"ZNR®" Transient/Surge Absorbers, SMD MoLd

Type: **VF**
Type: **CF**
Type: **SF**

■ Features

- Large withstanding surge current capability in compact size
- Designed for flow/reflow solderings
- Excellent response against high steep surge voltage
- Low clamping voltage for better surge protection

■ Recommended Applications

- Protection of communication module (Modem, xDSL, Terminal Adopter)
- Protection of consumer equipment
- Protection of industrial equipment
- Protection of automobile equipment
- Absorption of switching surge from relays

■ Precautions for Handling

See Page 134 to 136

■ Explanation of Part Numbers

1	2	3	4	5	6	7	8	9	10	11	12
E	R	Z	V	F	□	□	□	□	□	□	□
Product Code			Type				Nominal Varistor Voltage			Design No.	

Packaging Style	
1	Bulk Type
2	Taping Type

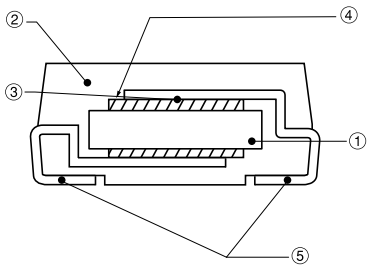
Height	
M	3.2 ± 0.3
T	2.3 ± 0.1

1	2	3	4	5	6	7	8	9	10	11	12
E	R	Z	□	F	□	M	K	□	□	□	□
Product Code			Type			Construction		Nominal Varistor Voltage			Design No.

Type	
CF	CF Type
SF	SF Type

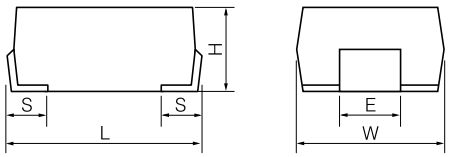
Packaging Style	
1	Bulk Type
2	Taping Type

■ Construction



① ZNR element	ZnO etc.
② Resin mold	Epoxy Resin(UL94V-0 approved)
③ Conductive adhesive	Silver
④ Electrode	Silver
⑤ Lead terminals	Soldered Ni-Fe Alloy

■ Dimensions in mm (not to scale)



Type	W	L	H	S	E
VF□M	6.0±0.4	8.0±0.5	3.2±0.3	1.3±0.3	2.5±0.2
VF□T	6.0±0.4	8.0±0.5	2.3±0.1	1.3±0.3	2.5±0.2
CF	6.0±0.4	8.0±0.5	3.2±0.3	1.3±0.3	2.5±0.2
SF	6.2±0.4				

■ Ratings and Characteristics

- Operating Temperature Range: –40 to 85 °C
- Storage Temperature Range: –40 to 125 °C
- Temperature Coefficient of Varistor Voltage: 0 to –0.05 %/°C

	Part No.	Varistor Voltage	Maximum Allowable Voltage		Clamping Voltage at Ip (max.)		Rated Power	Maximum Energy (2 ms)	Maximum Peak Current (8/20 µs, 2 times)
		V_{1mA} (V)	ACrms (V)	DC (V)	V_{xA} (V)	Ip (A)	(W)	(W)	(A)
Type VF□M	*ERZVF□M220	22(20~ 24)	14	18	43	2.5	0.01	0.5	125
	*ERZVF□M270	27(24~ 30)	17	22	53	2.5	0.01	0.7	125
	*ERZVF□M330	33(30~ 36)	20	26	65	2.5	0.01	0.8	125
	*ERZVF□M390	39(35~ 43)	25	31	77	2.5	0.01	0.9	125
	*ERZVF□M470	47(42~ 52)	30	38	93	2.5	0.01	1.1	125
	*ERZVF□M560	56(50~ 62)	35	45	110	2.5	0.01	1.3	125
	*ERZVF□M680	68(61~ 75)	40	56	135	2.5	0.01	1.6	125
	ERZVF□M820	82(74~ 90)	50	65	135	10	0.1	2.5	600
	ERZVF□M101	100(90~110)	60	85	165	10	0.1	3.0	600
	ERZVF□M121	120(108~132)	75	100	200	10	0.1	3.5	600
	ERZVF□M151	150(135~165)	95	125	250	10	0.1	4.5	600
	ERZVF□M201	200(185~225)	130	170	340	10	0.1	6.0	600
	ERZVF□M221	220(198~242)	140	180	360	10	0.1	6.5	600
	ERZVF□M241	240(216~264)	150	200	395	10	0.1	7.5	600
	ERZVF□M271	270(247~303)	175	225	455	10	0.1	8.0	600
	*ERZVF□M331	330(297~363)	210	270	545	10	0.1	8.0	300
	*ERZVF□M361	360(324~396)	230	300	595	10	0.1	9.0	300
	*ERZVF□M391	390(351~429)	250	320	650	10	0.1	9.0	300
	*ERZVF□M431	430(387~473)	275	350	710	10	0.1	10.0	300
	*ERZVF□M471	470(423~517)	300	385	775	10	0.1	10.0	300

