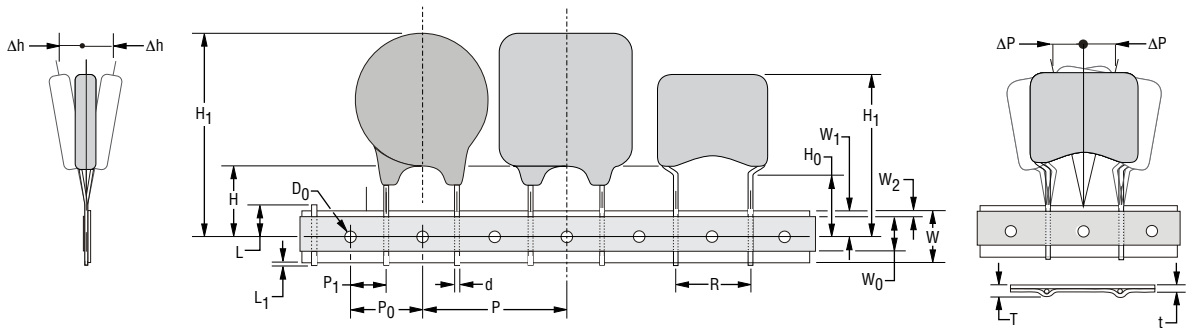
Conforms to IES Publication 286-2 Ed. 3: 2008-03

Dimension R = 5 mm



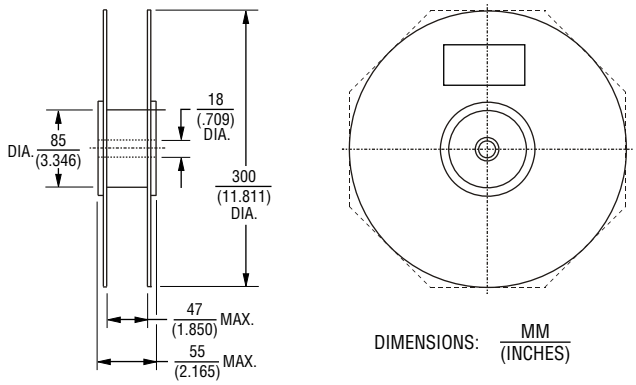
Dimensions on Next Page

Dimension R = 7.5 mm & 10 mm

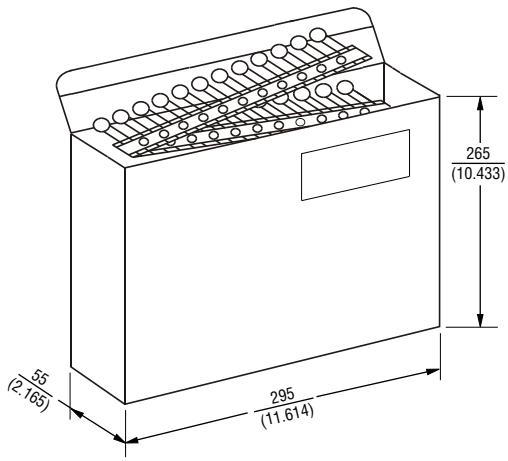


Dimensions on Next Page

Reel



Ammo Pack (Available upon Special Request)



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Packaging Specifications - Tape (Continued)

Symbol	Parameter	Model Size				
		5	7	10	14	20
W	Carrier tape width	18 +1.0/-0.5 (.709 +.039/-.020)				
W_0	Hold down tape width	5 (.197) MIN.				
W_1	Sprocket hole position	9 +0.75/-0.5 (.354 +.030/-.020)				
W_2	Distance between the upper edges of the carrier tape and hold down tape	3 (.118) MAX.				
T	Total tape thickness	1.5 (.059) MAX.		1.7 (.067) MAX.		1.9 (.075) MAX.
t	Tape thickness	0.9 (.035) MAX.				
P	Pitch of component	12.7 ± 1.0 (.500 ± .039)			25.4 ± 1.0 (1.000 ± .039)	
P_0	Feed hole pitch	12.7 ± 0.3 (.500 ± .012)				
P_1	Feed hole center to pitch	3.85 ± 0.7 (.152 ± .028)		8.95± 0.7 (.352 ± .028)		7.7 ± 0.7 (.303 ± .028)
R	Lead spacing	5 +0.5/-0.2 (.197 +.020/-.008)		7.5 +0.5/-0.2 (.295 +.020/-.008)		10 +0.5/-0.2 (.394 +.020/-.008)
ΔP	Component alignment	±1.3 (±.051) MAX.				
Δh	Component alignment	±2 (±.079) MAX.				
d	Wire diameter	0.6 (.024) MAX.		0.8 (.031) MAX.		1 (.039) MAX.
D_0	Feed hold diameter	4 ± 0.2 (.157 ± .008)				
H	Height from tape center to component base	18 +2.0/-0.0 (.709 +.079/-.000)				
H_0	Seating plane height	16 ± 0.5 (.630 ± .020)				
H_1	Component height	32.2 (1.268) MAX.		46.5 (1.831) MAX.		
L	Protrusion - cut out	11 (.433) MAX.				
L_1	Protrusion - cut off	0.5 (.020) MAX.				

