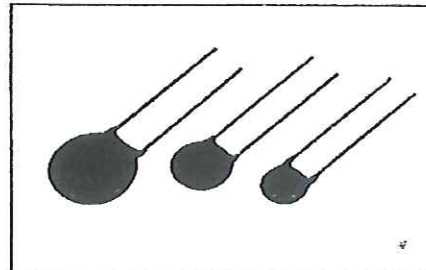


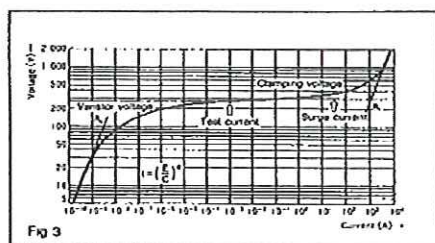
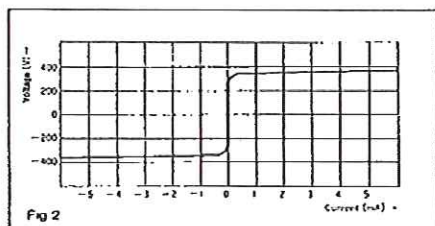
ZENAMIC

ZENAMIC is the product name of a metal oxide varistor. ZENAMIC features superior surge voltage suppression characteristics and large surge energy absorption because the whole element is used to distribute and absorb surge energy. The main use of ZENAMIC is for lightning surge suppression and suppression of surge generated within electronics equipments (e.g., by coils).



V-I characteristics

ZENAMIC has the forward-reverse symmetrical electrical characteristics shown in the figure 2. The voltage-current curves show the varistor characteristics in the range $1 \mu\text{A}$ to 10^4A , and show the resistance characteristics for the range under $1 \mu\text{A}$ and over 10^4A as in the figure 3. The voltage between terminals when test current (I_T : 1 mA) is applied to ZENAMIC is a standard varistor voltage (V_Z), and the voltage between terminals when a standard surge (I_p) is applied represents the maximum suppression voltage (V_C).



Temperature Characteristics

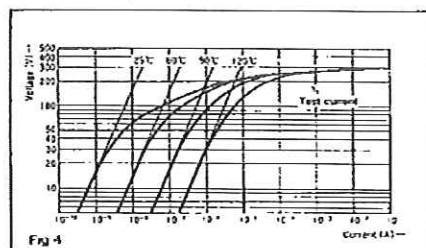
In the minimum current range, Zenamic features outstanding temperature characteristics. A shunt resistance R_p of metal oxide varistor has the temperature characteristics shown in the following equation

$$R_p = A e^{E_g/2KT} \quad (2)$$

T: Absolute temperature

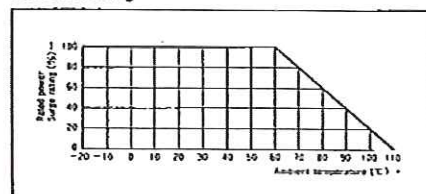
k: Boltzmann constant

A, E_g : constants



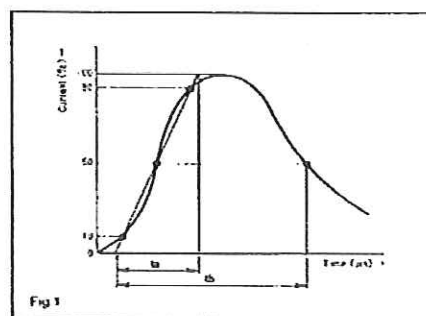
As shown in the figure 4, the temperature dependence characteristics are shown clearly in the low current area.