Packaging Style Code: "1" for bulk, "2" for embossed taping

	Part No.	Varistor Voltage	Maximum Allowable Voltage		Clamping Voltage at Ip (max.)		Rated Power	Maximum Energy (2 ms)	Maximum Peak Current (8/20 µs, 2 times)
		V_{1mA} (V)	ACrms (V)	DC (V)	V_{xA} (V)	Ip (A)	(W)	(W)	(A)
Type VF□T	ERZVF□T820	82(74~ 90)	50	65	145	5	0.1	1.7	400
	ERZVF□T101	100(90~110)	60	85	175	5	0.1	2.0	400
	ERZVF□T151	150(135~165)	95	125	260	5	0.1	3.0	400
	ERZVF□T241	240(216~264)	150	200	415	5	0.1	5.0	400
	ERZVF□T271	270(247~303)	175	225	475	5	0.1	6.0	400

Packaging Style Code: "1" for bulk, "2" for embossed taping

■ Ratings and Characteristics

- Operating Temperature Range: –40 to 85 °C
- Storage Temperature Range: –40 to 125 °C
- Temperature Coefficient of Varistor Voltage: 0 to –0.05 %/°C

	Part No.	Varistor Voltage	Maximum Allowable Voltage		Clamping Voltage at Ip (max.)		Rated Power	Maximum Energy (2 ms)	Maximum Peak Current (8/20 µs, 2 times)
		$V_{0.1\,mA}$ (V)	ACrms (V)	DC (V)	$V_{x\,A}$ (V)	Ip (A)	(W)	(J)	(A)
Type CF	ERZCF□MK220	22 (20– 24)	14	18	48	1	0.01	0.4	50
	ERZCF□MK270	27 (24– 30)	17	22	60	1	0.01	0.5	50
	ERZCF□MK330	33 (30– 36)	20	26	73	1	0.01	0.6	50
	ERZCF□MK390	39 (35– 43)	25	31	86	1	0.01	0.8	50
	ERZCF□MK470	47 (42– 52)	30	38	104	1	0.01	1.0	50
	ERZCF□MK560	56 (50– 62)	35	45	123	1	0.01	1.0	50
	ERZCF□MK680	68 (61– 75)	40	56	150	1	0.01	1.2	50
	ERZCF□MK820	82 (74– 90)	50	65	145	5	0.1	1.7	200
	ERZCF□MK101	100 (90–110)	60	85	175	5	0.1	2.0	200
	ERZCF□MK121	120 (108–132)	75	100	210	5	0.1	2.5	200
	ERZCF□MK151	150 (135–165)	95	125	260	5	0.1	3.0	200
	ERZCF□MK201	200 (185–225)	130	170	355	5	0.1	4.0	200
	ERZCF□MK221	220 (198–242)	140	180	380	5	0.1	4.5	200
	ERZCF□MK241	240 (216–264)	150	200	415	5	0.1	5.0	200
	ERZCF□MK271	270 (247–303)	175	225	475	5	0.1	6.0	200
	ERZCF□MK361	360 (324–396)	230	300	620	5	0.1	6.0	200
	ERZCF□MK391	390 (351–429)	250	320	675	5	0.1	6.0	200
	ERZCF□MK431	430 (387–473)	275	350	745	5	0.1	6.3	200
	ERZCF□MK471	470 (423–517)	300	385	810	5	0.1	7.0	200

