

TRANSIENT VOLTAGE SUPPRESSOR

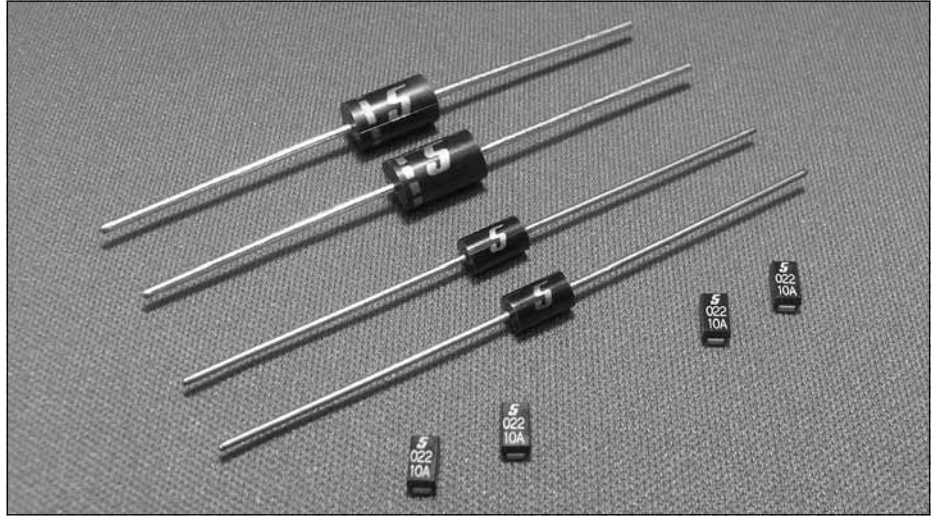
VRD

VRD is a transient voltage suppressor used for protecting electric circuits from surge voltage and thus preventing breakdown.

VRD has superior surge suppression characteristics, such as extremely fast response time, very low clamping voltage, and high surge capacity. Unlike metal oxide varistors, VRD does not have characteristics to change with surge variations within the rated capacity. This feature comprises another superior characteristics of the VRD as a transient voltage suppressors.

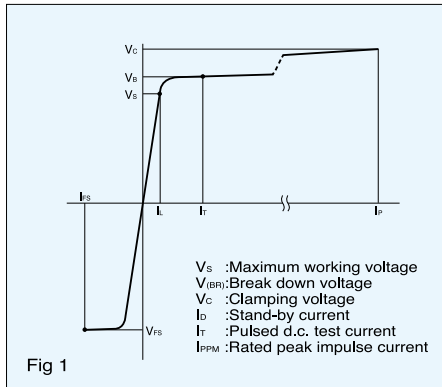
Part number

Z2 033 U - 52Z	
Z2	52Z : Axial taping winding type
033	52R : Axial taping relay type
U	FT : Radial form taping type
	Nil : individually packed in a bag
	U : Uni-Polar
	Nil : Bi-Polar
	Break down voltage
	Type
	Z2 : Rated electricity 1.0W
	Z6 : Rated electricity 2.0W
	ZD : Rated electricity 0.5W (reverse blocking type)



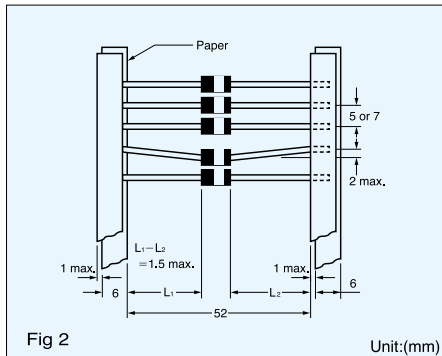
Electrical characteristics

Figure 1 shows the electrical characteristics. Bipolar type has almost symmetrical breakdown Voltage (V_B) The reverse breakdown voltage of the ZD type is 200 Volts or more at 10 μ A DC.



Taping

One of standard taping is as shown in Figure.