Power derating



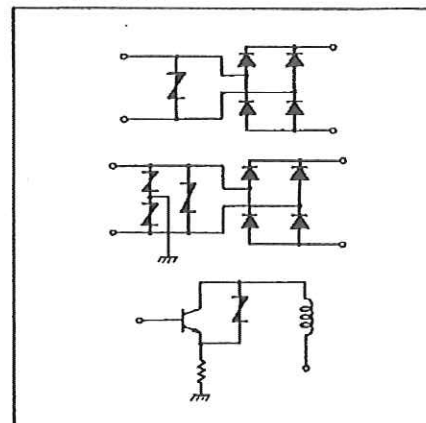
Surge waveform

A surge waveform varies according to the sources. An EXP waveform is used for surge testing of ZENAMIC, while a AC half-wave is used for the energy absorption test. The EXP waveform reaches its peak voltage (current) at $[t_a]$ as shown in the figure 1, and then decreases as time passes and reaches half of the peak voltage (current) at $[t_b]$. This type of the EXP waveform is shown as a $[t_a - t_b]$ voltage (current) waveform. For surge testing of ZENAMIC, the 8 - 20 μsec current waveform is used.



Application

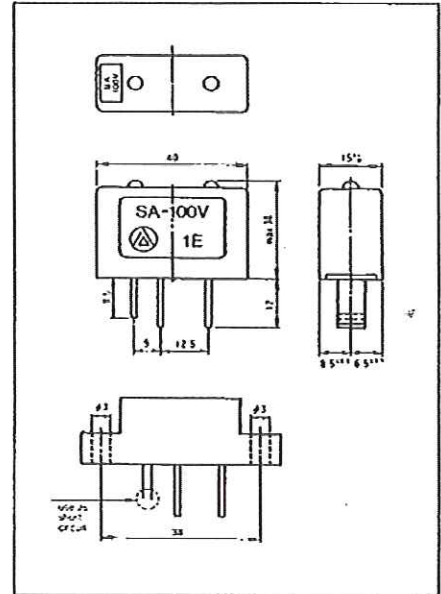
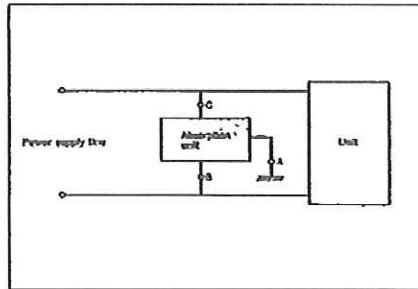
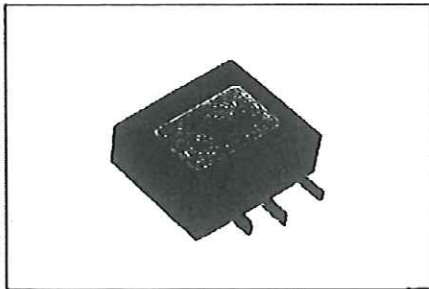
An example of ZENAMIC's main use is shown below. Power lines and surge absorption units with error display (SA series).



SURGE ABSORBER UNIT

The said unit is connected to line and ground, and protects an electronic appliance from the surge influence and when the unit was broken by the surge of over rated current, it shows trouble with lighting of LED.

The socket of exclusive use for the unit, shown in the bottom of right side, is also supplyable.



Specifications table SA series

Line voltage	Type No.	Rating voltage		Current rating		Clamping voltage (5KV)		Clamping voltage (7KV)	
		line-line	ground-line	line-line	ground-line	line-line	ground-line	line-line	ground-line
		V	V	A	A	V	V	V	V
48V DC	SA-50V	58	133	250	1000	340	600	400	700
100V AC	SA-100V	133	338	500	1000	560	1400	800	1600
200V AC	SA-200V	265	495	500	1000	1100	2000	1300	2300
240V AC	SA-240V	338	604	500	1000	1400	2500	1700	2800

Clamping Voltage is measured by 1 μV peak Voltage wave with line impedance of 50 Ω