Packaging Style Code: "1" for bulk, "2" for embossed taping

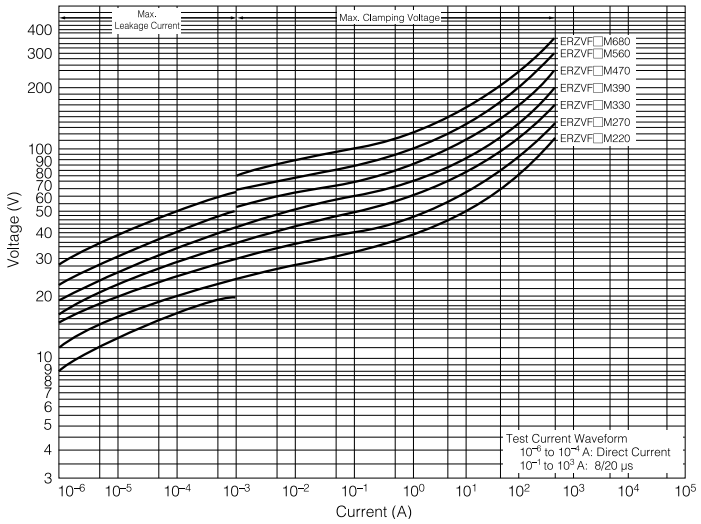
	Part No.	Varistor Voltage	Maximum Allowable Voltage		Clamping Voltage at Ip (max.)		Rated Power	Maximum Energy (2 ms)	Maximum Peak Current (8/20 µs, 2 times)
		$V_{1\,mA}$ (V)	ACrms (V)	DC (V)	$V_{x\,A}$ (V)	Ip (A)	(W)	(J)	(A)
Type SF	ERZSF□MK220	22 (20– 25)	14	18	43	2.5	0.02	0.9	125
	ERZSF□MK270	27 (24– 30)	17	22	53	2.5	0.02	1.0	125
	ERZSF□MK330	33 (30– 36)	20	26	65	2.5	0.02	1.2	125
	ERZSF□MK390	39 (35– 43)	25	31	77	2.5	0.02	1.5	125
	ERZSF□MK470	47 (42– 52)	30	38	93	2.5	0.02	1.8	125
	ERZSF□MK560	56 (50– 62)	35	45	110	2.5	0.02	2.2	125
	ERZSF□MK680	68 (61– 75)	40	56	135	2.5	0.02	2.5	125
	ERZSF□MK820	82 (74– 90)	50	65	135	10	0.25	3.5	600
	ERZSF□MK101	100 (90–110)	60	85	165	10	0.25	4.0	600
	ERZSF□MK121	120 (108–132)	75	100	200	10	0.25	5.0	600
	ERZSF□MK151	150 (135–165)	95	125	250	10	0.25	6.0	600
	ERZSF□MK201	200 (185–225)	130	170	340	10	0.25	8.0	600
	ERZSF□MK221	220 (198–242)	140	180	360	10	0.25	9.0	600
	ERZSF□MK241	240 (216–264)	150	200	395	10	0.25	10.0	600
	ERZSF□MK271	270 (247–303)	175	225	455	10	0.25	12.0	600
	ERZSF□MK361	360 (324–396)	230	300	595	10	0.20	12.0	400
	ERZSF□MK391	390 (351–429)	250	320	650	10	0.20	12.0	400
	ERZSF□MK431	430 (387–473)	275	350	710	10	0.20	14.0	400
	ERZSF□MK471	470 (423–517)	300	385	775	10	0.20	14.0	400