Taping qty

Part series	Taping method	Qty(pcs)
Z2,Z2U	Axial taping	reel type 5,000
		winding type 2,000
	Radial taping	winding type 2,000
Z6,Z6U	Axial taping	reel type 2,500
		winding type 1,000

Surge capability

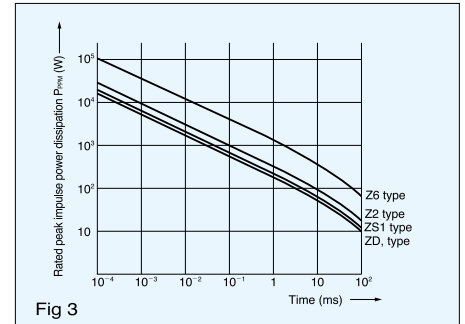
Allowable surge capability (P_{PPM}) is determined by the following equation:

$$P_{PPM} = I_{PPM} \times V_C$$

I_{PPM} : Rated peak impulse current

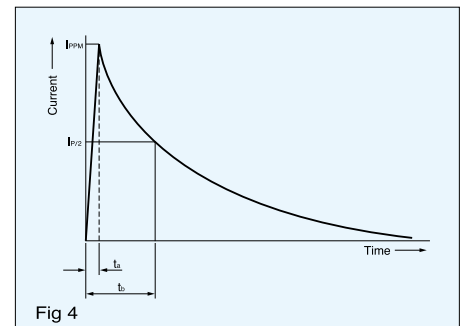
V_C : clamping voltage

The allowable surge capability (Rated peak impulse power dissipation P_{PPM}) of VRD is shown in following Figure 3 and the surge capability derating characteristics are shown in Figure 6.



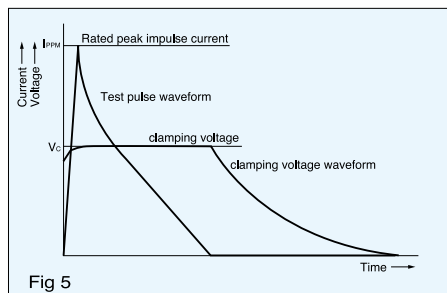
Surge waveform

There are many types of surge waveform depending on the source of the surge. For the VRD surge suppression characteristics test, the EXP waveform shown below is used. The EXP waveform is shown as t_a/t_b depending on the time width, however 10/1000 waveform is used as the standard test waveform.

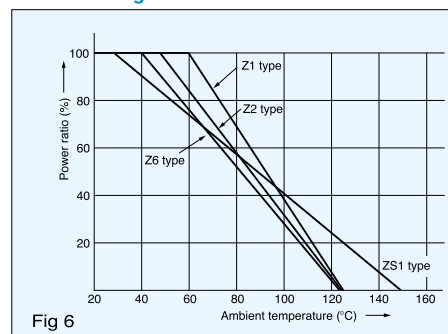


Surge suppression characteristics

When EXP waveform is applied, the surge suppression waveform shown in the figure 5 can be observed.



Power derating



Z2 type VRD has bipolar or unipolar electrical characteristics.

Maximum ratings

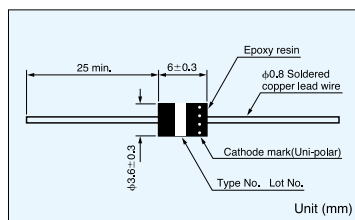
Rated peak impulse power dissipation
:500 W (10/1000 μ s)
6.00 kW (8/20 μ s)

Rated average power dissipation:1W
Operating and storage temperature
: -40°C to 125°C