ZENAMIC Standard of Reliability

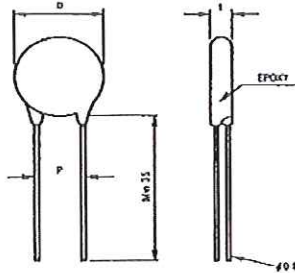
NO.	Item	Test method	Rate																			
1	Peak current	EI is measured after 30 minutes upon applying the 8/20 micro-sec current in the same direction twice every 2 minutes	A rate of change on EI, $\pm 10\%$																			
2	Repetitive surge	EI is measured after 30 minutes upon applying the 8/20 micro-sec current as specified below in the same direction 10,000 times <table><tr><th rowspan="2">Vanstor voltage</th><th colspan="4">Type</th></tr><tr><th>Z7L</th><th>Z10L</th><th>Z15L</th><th>Z21L</th></tr><tr><td>22 ~ 120V</td><td>10A</td><td>25A</td><td>50A</td><td></td></tr><tr><td>150 ~ 1,000V</td><td>25A</td><td>50A</td><td>100A</td><td>200A</td></tr></table>	Vanstor voltage	Type				Z7L	Z10L	Z15L	Z21L	22 ~ 120V	10A	25A	50A		150 ~ 1,000V	25A	50A	100A	200A	ditto
Vanstor voltage	Type																					
	Z7L	Z10L	Z15L	Z21L																		
22 ~ 120V	10A	25A	50A																			
150 ~ 1,000V	25A	50A	100A	200A																		
3	High temperature	EI is measured after 30 minutes of its leaving in normal temperature and moisture upon placing for 1,000 $\pm$ 12 hours in 110°C $\pm$ 5°C	ditto																			
4	Humidity	EI is measured after 30 minutes of its leaving in normal temperature and moisture upon applying on AC rated voltage for 1,000 $\pm$ 8 hours in 40 $\pm$ 2°C and 90-95% moisture.	ditto																			
5	Energy	EI is measured after 30 minutes upon applying a single sine wave at the specified energy	ditto																			
6	Temperature cycle	Cycle was repeated -25°C (30 minutes) $\rightarrow$ Normal temperature (15 minutes) $\rightarrow$ 85°C (30 minutes) $\rightarrow$ Normal temperature (15 minutes) 5 times, then the E I change ratio is measured	A rate of change on $\pm 10\%$ no change of appearance																			
7	Insulation	AC 1500V was applied between one of the ZENAMIC terminals and the installation plate (or the painted chassis of the main body) for 1 minute	No dielectric break down																			

EI means a vanstor terminal voltage in case DC 1mA is flowed for 0.4 second

Type No.

Z 10 L 221

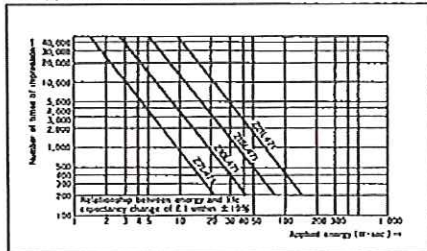
varistor voltage EI
With lead wire
Element diameter
ZENAMIC symbol



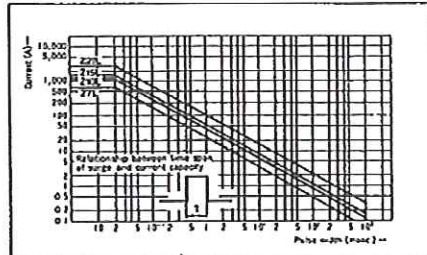
Dimensions

	Z7L	Z10L	Z16L	Z21L
D	max. 10	max. 13	max. 18	max. 24
t	max. 8	max. 8	max. 8	max. 9
P	6.8	8.3	8.3	10.8

Energy derating (AC half wave)