Packaging Style Code: "1" for bulk, "2" for embossed taping

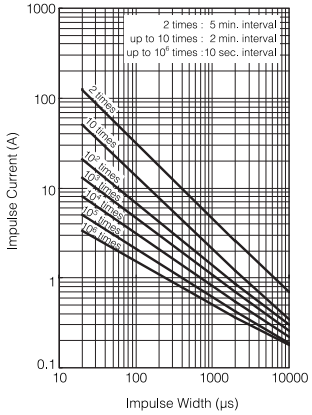
■ Typical Characteristics

■ Voltage vs. Current

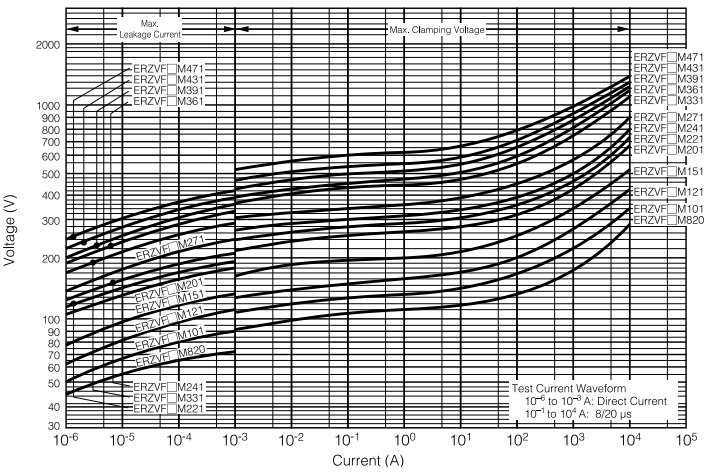
■ ERZVF1(2)M220 to ERZVF1(2)M680



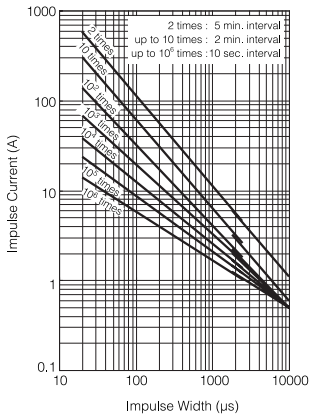
■ Impulse



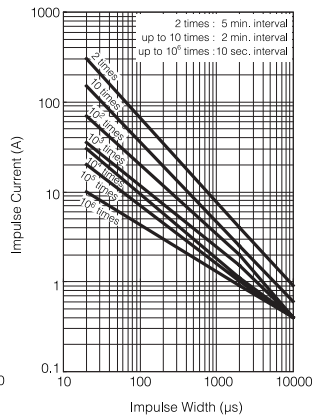
■ ERZVF1(2)M820 to ERZVF1(2)M471



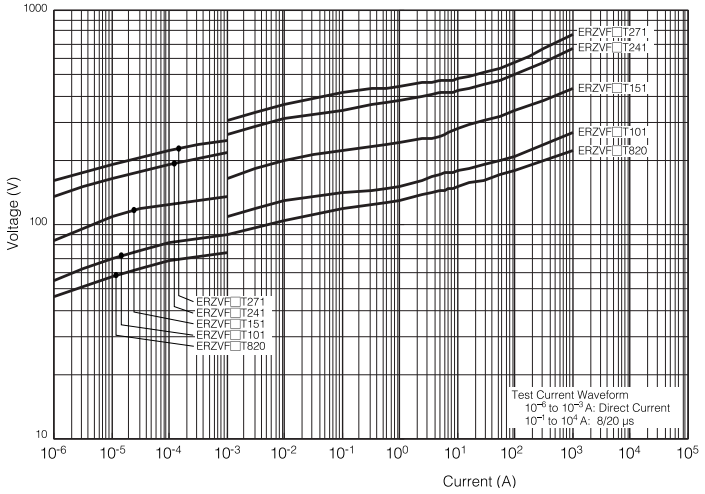
ERZVF1(2)M820 to ERZVF1(2)M271

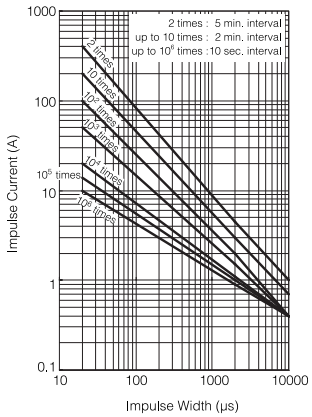


ERZVF1(2)M331 to ERZVF1(2)M471



■ ERZVF1(2)T820 to ERZVF1(2)T271