Symbol mark

Bi-polar

Uni-polar

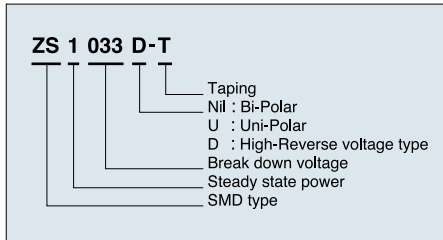


Part No.		Stand-off voltage V _S V	Stand-by current I _D μA	Breakdown voltage V _(BR) V	Pulsed d.c. test current I _T mA	Clamping Voltage & Rated peak impulse current				Temperature coefficient (TYP)	Capacitance (TYP) pF				
Bi-polar type	Uni-polar type					10/1000μs		8/20μs							
						V _C V	I _{PPM} A	V _C V	I _{PPM} A						
—	Z2008U	6.63	500	7.38-9.02	10	12.5	40.0	16.3	372	0.063	2400				
—	Z2010U	8.10	20	9.00-11.0		15.0	33.4	19.5	311	0.071	1900				
Z2012	—	9.72		10.8-13.2		17.3	28.9	22.7	267	0.066	790				
—	Z2012U			10.8-13.2		22.0	22.7	28.4	213	0.074	1580				
Z2015	—	13.5-16.5		0.075						640					
—	Z2015U	12.1			13.5-16.5						0.079	1280			
Z2018	—	14.5	16.2-19.8		26.5						18.8	34.0	178	0.079	520
—	Z2018U		16.2-19.8		31.9						15.7	41.2	147	0.083	1040
Z2022	—	17.8	19.8-24.2											39.1	12.8
—	Z2022U		19.8-24.2	47.7	10.5	61.7	98.2	0.086	840						
Z2027	—	21.8	24.3-29.7					56.4	8.86	73.0	83.0	0.085	340		
—	Z2027U		24.3-29.7	67.8	7.37	88.0	68.9					0.089	680		
Z2033	—	26.8	29.7-36.3					80.5	6.21	105.0	57.7	0.087	280		
—	Z2033U		29.7-36.3	98.0	5.10	127.0	47.7					0.092	560		
Z2039	—	31.6	35.1-42.9					118.0	4.24	153.0	39.6	0.090	240		
—	Z2039U		35.1-42.9	144.0	3.47	187.0	32.4					0.095	480		
Z2047	—	38.1	42.3-51.7					215.0	2.32	277.0	21.9	0.092	200		
—	Z2047U		42.3-51.7	258.0	1.94	333.0	18.2					0.097	400		
Z2056	—	45.4	50.4-61.6									0.094	160		
—	Z2056U		50.4-61.6	0.099	320										
Z2068	—	55.1	61.2-74.8	98.0	5.10	127.0	47.7					0.096	130		
—	Z2068U		61.2-74.8	118.0	4.24	153.0	39.6					0.100	260		
Z2082	—	66.4	73.8-90.2					144.0	3.47	187.0	32.4	0.099	110		
—	Z2082U		73.8-90.2	173.0	2.89	222.0	27.3					0.102	220		
Z2100	—	81.0	90.0-110					215.0	2.32	277.0	21.9	0.101	90		
—	Z2100U		90.0-110	258.0	1.94	333.0	18.2					0.104	180		
Z2120	—	97.2	108-132									0.103	75		
—	Z2120U		108-132	0.106	150										
Z2150	—	121.0	135-165	215.0	2.32	277.0	21.9					0.105	60		
—	Z2150U		135-165	258.0	1.94	333.0	18.2					0.107	120		
Z2180	—	146.0	162-198					258.0	1.94	333.0	18.2	0.106	49		
—	Z2180U		162-198						0.108	98					

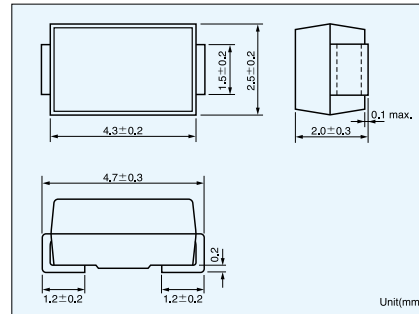
NOTE: Nonsuffix:bi-polar, suffix"U" : uni-polar.

SMD VRD

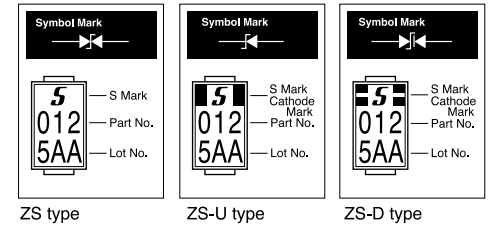
Part number



Dimensions

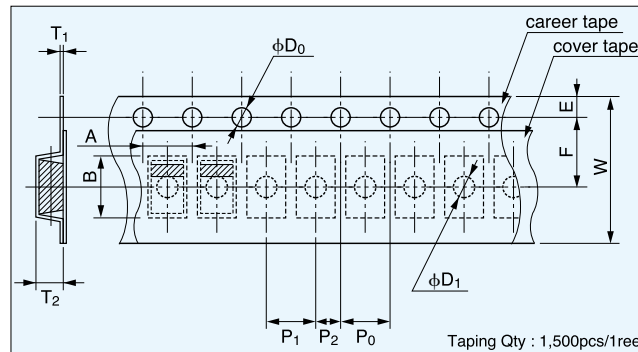


Marking



	Rating
Rated average power dissipation	1.0W
Rated peak impulse power dissipation	300W(10/1000μs)
	1200W(1.2/50μs)
	2000W(8/20μs)
Storage temp. range	-40°C~150°C

