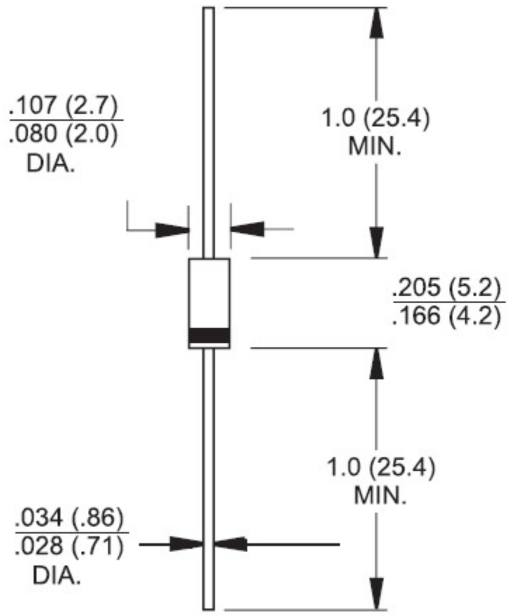
400 Watt Peak Power Transient Voltage Suppressors

Features

- Plastic package has underwriters laboratory flammablity Classification 94V-0
- 400W surge capability at 10×100us waveform, duty cycle : 0.01%
- Excellent clamping capability
- Low zener impedance
- Fast response time : Typically less than 1.0ps form 0 volts to V_{BR} for unidirectional and 5.0ns for bidirectional
- Typical I_R less than 1uA above 10V
- High temperature soldering guaranteed : 260°C/10 seconds/0.375",(9.5mm) lead length/5lbs.,(2.3kg)tension

DO-41

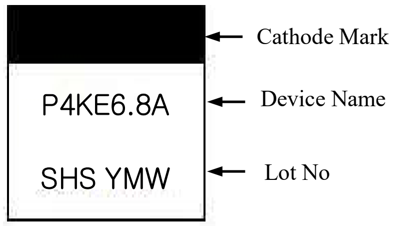


Dimensions in inches and (millimeters)

Mechanical Data

- Case : Molded plastic
- Lead : Axial leads, solderable per MIL-STD-750, Method 2026
- Polarity : Color band denotes cathode except bipolar
- Weight : approx. 0.30 grams

Marking



Maximum Ratings (Ta=25°C unless otherwise noted)

Rating at 25°C ambient temperature unless otherwise specified.
Single phase, half wave, 60 Hz, resistive or inductive load.
For capacitive load, derate current by 20%

Parameter	Symbol	Rated Value	Unit	Remark
Peak Power Dissipation at Ta = 25℃, T_P=1ms	P_{PK}	Minimum 400	W	Note 1
Steady State Power Dissipation at T_L=75℃ Lead Lengths 0.375", (9.5mm)	P_D	1.0	W	Note 2
Peak Forward Surge Current, 8.3ms Single Half Sine-wave Superimposed on Rated Load (JEDEC Method)	I_{FSM}	40	A	Note 3
Maximum Instantaneous Forward Voltage at 25A for Unidirectional Only	V_F	3.5 / 5.0	V	Note 4
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to +175	℃	

Note 1. Non-repetitive current pulse per Fig.3 and derated above Ta=25°C per Fig.2.
Note 2. Mounted on cupper pad area of 1.6 ×1.6"(40×40mm) per Fig.4.
Note 3. 8.3ms single half sine-wave or equivalent square wave, duty cycle=4 pulse per minutes maximum.
Note 4. V_F=3.5V for devices of V_{BR}≤200V and V_F=6.5V Max. for devices of V_{BR}>200V.
Devices for Bipolar Applications
1. For bidirectional use C or CA suffix for types P4KE6.8 through types P4KE440.
2. Electrical characteristics apply in both directions

Electrical Characteristics (Ta=25℃ unless otherwise noted)