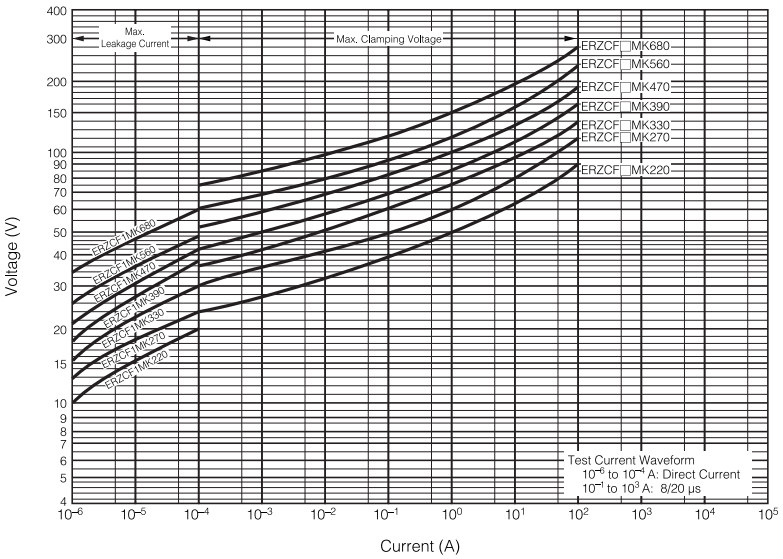




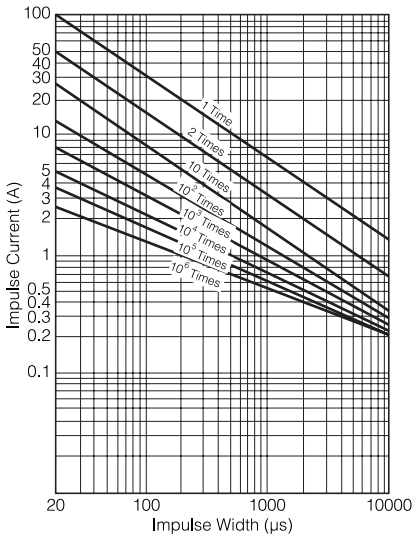
■ Typical Characteristics

■ Voltage vs. Current

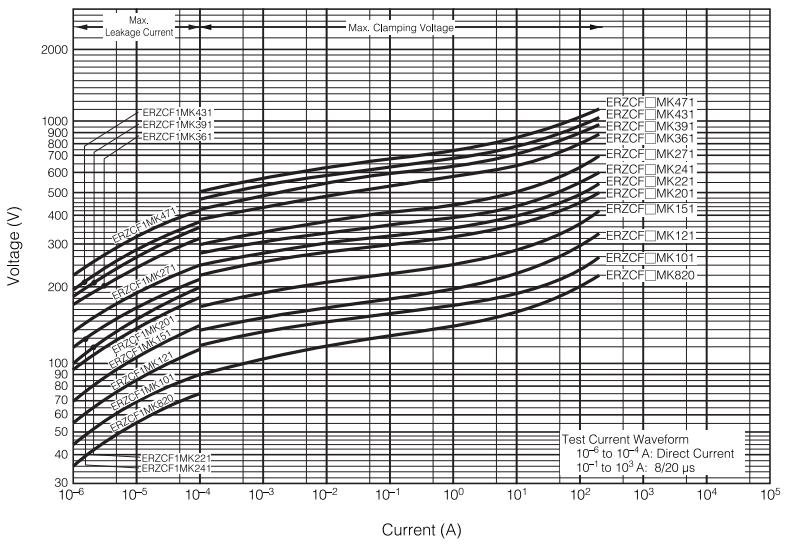
■ ERZCF1 (2) MK220 to ERZCF1 (2) MK680

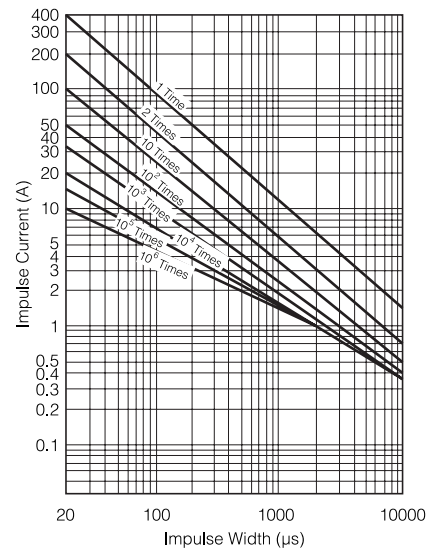


■ Impulse



■ ERZCF1 (2) MK820 to ERZCF1 (2) MK471

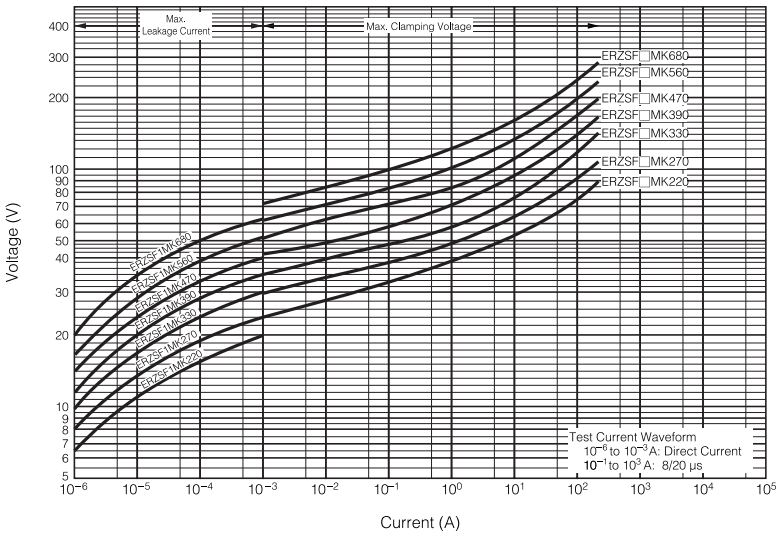




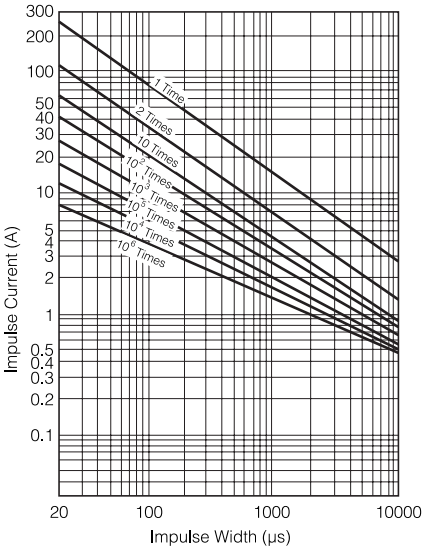
■ Typical Characteristics

■ Voltage vs. Current

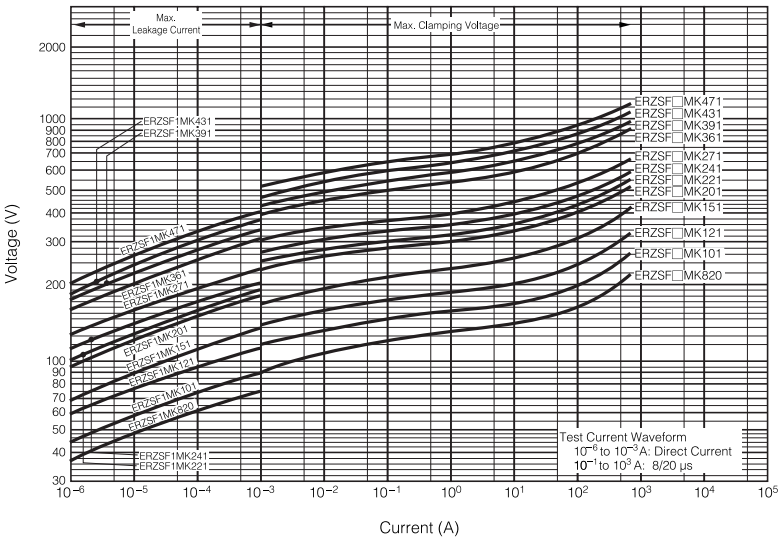
■ ERZSF1 (2) MK220 to ERZSF1 (2) MK680

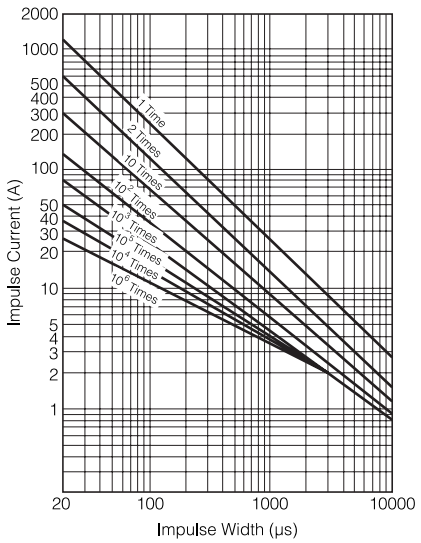