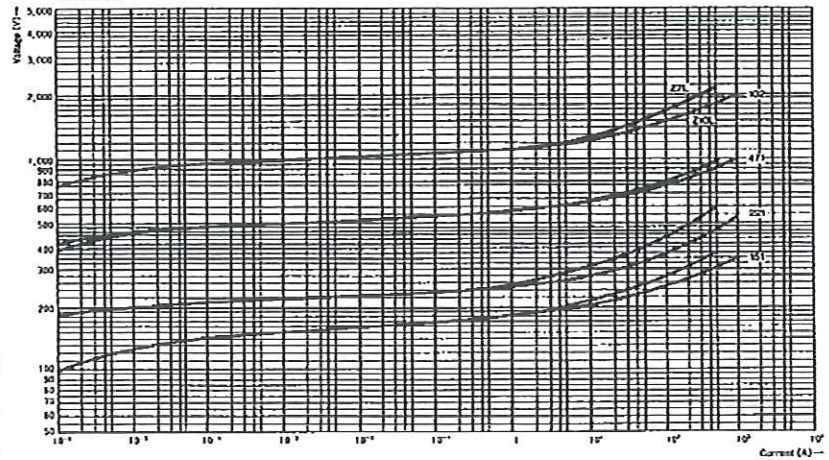


Peak current derating

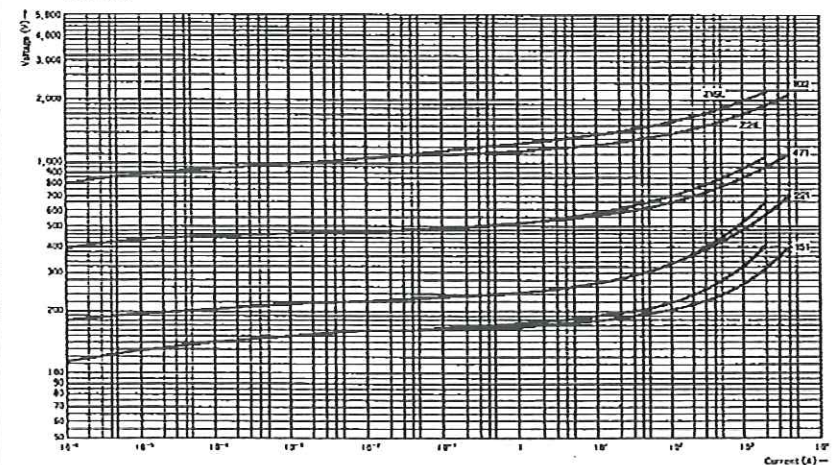


V-I characteristics

Z7L, Z10L



Z16L, Z21L



Specifications

Specifications											
Type No.	Varistor voltage E _V (V)		Limited voltage ratio E _{lim} /E _V ± 20%	Rating voltage		Surge absorptive energy	Capacitance (reference value)	Allowable power (W)	Leakage current (μA)	Peak current 8/20 μsec (A)	
	Min.	Max.		A.C (V rms)	D.C (V)						
Z7L220	22	19	25	2.30	12	15	1.0	4,200	0.03	50	125
Z7L270	27	23	31	2.27	14	19	1.2	3,300			
Z7L330	33	28	38	2.24	17	23	1.4	2,700			
Z7L390	39	33	45	2.21	20	27	1.6	2,200			
Z7L470	47	39	54	2.05	25	33	2.0	1,400			
Z7L560	56	47	64	1.95	30	40	2.4	1,100			
Z7L680	68	57	78	1.87	36	48	2.8	870			
Z7L820	82	69	94	1.80	44	58	3.4	700			
Z7L101	100	85	115	1.78	54	72	4.0	520			
Z7L121	120	102	138	1.75	65	88	4.8	420			
Z7L151	150	135	165	1.65	80	121	2	410	0.2	20	600
Z7L181	180	162	198	1.78	108	145	3	360			
Z7L201	200	180	220	1.69	120	160	4	320			
Z7L221	220	198	242	1.69	133	178	4	300			
Z7L271	270	243	297	1.63	163	219	4	250			
Z7L331	330	297	353	1.63	199	267	5	210			
Z7L391	390	351	429	1.63	235	315	6	180			
Z7L441	440	396	484	1.63	265	355	6	160			
Z7L471	470	423	517	1.66	284	390	6	150			
Z7L561	560	504	616	1.65	338	453	8	140			
Z7L681	680	612	748	1.64	411	550	8	110			
Z7L821	820	738	902	1.64	495	664	10	96			
Z7L102	1000	900	1100	1.62	604	810	10	86	0.06	50	600
Z10L220	22	19	25	2.25	12	15	1.5	6,900			
Z10L270	27	23	31	2.22	14	19	1.7	5,600			
Z10L330	33	28	38	2.19	17	23	2.0	4,600			
Z10L390	39	33	45	2.18	20	27	2.4	3,800			
Z10L470	47	39	54	2.00	25	33	3.0	2,400			
Z10L560	56	47	64	1.90	30	40	3.8	1,900			
Z10L680	68	57	78	1.82	36	48	4.2	1,500			
Z10L820	82	69	94	1.78	44	58	5.0	1,200			
Z10L101	100	85	115	1.76	54	72	6.0	900			
Z10L121	120	102	138	1.74	65	86	7.2	720	0.4	20	1,250
Z10L151	150	135	165	1.80	80	121	6	700			
Z10L181	180	162	198	1.68	108	145	8	600			
Z10L201	200	180	220	1.65	120	160	10	550			
Z10L221	220	198	242	1.65	133	178	10	520			
