



## P6KE SERIES

### Transient Voltage Suppressor Diodes



Voltage Range  
6.8 to 440 Volts  
600 Watts Peak Power  
5.0 Watts Steady State

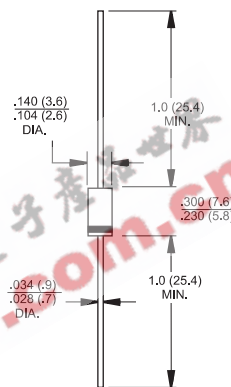
#### Features

- ✦ 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

#### Mechanical Data

- ✦ Case: Molded plastic
- ✦ Lead: Axial leads, solderable per MIL-STD-202, Method 208
- ✦ Polarity: Color band denotes cathode except bipolar
- ✦ Weight: 0.34gram

#### DO-15



#### 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 $T_A=25^\circ\text{C}$ , $T_p=1\text{ms}$ (Note 1)	$P_{PK}$	Minimum 600	Watts
Steady State Power Dissipation at $T_L=75^\circ\text{C}$ 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  $T_A=25^\circ\text{C}$  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.  $V_F=3.5\text{V}$  for Devices of  $V_{BR} \leq 200\text{V}$  and  $V_F=5.0\text{V}$  Max. for Devices of  $V_{BR} > 200\text{V}$ .

Devices for Bipolar Applications

1. For Bidirectional Use C or CA Suffix for Types P6KE6.8 through Types P6KE440.

2. Electrical Characteristics Apply in Both Directions.



## RATINGS AND CHARACTERISTIC CURVES (P6KE SERIES)

FIG.1- PEAK PULSE POWER RATING CURVE



FIG.2- PULSE DERATING CURVE

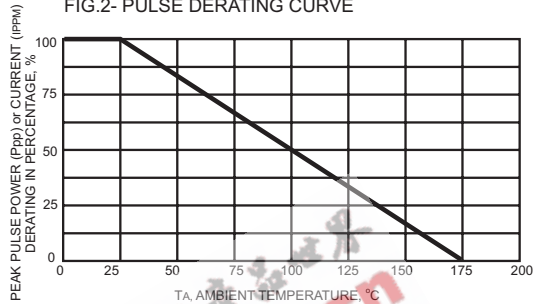


FIG.3- PULSE WAVEFORM



FIG.4- STEADY STATE POWER DERATING CURVE

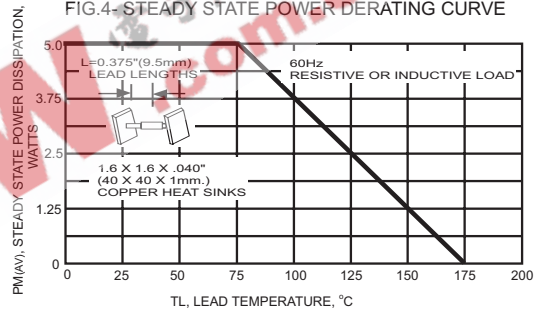


FIG.5- MAXIMUM NON-REPETITIVE FORWARD SURGE CURRENT UNIDIRECTIONAL ONLY

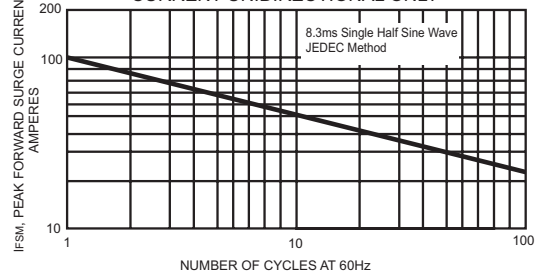


FIG.7- TYPICAL JUNCTION CAPACITANCE UNIDIRECTIONAL

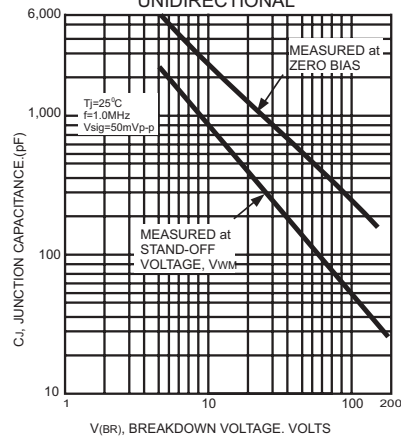
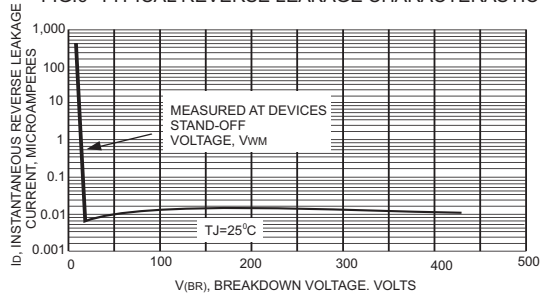