DIMENSIONS: MM (INCHES)

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Packaging Quantities - Bulk

Voltage	Model Size					
	5	7	10	14	20	23
60	1300	1000	500	400	250	
75	1300	1000	500	400	250	
95	1300	900	500	400	250	
115	1300	900	400	400	250	
130	1300	900	400	400	250	150
140	1300	900	400	400	250	150
150	1300	900	400	400	250	150
175	1300	900	400	400	250	150
230	900	900	400	250	250	150
250	900	900	400	250	250	150
275	900	900	400	250	250	150
300		900	400	250	150	100
320			400	250	150	100
385			300	250	150	100
420			300	250	150	100
460			300	250	150	100
510			300	250	150	100
550-680			300	250	150	100

Packaging Quantities - Reel

Voltage	Model Size			
	5	7	10	14
60	1500	1500	1300	600
75	1300	1300	1300	600
95	1300	1300	1200	600
115	1300	1300	1200	500
130	1300	1300	1200	500
140	1300	1300	1200	500
150	1200	1200	1000	500
175	1200	1200	1000	500
230	1000	1000	1000	500
250	1000	1000	900	400
275	1000	1000	900	400
300		900	800	400
320			800	400
385			700	300
420			700	300
460			600	300
510			600	300
550-680			600	300

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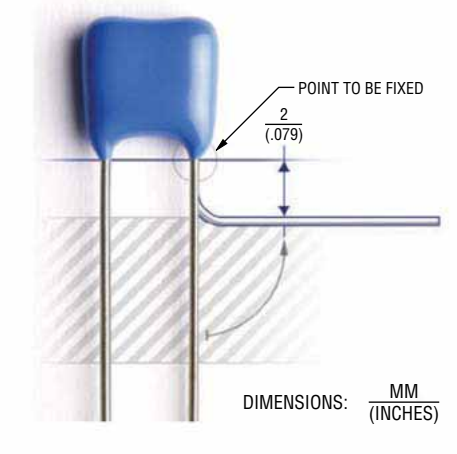
Assembly Recommendations for Through-Hole Components



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

In order to avoid epoxy 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 lifetime is thermal shock during manual soldering with a soldering iron. This can occur when a soldering iron is placed too close to one point of the component body and it happens most often when the solder joint is too close to the varistor body.

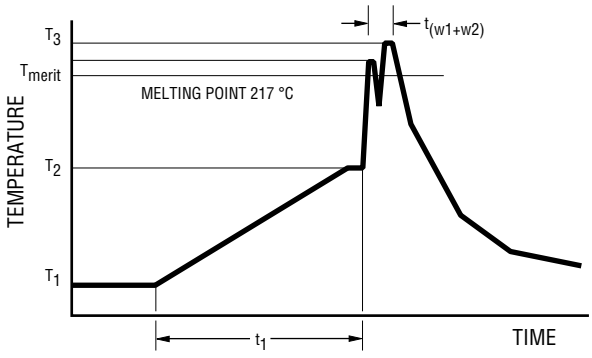
Resistance to Soldering Heat

In the case of automatic wave soldering, it is important to provide sufficient resistance to soldering heat. In order to prevent any potential problems, internal standards were introduced for testing the resistance to soldering heat of through-hole components: 300 °C, 10 seconds.

Pb-free Wave Soldering Profile Recommendations

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

Lead-free Wave Soldering Profile - Pb-free wave profile requirements for soldering heat resistance of components



Parameter	Symbol	Specification
Preheating temperature gradient		4 °C/sec. max.
Preheating time	t_1	2 to 5 min.
Min. preheating temperature	T_1	130 °C
Max. preheating temperature	T_2	180 °C
Melting temperature/point	T_{meltv}	217 °C
Time in wave soldering phase (w_1+w_2)	t_{w1+w2}	10 sec.
Max. wave temperature (w_1+w_2)	T_s	265 °C +0/-5 °C
Cooling temperature gradient		6° C/sec. max.
Temperature jump from 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.

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Reliability Testing Procedures

Varistor test procedures comply with CECC 42200, IEC 1051-1/2 (and AEC-Q200, if applicable for automotive grade products). 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 (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

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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 Curreent	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 (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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