TAIWAN SEMICONDUCTOR

RoHS COMPLIANCE

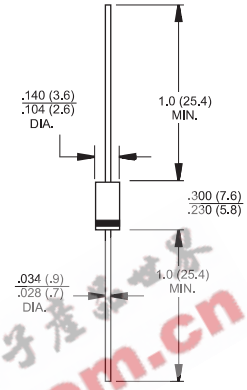
P6KE SERIES

600 Watts Transient Voltage Suppressor Diodes

DO-15

Features

- ✧ UL Recognized File # E-96005
- ✧ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ✧ Exceeds environmental standards of MIL-STD-19500
- ✧ 600W surge capability at 10 x 100 us waveform, duty cycle: 0.01%
- ✧ Excellent clamping capability
- ✧ Low zener impedance
- ✧ Fast response time: Typically less than 1.0ps from 0 volts to VBR for unidirectional and 5.0 ns for bidirectional
- ✧ Typical I_R less than 1uA above 10V
- ✧ High temperature soldering guaranteed: 260°C / 10 seconds / .375",(9.5mm) lead length / 5lbs.,(2.3kg) tension



Dimensions in inches and (millimeters)

Mechanical Data

- ✧ Case: Molded plastic
- ✧ Lead: Pure tin plated lead free,, solderable per MIL-STD-202, Method 208
- ✧ Polarity: Color band denotes cathode except bipolar
- ✧ Weight: 0.42gram

Maximum Ratings and Electrical Characteristics

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%

Type Number	Symbol	Value	Units
Peak Power Dissipation at T_A=25°C, Tp=1ms (Note 1)	P_{PK}	Minimum 600	Watts
Steady State Power Dissipation at T_L=75 °C Lead Lengths .375", 9.5mm (Note 2)	P_D	5.0	Watts
Peak Forward Surge Current, 8.3 ms Single Half Sine-wave Superimposed on Rated Load (JEDEC method) (Note 3)	I_{FSM}	100	Amps
Maximum Instantaneous Forward Voltage at 50.0A for Unidirectional Only (Note 4)	V_F	3.5 / 5.0	Volts
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to + 175	°C

Notes:
1. Non-repetitive Current Pulse Per Fig. 3 and Derated above T_A=25°C Per Fig. 2.
2. Mounted on Copper Pad Area of 1.6 x 1.6" (40 x 40 mm) Per Fig. 4.
3. 8.3ms Single Half Sine-wave or Equivalent Square Wave, Duty Cycle=4 Pulses Per Minutes Maximum.
4. V_F=3.5V for Devices of $V_{BR} \leq$ 200V and V_F=5.0V Max. for Devices of V_{BR}>200V.

Devices for Bipolar Applications
1. For Bidirectional Use C or CA Suffix for Types P6KE6.8 through Types P6KE400.
2. Electrical Characteristics Apply in Both Directions.

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RATINGS AND CHARACTERISTIC CURVES (P6KE SERIES)