FIG.6- TYPICAL REVERSE LEAKAGE CHARACTERISTICS



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

Device	Nominal Voltage (Volts)	Breakdown Voltage		Test Current @t <sub>r</sub> (mA)	Stand-Off Voltage V <sub>WM</sub> (Volts)	Maximum Reverse Leakage at V <sub>WM</sub> I <sub>D</sub> (µA)	Maximum Peak Pulse Current I <sub>PSM</sub> (Note 2)(Amps)	Maximum Clamping Voltage at I <sub>PPM</sub> V <sub>C</sub> (Volts)	Maximum Temperature Coefficient of V <sub>BR</sub> (%/°C)
		V <sub>BR</sub> (Volts) (Note 1)							
		Min	Max						
PRKE6.8	6.8	6.12	7.48	10	5.50	1000	58	10.8	0.057
PRKE6.8A	6.8	6.45	7.14	10	5.80	1000	60	10.5	0.057
PRKE7.5	7.5	6.75	8.25	10	6.05	500	53	11.7	0.061
PRKE7.5A	7.5	7.13	7.88	10	6.40	500	55	11.3	0.061
PRKE8.2	8.2	7.38	9.02	10	6.63	200	50	12.5	0.065
PRKE8.2A	8.2	7.79	8.61	1.0	7.02	200	52	12.1	0.065
PRKE9.1	9.1	8.19	10.0	1.0	7.37	50	45	13.8	0.068
PRKE9.1A	9.1	8.65	9.55	1.0	7.78	50	47	13.4	0.068
PRKE10	10	9.00	11.0	1.0	8.10	10	42	15.0	0.073
PRKE10A	10	9.50	10.5	1.0	8.55	10	43	14.5	0.073
PRKE11	11	9.90	12.1	1.0	8.92	5.0	38	16.2	0.075
PRKE11A	11	10.5	11.6	1.0	9.40	5.0	40	15.6	0.075
PRKE12	12	10.8	13.2	1.0	9.72	5.0	36	17.3	0.078
PRKE12A	12	11.4	12.6	1.0	10.2	5.0	37	16.7	0.078
PRKE13	13	11.7	14.3	1.0	10.5	5.0	33	19.0	0.081
PRKE13A	13	12.4	13.7	1.0	11.1	5.0	34	18.2	0.081
PRKE15	15	13.5	16.5	1.0	12.1	5.0	28	22.0	0.084
PRKE15A	15	14.3	15.8	1.0	12.8	5.0	29	21.2	0.084
PRKE16	16	14.4	17.6	1.0	12.9	5.0	26	23.5	0.086
PRKE16A	16	15.2	16.8	1.0	13.6	5.0	28	22.5	0.086
PRKE18	18	16.2	19.8	1.0	14.5	5.0	23	26.5	0.088
PRKE18A	18	17.1	18.9	1.0	15.3	5.0	25	25.2	0.088
PRKE20	20	18.0	22.0	1.0	16.2	5.0	21	29.1	0.090
PRKE20A	20	19.0	21.0	1.0	17.1	5.0	22	27.7	0.090
PRKE22	22	19.8	24.2	1.0	17.8	5.0	19	31.9	0.092
PRKE22A	22	20.9	23.1	1.0	18.8	5.0	20	30.6	0.092
PRKE24	24	21.6	26.4	1.0	19.4	5.0	18	34.7	0.094
PRKE24A	24	22.8	25.2	1.0	20.5	5.0	19	33.2	0.094
PRKE27	27	24.3	29.7	1.0	21.8	5.0	16	39.1	0.096
PRKE27A	27	25.7	28.4	1.0	23.1	5.0	16.8	37.5	0.096
PRKE30	30	27.0	33.0	1.0	24.3	5.0	14	43.5	0.097
PRKE30A	30	28.5	31.5	1.0	25.6	5.0	15	41.4	0.097
PRKE33	33	29.7	36.3	1.0	26.8	5.0	13.0	47.7	0.098
PRKE33A	33	31.4	34.7	1.0	28.2	5.0	13.8	45.7	0.098
PRKE36	36	32.4	39.6	1.0	29.1	5.0	12	52.0	0.099
PRKE36A	36	34.2	37.8	1.0	30.8	5.0	12.6	49.9	0.099
PRKE39	39	35.1	42.9	1.0	31.6	5.0	11.1	56.4	0.100
PRKE39A	39	37.1	41.0	1.0	33.3	5.0	11.6	53.9	0.100
PRKE43	43	38.7	47.3	1.0	34.8	5.0	10.0	61.9	0.101
PRKE43A	43	40.9	45.2	1.0	36.8	5.0	10.6	59.3	0.101
PRKE47	47	42.3	51.7	1.0	38.1	5.0	9.2	67.8	0.101
PRKE47A	47	44.7	49.4	1.0	40.2	5.0	9.7	64.8	0.101
PRKE51	51	45.9	56.1	1.0	41.3	5.0	8.5	73.5	0.102
PRKE51A	51	48.5	53.6	1.0	43.6	5.0	8.9	70.1	0.102