Device	Nominal Voltage (V)	Breakdown Voltage(Note 1) V_{BR}(V)		Test Current @I_T(mA)	Stand-Off Voltage V_{WM}(V)	Maximum Reverse Leakage at V_{WM} I_D(uA)	Maximum Peak Pulse Current I_{RSM} (Note 2) (A)	Maximum Clamping Voltage at I_{PPM} V_C(V)	Maximum Temperature Coefficient of V_{BR}(%/℃)
		Min	Max						
P4KE6.8	6.8	6.12	7.48	10	5.50	1000	38.0	10.8	0.057
P4KE6.8A	6.8	6.45	7.14	10	5.80	1000	40.0	10.5	0.057
P4KE7.5	7.5	6.75	8.25	10	6.05	500	35.0	11.7	0.061
P4KE7.5A	7.5	7.13	7.88	10	6.40	500	37.0	11.3	0.061
P4KE8.2	8.2	7.38	9.02	10	6.63	200	33.0	12.5	0.065
P4KE8.2A	8.2	7.79	8.61	1.0	7.02	200	34.0	12.1	0.065
P4KE9.1	9.1	8.19	10.0	1.0	7.37	50	30.0	13.8	0.068
P4KE9.1A	9.1	8.65	9.55	1.0	7.78	50	31.0	13.4	0.068
P4KE10	10	9.00	11.0	1.0	8.10	10	28.0	15.0	0.073
P4KE10A	10	9.50	10.5	1.0	8.55	10	29.0	14.5	0.073
P4KE11	11	9.90	12.1	1.0	8.92	5.0	26.0	16.2	0.075
P4KE11A	11	10.5	11.6	1.0	9.40	5.0	27.0	15.6	0.075
P4KE12	12	10.8	13.2	1.0	9.72	5.0	24.0	17.3	0.078
P4KE12A	12	11.4	12.6	1.0	10.2	5.0	25.0	16.7	0.078
P4KE13	13	11.7	14.3	1.0	10.5	5.0	22.0	19.0	0.081
P4KE13A	13	12.4	13.7	1.0	11.1	5.0	23.0	18.2	0.081
P4KE15	15	13.5	16.5	1.0	12.1	5.0	19.0	22.0	0.084
P4KE15A	15	14.3	15.8	1.0	12.8	5.0	20.0	21.2	0.084
P4KE16	16	14.4	17.6	1.0	12.9	5.0	17.8	23.5	0.086
P4KE16A	16	15.2	16.8	1.0	13.6	5.0	18.6	22.5	0.086
P4KE18	18	16.2	19.8	1.0	14.5	5.0	16.0	26.5	0.088
P4KE18A	18	17.1	18.9	1.0	15.3	5.0	16.5	25.2	0.088
P4KE20	20	18.0	22.0	1.0	16.2	5.0	14.0	29.1	0.090
P4KE20A	20	19.0	21.0	1.0	17.1	5.0	15.0	27.7	0.090
P4KE22	22	19.8	24.2	1.0	17.8	5.0	13.0	31.9	0.092
P4KE22A	22	20.9	23.1	1.0	18.8	5.0	13.7	30.6	0.092
P4KE24	24	21.6	26.4	1.0	19.4	5.0	12.0	34.7	0.094
P4KE24A	24	22.8	25.2	1.0	20.5	5.0	12.6	33.2	0.094
P4KE27	27	24.3	29.7	1.0	21.8	5.0	10.7	39.1	0.096
P4KE27A	27	25.7	28.4	1.0	23.1	5.0	11	37.5	0.096
P4KE30	30	27.0	33.0	1.0	24.3	5.0	9.6	43.5	0.097
P4KE30A	30	28.5	31.5	1.0	25.6	5.0	10.0	41.4	0.097
P4KE33	33	29.7	36.3	1.0	26.8	5.0	8.8	47.7	0.098
P4KE33A	33	31.4	34.7	1.0	28.2	5.0	9.0	45.7	0.098
P4KE36	36	32.4	39.6	1.0	29.1	5.0	8.0	52.0	0.099
P4KE36A	36	34.2	37.8	1.0	30.8	5.0	8.4	49.9	0.099
P4KE39	39	35.1	42.9	1.0	31.6	5.0	7.4	56.4	0.100
P4KE39A	39	37.1	41.0	1.0	33.3	5.0	7.7	53.9	0.100
P4KE43	43	38.7	47.3	1.0	34.8	5.0	6.7	61.9	0.101
P4KE43A	43	40.9	45.2	1.0	36.8	5.0	7.0	59.3	0.101
P4KE47	47	42.3	51.7	1.0	38.1	5.0	6.2	67.8	0.101
P4KE47A	47	44.7	49.4	1.0	40.2	5.0	6.4	64.8	0.101
P4KE51	51	45.9	56.1	1.0	41.3	5.0	5.7	73.5	0.102
P4KE51A	51	48.5	53.6	1.0	43.6	5.0	6.0	70.1	0.102