FIG.1- PEAK PULSE POWER RATING CURVE

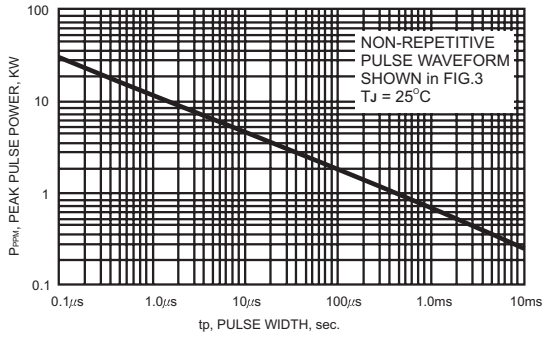


FIG.2- PULSE DERATING CURVE

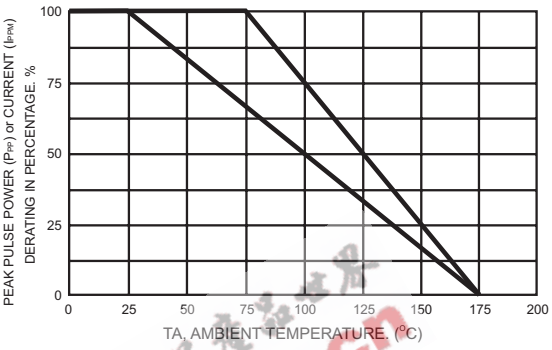


FIG.3- CLAMPING POWER PULSE WAVEFORM

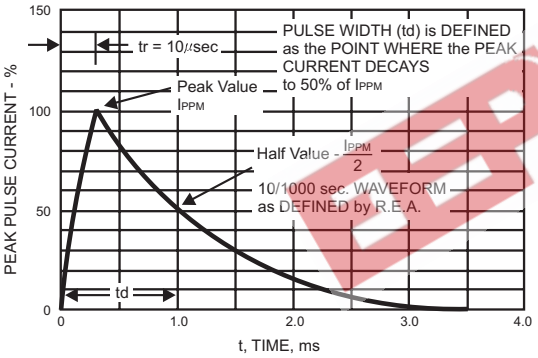


FIG.4- MAXIMUM NON-REPETITIVE FORWARD SURGE CURRENT UNIDIRECTIONAL ONLY

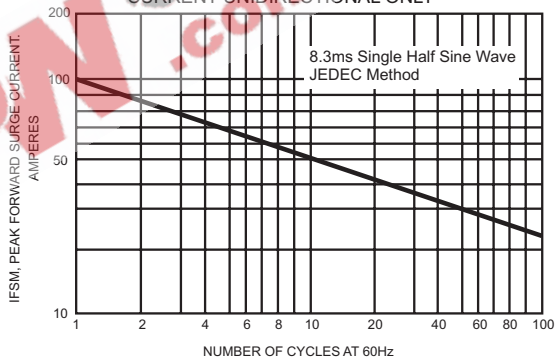
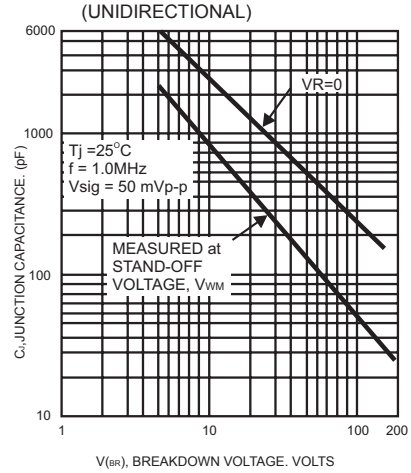


FIG.5- TYPICAL JUNCTION CAPACITANCE (UNIDIRECTIONAL)



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ELECTRICAL CHARACTERISTICS (TA=25°C unless otherwise noted)

