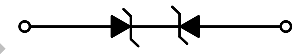
P6KE6.8CA Series

600 Watt Peak Power Surmetic™-40 Zener Transient Voltage Suppressors

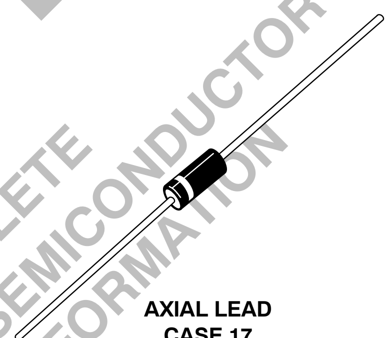
Bidirectional*

ON Semiconductor®

http://onsemi.com



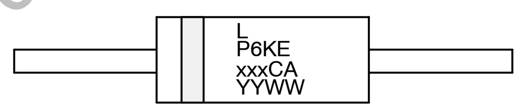
The P6KE6.8CA series is designed to protect voltage sensitive components from high voltage, high energy transients. They have excellent clamping capability, high surge capability, low zener impedance and fast response time. These devices are ON Semiconductor's exclusive, cost-effective, highly reliable Surmetic axial leaded package and is ideally-suited for use in communication systems, numerical controls, process controls, medical equipment, business machines, power supplies and many other industrial/consumer applications.



AXIAL LEAD
CASE 17
PLASTIC

Specification Features:

- Working Peak Reverse Voltage Range − 5.8 to 171 V
- Peak Power − 600 Watts @ 1 ms
- ESD Rating of class 3 (>16 KV) per Human Body Model
- Maximum Clamp Voltage @ Peak Pulse Current
- Low Leakage < 5 µA above 10 V
- Maximum Temperature Coefficient Specified
- UL 497B for Isolated Loop Circuit Protection
- Response Time is Typically < 1 ns



L = Assembly Location
P6KExxxCA = ON Device Code
YY = Year
WW = Work Week

Mechanical Characteristics:

CASE: Void-free, Transfer-molded, Thermosetting plastic

FINISH: All external surfaces are corrosion resistant and leads are readily solderable

MAXIMUM LEAD TEMPERATURE FOR SOLDERING PURPOSES: 230°C, 1/16" from the case for 10 seconds

POLARITY: Cathode band does not imply polarity

MOUNTING POSITION: Any

ORDERING INFORMATION

Device	Package	Shipping
P6KExxxCA	Axial Lead	1000 Units/Box
P6KExxxCARL*	Axial Lead	4000/Tape & Reel

*P6KE170CA Not Available in 4000/Tape & Reel

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Peak Power Dissipation (Note 1.) @ $T_L \leq 25°C$	P_{PK}	600	Watts
Steady State Power Dissipation @ $T_L \leq 75°C$, Lead Length = 3/8″ Derated above $T_L = 75°C$	P_D	5 50	Watts mW/°C
Thermal Resistance, Junction−to−Lead	$R_{\theta JL}$	20	°C/W
Operating and Storage Temperature Range	T_J, T_{stg}	− 55 to +175	°C

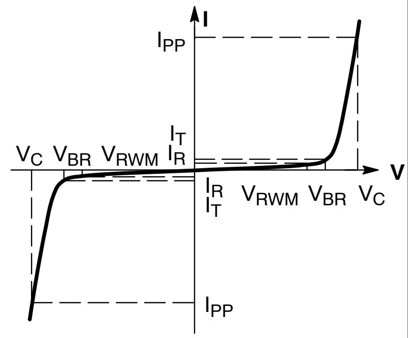
1. Nonrepetitive current pulse per Figure 3 and derated above $T_A = 25°C$ per Figure 2.

*Please see P6KE6.8A − P6KE200A for Unidirectional devices.