Electrical Characteristics (Ta=25℃ unless otherwise noted)

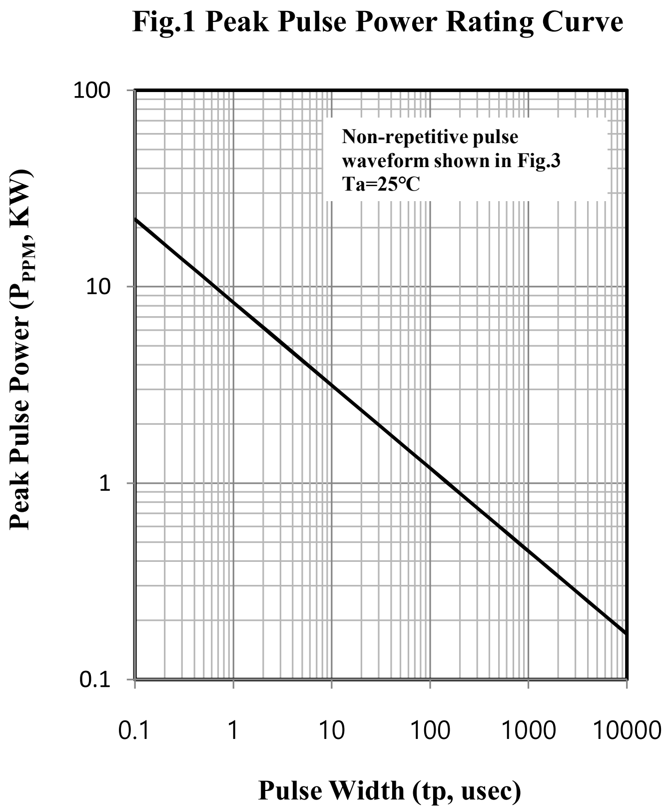
Device	Nominal Voltage (V)	Breakdown Voltage(Note 1) V_{BR}(V)		Test Current @I_T(mA)	Stand-Off Voltage V_{WM}(V)	Maximum Reverse Leakage at V_{WM} I_D(uA)	Maximum Peak Pulse Current I_{RSM} (Note 2) (A)	Maximum Clamping Voltage at I_{PPM} V_C(V)	Maximum Temperature Coefficient of V_{BR}(%/℃)
		Min	Max						
P4KE56	56	50.4	61.6	1.0	45.4	5.0	5.2	80.5	0.103
P4KE56A	56	53.2	58.8	1.0	47.8	5.0	5.4	77.0	0.103
P4KE62	62	55.8	68.2	1.0	50.2	5.0	4.7	89.0	0.104
P4KE62A	62	58.9	65.1	1.0	53.0	5.0	5.0	85.0	0.104
P4KE68	68	61.2	74.8	1.0	55.1	5.0	4.2	98.0	0.104
P4KE68A	68	64.6	71.4	1.0	58.1	5.0	4.5	92.0	0.104
P4KE75	75	67.5	82.5	1.0	60.7	5.0	3.8	108	0.105
P4KE75A	75	71.3	78.8	1.0	64.1	5.0	4.0	103	0.105
P4KE82	82	73.8	90.2	1.0	66.4	5.0	3.5	118	0.105
P4KE82A	82	77.9	86.1	1.0	70.1	5.0	3.7	113	0.105
P4KE91	91	81.9	100	1.0	73.7	5.0	3.2	131	0.106
P4KE91A	91	86.5	95.5	1.0	77.8	5.0	3.3	125	0.106
P4KE100	100	90.0	110	1.0	81.0	5.0	2.9	144	0.106
P4KE100A	100	95.0	105	1.0	85.5	5.0	3.0	137	0.106
P4KE110	110	99.0	121	1.0	89.2	5.0	2.6	158	0.107
P4KE110A	110	105	116	1.0	94.0	5.0	2.7	152	0.107
P4KE120	120	108	132	1.0	97.2	5.0	2.4	173	0.107
P4KE120A	120	114	126	1.0	102	5.0	2.5	165	0.107
P4KE130	130	117	143	1.0	105	5.0	2.2	187	0.107
P4KE130A	130	124	137	1.0	111	5.0	2.3	179	0.107
P4KE150	150	135	165	1.0	121	5.0	1.9	215	0.108
P4KE150A	150	143	158	1.0	128	5.0	2.0	207	0.108
P4KE160	160	144	176	1.0	130	5.0	1.8	230	0.108
P4KE160A	160	152	168	1.0	136	5.0	1.9	219	0.108
P4KE170	170	153	187	1.0	138	5.0	1.7	244	0.108
P4KE170A	170	162	179	1.0	145	5.0	1.8	234	0.108
P4KE180	180	162	198	1.0	146	5.0	1.6	258	0.108
P4KE180A	180	171	189	1.0	154	5.0	1.7	246	0.108
P4KE200	200	180	220	1.0	162	5.0	1.4	287	0.108
P4KE200A	200	190	210	1.0	171	5.0	1.5	274	0.108
P4KE220	220	198	242	1.0	175	5.0	1.2	344	0.108
P4KE220A	220	209	231	1.0	185	5.0	1.3	328	0.108
P4KE250	250	225	275	1.0	202	5.0	1.1	360	0.110
P4KE250A	250	237	263	1.0	214	5.0	1.2	344	0.110
P4KE300	300	270	330	1.0	243	5.0	1.0	430	0.110
P4KE300A	300	285	315	1.0	256	5.0	1.0	414	0.110
P4KE350	350	315	385	1.0	284	5.0	0.8	504	0.110
P4KE350A	350	332	368	1.0	300	5.0	0.9	482	0.110
P4KE400	400	360	440	1.0	324	5.0	0.73	574	0.110
P4KE400A	400	380	420	1.0	342	5.0	0.76	548	0.110
P4KE440	440	396	484	1.0	356	5.0	0.66	631	0.110
P4KE440A	440	418	462	1.0	376	5.0	0.69	600	0.110
P4KE480A	480	456.0	504.0	1.0	408	1.0	0.61	658.0	0.110
P4KE510A	510	485.0	535.0	1.0	434	1.0	0.57	698.0	0.110