■ Impulse

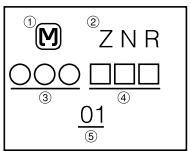


■ ERZSF1 (2) MK820 to ERZSF1 (2) MK471





■ Marking Contents



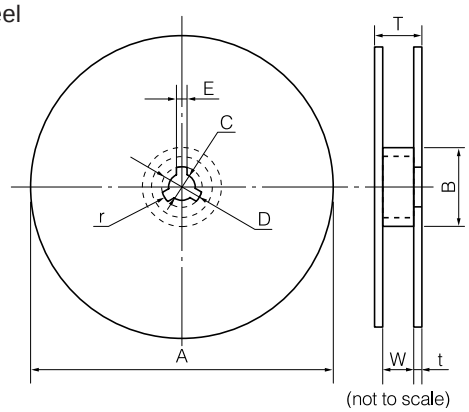
① Trade Mark	Trade Mark
② Product Name	ZNR
③ Type	VF□M Type:VFM, VF□T Type:VFT CF Type:FK, SF Type:SF
④ Abbreviation of Part No.	The first two digits are significant figures and the third one denotes the number of zeros following.
⑤ Date Code	Left(Year): 2002:B, 2003:C, 2004:D, 2005:E, 2006:F Right(Month): Jan. to Sep.:1 to 9, Oct.:0, Nov.:N, Dec.:D

■ Packaging Specifications