PRKE56	56	50.4	61.6	1.0	45.4	5.0	7.8	80.5	0.103
PRKE56A	56	53.2	58.8	1.0	47.8	5.0	8.1	77.0	0.103
PRKE62	62	55.8	68.2	1.0	50.2	5.0	7.0	89.0	0.104
PRKE62A	62	58.9	65.1	1.0	53.0	5.0	7.4	85.0	0.104
PRKE68	68	61.2	74.8	1.0	55.1	5.0	6.4	98.0	0.104
PRKE68A	68	64.6	71.4	1.0	58.1	5.0	6.8	92.0	0.104
PRKE75	75	67.5	82.5	1.0	60.7	5.0	5.8	108.0	0.105
PRKE75A	75	71.3	78.8	1.0	64.1	5.0	6.1	103.0	0.105
PRKE82	82	73.8	90.2	1.0	66.4	5.0	5.3	118.0	0.105
PRKE82A	82	77.9	86.1	1.0	70.1	5.0	5.5	113.0	0.105
PRKE91	91	81.9	100.0	1.0	73.7	5.0	4.8	131.0	0.106
PRKE91A	91	86.5	95.5	1.0	77.8	5.0	5.0	125.0	0.106
PRKE100	100	90.0	110.0	1.0	81.0	5.0	4.3	144.0	0.106
PRKE100A	100	95.0	105.0	1.0	85.5	5.0	4.5	137.0	0.106
PRKE110	110	99.0	121.0	1.0	89.2	5.0	3.9	158.0	0.107
PRKE110A	110	105.0	116.0	1.0	94.0	5.0	4.1	152.0	0.107
PRKE120	120	108.0	132.0	1.0	97.2	5.0	3.6	173.0	0.107
PRKE120A	120	114.0	126.0	1.0	102.0	5.0	3.8	165.0	0.107
PRKE130	130	117.0	143.0	1.0	105.0	5.0	3.3	187.0	0.107
PRKE130A	130	124.0	137.0	1.0	111.0	5.0	3.5	179.0	0.107
PRKE150	150	135.0	165.0	1.0	121.0	5.0	2.9	215.0	0.108
PRKE150A	150	143.0	158.0	1.0	128.0	5.0	3.0	207.0	0.108
PRKE160	160	144.0	176.0	1.0	130.0	5.0	2.7	230.0	0.108
PRKE160A	160	152.0	168.0	1.0	136.0	5.0	2.8	219.0	0.108
PRKE170	170	153.0	187.0	1.0	138.0	5.0	2.5	244.0	0.108
PRKE170A	170	162.0	179.0	1.0	145.0	5.0	2.6	234.0	0.108
PRKE180	180	162.0	198.0	1.0	146.0	5.0	2.4	258.0	0.108
PRKE180A	180	171.0	189.0	1.0	154.0	5.0	2.5	246.0	0.108
PRKE200	200	180.0	220.0	1.0	162.0	5.0	2.1	287.0	0.108
PRKE200A	200	190.0	210.0	1.0	171.0	5.0	2.2	274.0	0.108
PRKE220	220	198.0	242.0	1.0	175.0	5.0	1.8	344.0	0.108
PRKE220A	220	209.0	231.0	1.0	185.0	5.0	1.9	328.0	0.108
PRKE250	250	225.0	275.0	1.0	202.0	5.0	1.7	360.0	0.110
PRKE250A	250	237.0	263.0	1.0	214.0	5.0	1.8	344.0	0.110
PRKE300	300	270.0	330.0	1.0	243.0	5.0	1.4	430.0	0.110
PRKE300A	300	285.0	315.0	1.0	256.0	5.0	1.5	414.0	0.110
PRKE350	350	315.0	385.0	1.0	284.0	5.0	1.2	504.0	0.110
PRKE350A	350	332.0	368.0	1.0	300.0	5.0	1.3	482.0	0.110
PRKE400	400	360.0	440.0	1.0	324.0	5.0	1.05	574.0	0.110
PRKE400A	400	380.0	420.0	1.0	342.0	5.0	1.1	548.0	0.110
PRKE440	440	396.0	484.0	1.0	356.0	5.0	0.99	631.0	0.110
PRKE440A	440	418.0	462.0	1.0	376.0	5.0	1.04	600.0	0.110

Notes:

1. V<sub>BR</sub> measured after t<sub>r</sub> applied for 300µs, t<sub>r</sub>-square wave pulse or equivalent.
2. Surge current waveform per Figure 3 and derate per Figure 2.
3. For bipolar types having V<sub>WM</sub> of 10 volts and under, the I<sub>D</sub> limit is doubled.
4. All terms and symbols are consistent with ANSI/IEEE C62.35.

## 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.

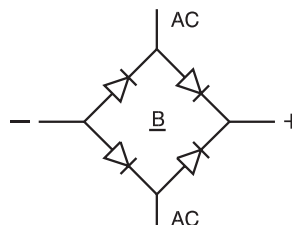


FIGURE 2