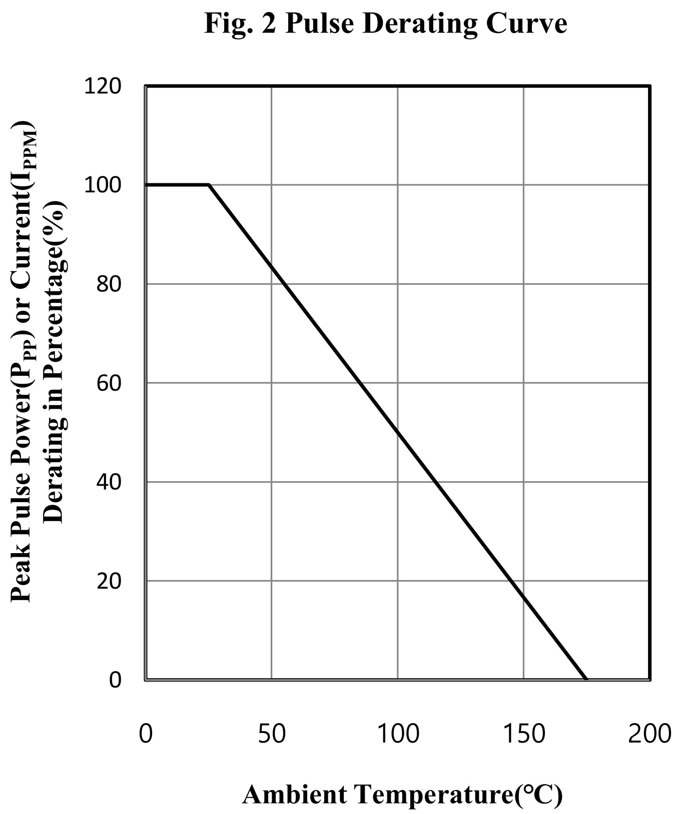
Electrical Characteristics (Ta=25℃ unless otherwise noted)