● Packing Quantity

Style / Size Code	Embossed taping	Bulk
"VF□M", "VF□T", "CF", "SF"	2000 pcs./reel	200 pcs./bag

● Reel



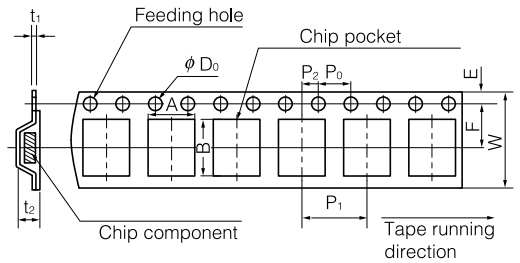
(not to scale)

Dimensions (mm)	A	B	C	D	E
	382 max.	50 min.	13.0±0.5	21.0±0.8	2.0±0.5

Dimensions (mm)	W	T	t	r
	$16.4^{+2.0}_{0}$	22.4 max.	2.5±0.5	1.0

● Embossed Taping

(W=16 mm)



(not to scale)

Dimensions (mm)	A	B	W	F	E	P_1
	6.8±0.2	11.9 max.	16.0±0.3	7.5±0.1	1.75±0.10	8.0±0.1

Dimensions (mm)	P_2	P_0	ϕD_0	t_1	t_2
	2.0±0.1	4.0±0.1	$1.5^{+0.1}_{-0}$	0.6 max.	6.5 max.