Z10L271	270	243	297	1.64	163	219	10	440			
Z10L331	330	297	353	1.62	199	267	12	370			
Z10L391	390	351	429	1.60	235	315	15	330			
Z10L441	440	396	484	1.60	265	355	15	310			
Z10L471	470	423	517	1.58	284	390	15	280			
Z10L561	560	504	616	1.58	338	453	17	250			
Z10L681	680	612	748	1.56	411	550	17	220			
Z10L821	820	738	902	1.56	495	664	20	180			
Z10L102	1000	900	1100	1.55	604	810	20	170	0.1	50	750
Z15L220	22	19	25	2.23	12	15	2.2	15,000			
Z15L270	27	23	31	2.20	14	19	2.6	12,000			
Z15L330	33	28	38	2.17	17	23	3.0	10,000			
Z15L390	39	33	45	2.14	20	27	3.6	8,000			
Z15L470	47	39	54	1.93	25	33	4.4	5,000			
Z15L560	56	47	64	1.83	30	40	5.4	4,000			
Z15L680	68	57	78	1.79	36	48	6.6	3,100			
Z15L820	82	69	94	1.77	44	58	8.0	2,500			
Z15L101	100	85	115	1.75	54	72	9.0	1,900			
Z15L121	120	102	138	1.73	65	86	11.0	1,500	0.6	20	1,600
Z15L151	150	135	165	1.68	80	121	10	1,600			
Z15L181	180	162	198	1.68	108	145	12	1,400			
Z15L201	200	180	220	1.64	120	160	15	1,200			
Z15L221	220	198	242	1.64	133	178	15	1,100			
Z15L271	270	243	297	1.63	163	219	15	970			
Z15L331	330	297	353	1.61	199	267	17	820			
Z15L391	390	351	429	1.60	235	315	20	700			
Z15L441	440	396	484	1.59	265	355	20	640			
Z15L471	470	423	517	1.57	284	390	20	600			
Z15L561	560	504	616	1.56	338	453	25	520			
Z15L681	680	612	748	1.55	411	550	25	440			
Z15L821	820	738	902	1.55	495	664	30	380			
Z15L102	1000	900	1100	1.54	604	810	30	330	0.8	20	3,000
Z21L151	150	135	165	1.87	90	121	15	2,300			
Z21L181	180	162	198	1.84	108	145	18	2,000			
Z21L201	200	180	220	1.82	120	160	18	1,800			
Z21L221	220	198	242	1.82	133	178	22	1,700			
Z21L271	270	243	297	1.61	163	219	22	1,400			
Z21L331	330	297	353	1.60	199	267	25	1,200			
Z21L391	390	351	429	1.58	235	315	30	1,050			
Z21L441	440	396	484	1.57	265	355	30	950			
Z21L471	470	423	517	1.58	284	390	30	900			
Z21L561	560	504	616	1.55	338	453	35	800			
Z21L681	680	612	748	1.55	411	550	35	680			
Z21L821	820	738	902	1.54	495	664	40	580			
Z21L102	1000	900	1100	1.53	604	810	40	500			