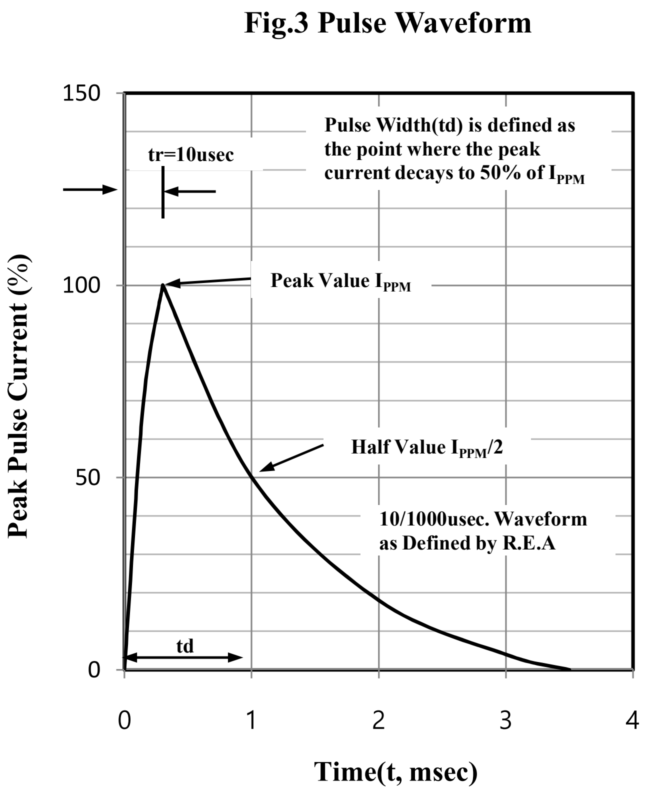
Device	Nominal Voltage (V)	Breakdown Voltage(Note 1) V_{BR}(V)		Test Current @I_T(mA)	Stand-Off Voltage V_{WM}(V)	Maximum Reverse Leakage at V_{WM} I_D(uA)	Maximum Peak Pulse Current I_{RSM} (Note 2) (A)	Maximum Clamping Voltage at I_{PPM} V_C(V)	Maximum Temperature Coefficient of V_{BR}(%/℃)
		Min	Max						
P4KE530A	530	503.5	556.5	1.0	450	1.0	0.55	725.0	0.110
P4KE540A	540	513.0	567.0	1.0	459	1.0	0.54	740.0	0.110
P4KE550A	550	522.5	577.5	1.0	467	1.0	0.52	760.0	0.110

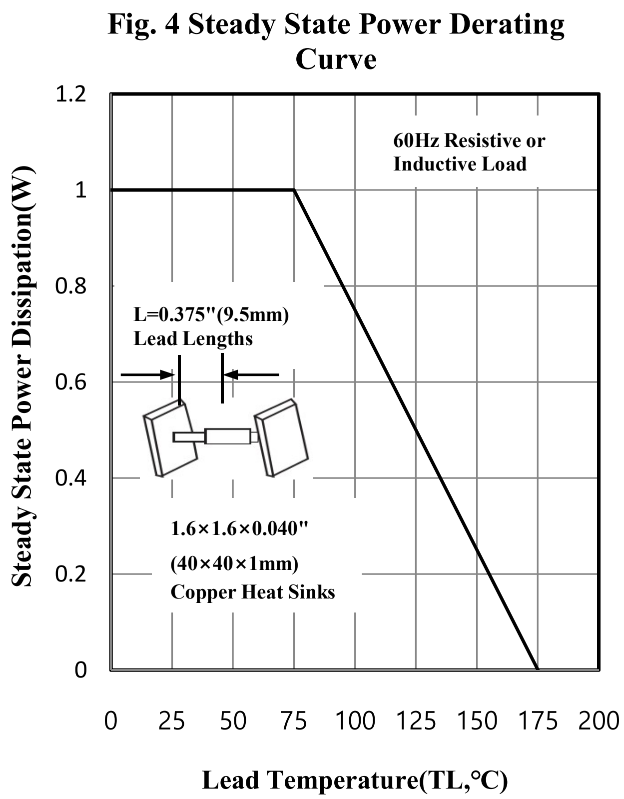
Notes 1. V_{BR} measured after I_T applied for 300us, I_T=square wave pulse or equivalent.
2. Surge current waveform per Fig. 3 and derate per Fig. 2.
3. For bipolar types having V_{WM} of 10 volts and under, the I_D limit is doubled
4. All terms and symbols are consistent with ANSI/IEEE C62.35.