Device	Nominal Voltage (Volts)	Breakdown Voltage V_{BR} (Volts) (Note 1)		Test Current @I_T (mA)	Stand-Off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D (uA)	Maximum Peak Pulse Current I_{RSM} (Note 2)(Amps)	Maximum Clamping Voltage at I_{PPM} V_C(Volts)	Maximum Temperature Coefficient of V_{BR}(% / °C)
		Min	Max						
P6KE6.8	6.8	6.12	7.48	10	5.50	1000	58	10.8	0.057
P6KE6.8A	6.8	6.45	7.14	10	5.80	1000	60	10.5	0.057
P6KE7.5	7.5	6.75	8.25	10	6.05	500	53	11.7	0.061
P6KE7.5A	7.5	7.13	7.88	10	6.40	500	55	11.3	0.061
P6KE8.2	8.2	7.38	9.02	10	6.63	200	50	12.5	0.065
P6KE8.2A	8.2	7.79	8.61	1.0	7.02	200	52	12.1	0.065
P6KE9.1	9.1	8.19	10.0	1.0	7.37	50	45	13.8	0.068
P6KE9.1A	9.1	8.65	9.55	1.0	7.78	50	47	13.4	0.068
P6KE10	10	9.00	11.0	1.0	8.10	10	42	15.0	0.073
P6KE10A	10	9.50	10.5	1.0	8.55	10	43	14.5	0.073
P6KE11	11	9.90	12.1	1.0	8.92	5.0	38	16.2	0.075
P6KE11A	11	10.5	11.6	1.0	9.40	5.0	40	15.6	0.075
P6KE12	12	10.8	13.2	1.0	9.72	5.0	36	17.3	0.078
P6KE12A	12	11.4	12.6	1.0	10.2	5.0	37	16.7	0.078
P6KE13	13	11.7	14.3	1.0	10.5	5.0	33	19.0	0.081
P6KE13A	13	12.4	13.7	1.0	11.1	5.0	34	18.2	0.081
P6KE15	15	13.5	16.5	1.0	12.1	5.0	28	22.0	0.084
P6KE15A	15	14.3	15.8	1.0	12.8	5.0	29	21.2	0.084
P6KE16	16	14.4	17.6	1.0	12.9	5.0	26	23.5	0.086
P6KE16A	16	15.2	16.8	1.0	13.6	5.0	28	22.5	0.086
P6KE18	18	16.2	19.8	1.0	14.5	5.0	23	26.5	0.088
P6KE18A	18	17.1	18.9	1.0	15.3	5.0	25	25.2	0.088
P6KE20	20	18.0	22.0	1.0	16.2	5.0	21	29.1	0.090
P6KE20A	20	19.0	21.0	1.0	17.1	5.0	22	27.7	0.090
P6KE22	22	19.8	24.2	1.0	17.8	5.0	19	31.9	0.092
P6KE22A	22	20.9	23.1	1.0	18.8	5.0	20	30.6	0.092
P6KE24	24	21.6	26.4	1.0	19.4	5.0	18	34.7	0.094
P6KE24A	24	22.8	25.2	1.0	20.5	5.0	19	33.2	0.094
P6KE27	27	24.3	29.7	1.0	21.8	5.0	16	39.1	0.096
P6KE27A	27	25.7	28.4	1.0	23.1	5.0	16.8	37.5	0.096
P6KE30	30	27.0	33.0	1.0	24.3	5.0	14	43.5	0.097
P6KE30A	30	28.5	31.5	1.0	25.6	5.0	15	41.4	0.097
P6KE33	33	29.7	36.3	1.0	26.8	5.0	13.0	47.7	0.098
P6KE33A	33	31.4	34.7	1.0	28.2	5.0	13.8	45.7	0.098
P6KE36	36	32.4	39.6	1.0	29.1	5.0	12	52.0	0.099
P6KE36A	36	34.2	37.8	1.0	30.8	5.0	12.6	49.9	0.099
P6KE39	39	35.1	42.9	1.0	31.6	5.0	11.1	56.4	0.100
P6KE39A	39	37.1	41.0	1.0	33.3	5.0	11.6	53.9	0.100
P6KE43	43	38.7	47.3	1.0	34.8	5.0	10.0	61.9	0.101
P6KE43A	43	40.9	45.2	1.0	36.8	5.0	10.6	59.3	0.101
P6KE47	47	42.3	51.7	1.0	38.1	5.0	9.2	67.8	0.101
P6KE47A	47	44.7	49.4	1.0	40.2	5.0	9.7	64.8	0.101
P6KE51	51	45.9	56.1	1.0	41.3	5.0	8.5	73.5	0.102
P6KE51A	51	48.5	53.6	1.0	43.6	5.0	8.9	70.1	0.102
P6KE56	56	50.4	61.6	1.0	45.4	5.0	7.8	80.5	0.103
P6KE56A	56	53.2	58.8	1.0	47.8	5.0	8.1	77.0	0.103