■ Performance Characteristics

<table>
<tr><th>Characteristics</th><th>Test Methods</th><th>Specifications</th></tr>
<tr><td>Standard Test Condition</td><td>Electrical measurements (initial/after tests) shall be conducted at temperature of 5 to 35 °C, relative humidity of maximum 85 %</td><td>—</td></tr>
<tr><td>Varistor Voltage</td><td>The voltage between two terminals with the specified measuring current CmA DC applied is called Vc or V_{CmA}. The measurement shall be made as fast as possible to avoid heat affection.</td><td rowspan="6">To meet the specified value.</td></tr>
<tr><td>Maximum Allowable Voltage</td><td>The recommended maximum sinusoidal wave voltage (rms) or the maximum DC voltage that can be applied continuously.</td></tr>
<tr><td>Clamping Voltage</td><td>The maximum voltage between two terminals with the specified impulse current (8/20 μs).</td></tr>
<tr><td>Rated Power</td><td>The maximum power that can be applied within the specified ambient temperature.</td></tr>
<tr><td>Maximum Energy</td><td>Maximum energy at less than ±10 % of varistor voltage change when the standard impulse (2 ms) is applied one time.</td></tr>
<tr><td>Maximum Peak Current</td><td>Maximum current at less than ±10 % of varistor voltage change when impulse current (8/20 μs) is applied two times continuously with the interval of 5 minutes.</td></tr>
<tr><td>Temperature Coefficient of Varistor Voltage</td><td>$\frac{V_{CmA} \text{ at } 85\,^{\circ}C - V_{CmA} \text{ at } 25\,^{\circ}C}{V_{CmA} \text{ at } 25\,^{\circ}C} \times \frac{1}{60} \times 100(\%/^{\circ}C)$</td><td>0 to –0.05 %/°C</td></tr>
<tr><td>Impulse Life (I)</td><td>The change of Vc shall be measured after the specified impulse is applied 10000 times continuously with the interval of 10 seconds at room temperature.
<table>
<tr><th>Type</th><th>Part Number</th><th>Waveform</th><th>Current</th></tr>
<tr><td rowspan="3">VF□M</td><td>ERZVF□M220 to ERZVF□M680</td><td>8/20 μs</td><td>8 A</td></tr>
<tr><td>ERZVF□M820 to ERZVF□M271</td><td>8/20 μs</td><td>40 A</td></tr>
<tr><td>ERZVF□M331 to ERZVF□M471</td><td>8/20 μs</td><td>30 A</td></tr>
<tr><td>VF□T</td><td>ERZVF□T820 to ERZVF□T271</td><td>8/20 μs</td><td>20 A</td></tr>
<tr><td rowspan="2">CF</td><td>ERZCF □MK220 to ERZCF □MK680</td><td>2 ms</td><td>0.5 A</td></tr>
<tr><td>ERZCF □MK820 to ERZCF □MK471</td><td>8/20 μs</td><td>20 A</td></tr>
<tr><td rowspan="3">SF</td><td>ERZSF □MK220 to ERZSF □MK680</td><td>8/20 μs</td><td>18 A</td></tr>
<tr><td>ERZSF □MK820 to ERZSF □MK271</td><td>8/20 μs</td><td>50 A</td></tr>
<tr><td>ERZSF □MK331 to ERZSF □MK471</td><td>8/20 μs</td><td>40 A</td></tr>
</table></td><td>$\Delta V_{CmA}/V_{CmA} \leqq \pm 10$ %</td></tr>
<tr><td>Impulse Life (II)</td><td>The change of Vc shall be measured after the specified impulse is applied 100000 times continuously with the interval of 10 seconds at room temperature.
<table>
<tr><th>Type</th><th>Part Number</th><th>Waveform</th><th>Current</th></tr>
<tr><td rowspan="3">VF□M</td><td>ERZVF□M220 to ERZVF□M680</td><td>8/20 μs</td><td>5 A</td></tr>
<tr><td>ERZVF□M820 to ERZVF□M271</td><td>8/20 μs</td><td>25 A</td></tr>
<tr><td>ERZVF□M331 to ERZVF□M471</td><td>8/20 μs</td><td>20 A</td></tr>
<tr><td>VF□T</td><td>ERZVF□T820 to ERZVF□T271</td><td>8/20 μs</td><td>14 A</td></tr>
<tr><td rowspan="2">CF</td><td>ERZCF □MK220 to ERZCF □MK680</td><td>2 ms</td><td>0.45 A</td></tr>
<tr><td>ERZCF □MK820 to ERZCF □MK471</td><td>8/20 μs</td><td>14 A</td></tr>
<tr><td rowspan="3">SF</td><td>ERZSF □MK220 to ERZSF □MK680</td><td>8/20 μs</td><td>12 A</td></tr>
<tr><td>ERZSF □MK820 to ERZSF □MK271</td><td>8/20 μs</td><td>35 A</td></tr>
<tr><td>ERZSF □MK331 to ERZSF □MK471</td><td>8/20 μs</td><td>28 A</td></tr>
</table></td><td>$\Delta V_{CmA}/V_{CmA} \leqq \pm 10$ %</td></tr>
</table>