Ratings and Characteristics Curves (Ta=25°C unless otherwise noted)









Ratings and Characteristics Curves (Ta=25°C unless otherwise noted)

Fig. 5 Maximum Non-Repetitive Forward Surge Current Unidirectional Only

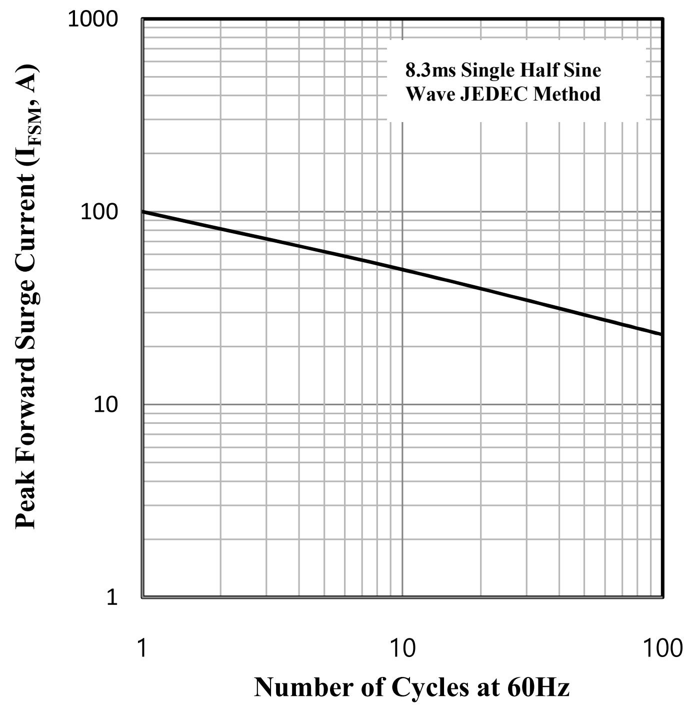


Fig. 6 Typical Reverse Leakage Characteristics

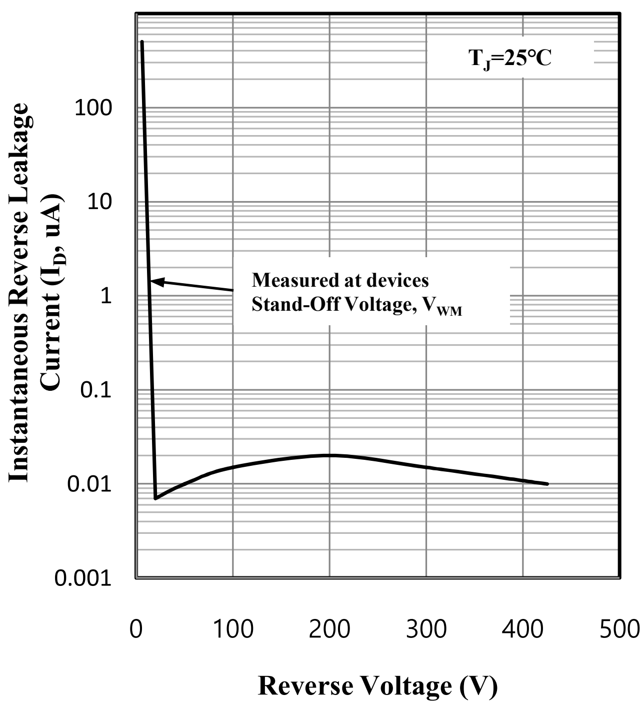
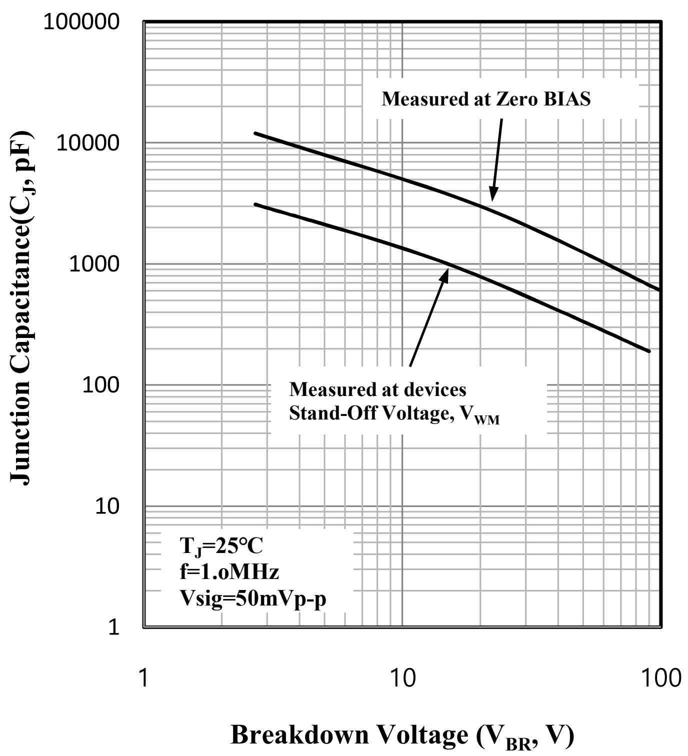