P6KE62	62	55.8	68.2	1.0	50.2	5.0	7.0	89.0	0.104
P6KE62A	62	58.9	65.1	1.0	53.0	5.0	7.4	85.0	0.104
P6KE68	68	61.2	74.8	1.0	55.1	5.0	6.4	98.0	0.104
P6KE68A	68	64.6	71.4	1.0	58.1	5.0	6.8	92.0	0.104
P6KE75	75	67.5	82.5	1.0	60.7	5.0	5.8	108.0	0.105
P6KE75A	75	71.3	78.8	1.0	64.1	5.0	6.1	103.0	0.105
P6KE82	82	73.8	90.2	1.0	66.4	5.0	5.3	118.0	0.105
P6KE82A	82	77.9	86.1	1.0	70.1	5.0	5.5	113.0	0.105
P6KE91	91	81.9	100.0	1.0	73.7	5.0	4.8	131.0	0.106
P6KE91A	91	86.5	95.5	1.0	77.8	5.0	5.0	125.0	0.106
P6KE100	100	90.0	110.0	1.0	81.0	5.0	4.3	144.0	0.106
P6KE100A	100	95.0	105.0	1.0	85.5	5.0	4.5	137.0	0.106
P6KE110	110	99.0	121.0	1.0	89.2	5.0	3.9	158.0	0.107
P6KE110A	110	105.0	116.0	1.0	94.0	5.0	4.1	152.0	0.107
P6KE120	120	108.0	132.0	1.0	97.2	5.0	3.6	173.0	0.107
P6KE120A	120	114.0	126.0	1.0	102.0	5.0	3.8	165.0	0.107
P6KE130	130	117.0	143.0	1.0	105.0	5.0	3.3	187.0	0.107
P6KE130A	130	124.0	137.0	1.0	111.0	5.0	3.5	179.0	0.107
P6KE150	150	135.0	165.0	1.0	121.0	5.0	2.9	215.0	0.108
P6KE150A	150	143.0	158.0	1.0	128.0	5.0	3.0	207.0	0.108
P6KE160	160	144.0	176.0	1.0	130.0	5.0	2.7	230.0	0.108
P6KE160A	160	152.0	168.0	1.0	136.0	5.0	2.8	219.0	0.108
P6KE170	170	153.0	187.0	1.0	138.0	5.0	2.5	244.0	0.108
P6KE170A	170	162.0	179.0	1.0	145.0	5.0	2.6	234.0	0.108
P6KE180	180	162.0	198.0	1.0	146.0	5.0	2.4	258.0	0.108
P6KE180A	180	171.0	189.0	1.0	154.0	5.0	2.5	246.0	0.108
P6KE200	200	180.0	220.0	1.0	162.0	5.0	2.1	287.0	0.108
P6KE200A	200	190.0	210.0	1.0	171.0	5.0	2.2	274.0	0.108
P6KE220	220	198.0	242.0	1.0	175.0	5.0	1.8	344.0	0.108
P6KE220A	220	209.0	231.0	1.0	185.0	5.0	1.9	328.0	0.108
P6KE250	250	225.0	275.0	1.0	202.0	5.0	1.7	360.0	0.110
P6KE250A	250	237.0	263.0	1.0	214.0	5.0	1.8	344.0	0.110
P6KE300	300	270.0	330.0	1.0	243.0	5.0	1.4	430.0	0.110
P6KE300A	300	285.0	315.0	1.0	256.0	5.0	1.5	414.0	0.110
P6KE350	350	315.0	385.0	1.0	284.0	5.0	1.2	504.0	0.110
P6KE350A	350	332.0	368.0	1.0	300.0	5.0	1.3	482.0	0.110
P6KE400	400	360.0	440.0	1.0	324.0	5.0	1.05	574.0	0.110
P6KE400A	400	380.0	420.0	1.0	342.0	5.0	1.1	548.0	0.110
P6KE440	440	396.0	484.0	1.0	356.0	5.0	0.99	631.0	0.110
P6KE440A	440	418.0	462.0	1.0	376.0	5.0	1.04	600.0	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 Figure 3 and derate per Figure 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.

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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.

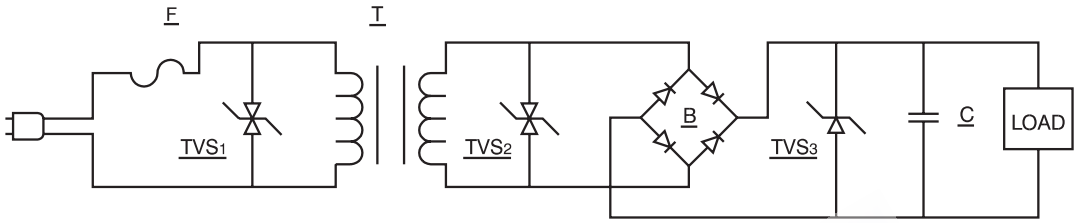

FIGURE 1

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 excellent 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.

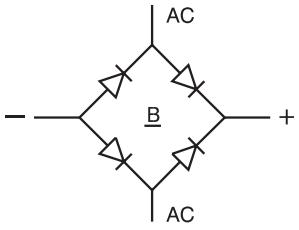

FIGURE 2