Taping



A	B	W	F	E	P ₁
3.0 ±0.1	5.2 ±0.1	12.0 ±0.3	5.5 ±0.05	1.75 ±0.1	4.0 ±0.1
P ₂	P ₀	ΦD ₀	ΦD ₁	T ₁	T ₂
2.0 ±0.1	4.0 ±0.1	1.5 +0.1 -0	1.5 +0.2 -0	0.3 ±0.05	(2.6)

Unit (mm)

Specifications

ZS type

Part No.	Breakdown voltage	Stand-off voltage	Stand-by current	Maximum clamping voltage & Maximum peak pulse current				Temperature coefficient (TYP)	Capacitance (TYP)
	V _(BR)	V _S	I _L max	V _C max/I _{PPM}				25°C~50°C	C
	It=1mA	D.C.	V _S	10/1000μs		8/20μs			
	V	V	μA	V	A	V	A	%/°C	pF
ZS1012	12(10.8~13.2)	9.72	10	17.3	17.3	22.4	89.3	0.066	551
ZS1015	15(13.5~16.5)	12.1	5	22.0	13.6	28.5	70.2	0.075	465
ZS1018	18(16.2~19.8)	14.5		26.5	11.3	34.4	58.1	0.079	376
ZS1022	22(19.8~24.2)	17.8		31.9	9.40	41.4	48.3	0.082	299
ZS1027	27(24.3~29.7)	21.8		39.1	7.67	50.7	39.4	0.085	248
ZS1033	33(29.7~36.3)	26.8		47.7	6.29	61.8	32.4	0.087	198
ZS1039	39(35.1~42.9)	31.6		56.4	5.32	73.1	27.4	0.090	164
ZS1047	47(42.3~51.7)	38.1		67.8	4.42	88.0	22.7	0.092	137

ZS-U type

Part No.	Breakdown voltage	Stand-off voltage	Stand-by current	Maximum clamping voltage & Maximum peak pulse current				Temperature coefficient (TYP)	Capacitance (TYP)
	V _(BR)	V _S	I _L max	V _C max/I _{PPM}					C
	It=1mA	D.C.	V _S	10/1000μs		8/20μs		25°C~50°C	
	V	V	μA	V	A	V	A	%/°C	pF
ZS1012U	12(10.8~13.2)	9.72	10	17.3	17.3	22.4	89.3	0.066	1,102
ZS1015U	15(13.5~16.5)	12.1	5	22.0	13.6	28.5	70.2	0.075	929
ZS1018U	18(16.2~19.8)	14.5		26.5	11.3	34.4	58.1	0.079	751
ZS1022U	22(19.8~24.2)	17.8		31.9	9.40	41.4	48.3	0.082	598
ZS1027U	27(24.3~29.7)	21.8		39.1	7.67	50.7	39.4	0.085	497
ZS1033U	33(29.7~36.3)	26.8		47.7	6.29	61.8	32.4	0.087	395
ZS1039U	39(35.1~42.9)	31.6		56.4	5.32	73.1	27.4	0.090	328
ZS1047U	47(42.3~51.7)	38.1		67.8	4.42	88.0	22.7	0.092	274

ZS-D type

Part No.	Breakdown voltage	Stand-off voltage	Stand-by current	Maximum clamping voltage & Maximum peak pulse current				Temperature coefficient (TYP)	Capacitance (TYP)
	V _(BR)	V _S	I _L max	V _{Cmax} /I _{PPM}					C
	It=1mA	D.C.	V _S	10/1000μs		8/20μs		25°C~50°C	
	V	V	μA	V	A	V	A	%/°C	pF
ZS1012D	12(10.8~13.2)	9.72	10	17.3	17.3	22.4	89.3	0.066	30.2
ZS1015D	15(13.5~16.5)	12.1	5	22.0	13.6	28.5	70.2	0.075	29.1
ZS1018D	18(16.2~19.8)	14.5		26.5	11.3	34.4	58.1	0.079	28.2
ZS1022D	22(19.8~24.2)	17.8		31.9	9.40	41.4	48.3	0.082	27.3
ZS1027D	27(24.3~29.7)	21.8		39.1	7.67	50.7	39.4	0.085	26.4
ZS1033D	33(29.7~36.3)	26.8		47.7	6.29	61.8	32.4	0.087	25.5
ZS1039D	39(35.1~42.9)	31.6		56.4	5.32	73.1	27.4	0.090	24.8
ZS1047D	47(42.3~51.7)	38.1		67.8	4.42	88.0	22.7	0.092	24.0

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