Fig 7. Typical Junction Capacitance Unidirectional



TVS APPLICATION NOTES:

Transient Voltage Suppressors may be used at various points in a circuit to provide various degrees of protection. The following is a typical linear power supply with transient voltage suppressor units placed at different points. All provide protection of the load.

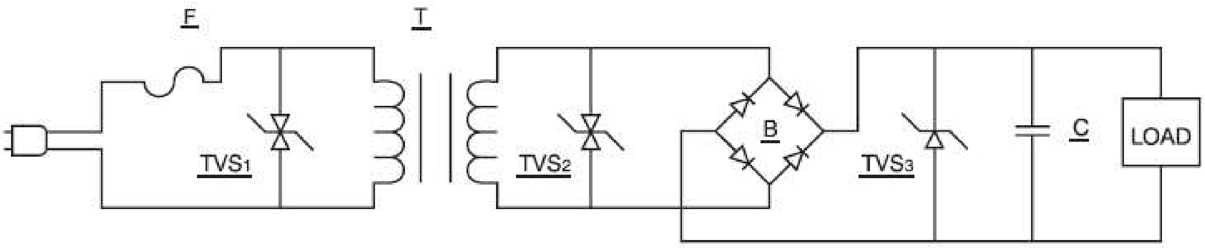


FIGURE 1

Transient Voltage Suppressors 1 provides maximum protection. However, the system will probably require replacement of the line fuse(F) since it provides a dominant portion of the series impedance when a surge is encountered.

However, we do not recommend to use the TVS diode here, unless we can know the electric circuit impedance and the magnitude of surge rushed into the circuit. Otherwise the TVS diode is easy to be destroyed by voltage surge.

Transient Voltage Suppressor 2 provides execllent protection of circuitry excluding the transformer(T). However, since the transformer is a large part of the series impedance, the chance of the line fuse opening during the surge condition is reduced.

Transient Voltage Suppressor 3 provides the load with complete protection. It uses a unidirectional Transient Voltage Suppressor, which is a cost advantage. The series impedance now includes the line fuse, transformer, and bridge rectifier(B) so failure of the line fuse is further reduced. If only Transient Voltage Suppressor 3 is in use, then the bridge rectifier is unprotected and would require a higher voltage and current rating to prevent failure by transients.

Any combination of these three, or any one of these applications, will prevent damage to the load. This would require varying trade-offs in power supply protection versus maintenance(changing the time fuse).

An additional method is to utilize the Transient Voltage Suppressor units as a controlled avalanche bridge. This reduces the parts count and incorporates the protection within the bridge rectifier.

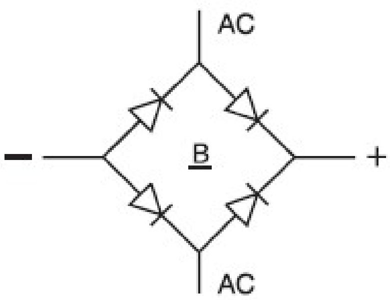


FIGURE 2