ELECTRICAL CHARACTERISTICS

(T_A = 25°C unless otherwise noted)

Symbol	Parameter
I_{PP}	Maximum Reverse Peak Pulse Current
V_C	Clamping Voltage @ I_{PP}
V_{RWM}	Working Peak Reverse Voltage
I_R	Maximum Reverse Leakage Current @ V_{RWM}
V_{BR}	Breakdown Voltage @ I_T
I_T	Test Current
ΘV_{BR}	Maximum Temperature Variation of V_{BR}



Bi−Directional TVS

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted.)

Device	Device Marking	V_{RWM} (Note 1)	I_R @ V_{RWM}	Breakdown Voltage V_{BR} (Note 2) (Volts)			@ I_T	V_C @ I_{PP} (Note 3) V_C	I_{PP}	ΘV_{BR}
		(Volts)	(μA)	Min	Nom	Max	(mA)	(Volts)	(A)	(%/°C)
P6KE6.8CA	P6KE6.8CA	5.8	1000	6.45	6.80	7.14	10	10.5	57	0.057
P6KE7.5CA	P6KE7.5CA	6.4	500	7.13	7.51	7.88	10	11.3	53	0.061
P6KE8.2CA	P6KE8.2CA	7.02	200	7.79	8.2	8.61	10	12.1	50	0.065
P6KE9.1CA	P6KE9.1CA	7.78	50	8.65	9.1	9.55	1	13.4	45	0.068
P6KE10CA	P6KE10CA	8.55	10	9.5	10	10.5	1	14.5	41	0.073
P6KE11CA	P6KE11CA	9.4	5	10.5	11.05	11.6	1	15.6	38	0.075
P6KE12CA	P6KE12CA	10.2	5	11.4	12	12.6	1	16.7	36	0.078
P6KE13CA	P6KE13CA	11.1	5	12.4	13.05	13.7	1	18.2	33	0.081
P6KE15CA	P6KE15CA	12.8	5	14.3	15.05	15.8	1	21.2	28	0.084
P6KE16CA	P6KE16CA	13.6	5	15.2	16	16.8	1	22.5	27	0.086
P6KE18CA	P6KE18CA	15.3	5	17.1	18	18.9	1	25.2	24	0.088
P6KE20CA	P6KE20CA	17.1	5	19	20	21	1	27.7	22	0.09
P6KE22CA	P6KE22CA	18.8	5	20.9	22	23.1	1	30.6	20	0.092
P6KE24CA	P6KE24CA	20.5	5	22.8	24	25.2	1	33.2	18	0.094
P6KE27CA	P6KE27CA	23.1	5	25.7	27.05	28.4	1	37.5	16	0.096
P6KE30CA	P6KE30CA	25.6	5	28.5	30	31.5	1	41.4	14.4	0.097
P6KE33CA	P6KE33CA	28.2	5	31.4	33.05	34.7	1	45.7	13.2	0.098
P6KE36CA	P6KE36CA	30.8	5	34.2	36	37.8	1	49.9	12	0.099
P6KE39CA	P6KE39CA	33.3	5	37.1	39.05	41	1	53.9	11.2	0.1
P6KE43CA	P6KE43CA	36.8	5	40.9	43.05	45.2	1	59.3	10.1	0.101
P6KE47CA	P6KE47CA	40.2	5	44.7	47.05	49.4	1	64.8	9.3	0.101
P6KE51CA	P6KE51CA	43.6	5	48.5	51.05	53.6	1	70.1	8.6	0.102
P6KE56CA	P6KE56CA	47.8	5	53.2	56	58.8	1	77	7.8	0.103
P6KE62CA	P6KE62CA	53	5	58.9	62	65.1	1	85	7.1	0.104
P6KE68CA	P6KE68CA	58.1	5	64.6	68	71.4	1	92	6.5	0.104
P6KE75CA	P6KE75CA	64.1	5	71.3	75.05	78.8	1	103	5.8	0.105
P6KE82CA	P6KE82CA	70.1	5	77.9	82	86.1	1	113	5.3	0.105
P6KE91CA	P6KE91CA	77.8	5	86.5	91	95.5	1	125	4.8	0.106
P6KE100CA	P6KE100CA	85.5	5	95	100	105	1	137	4.4	0.106
P6KE110CA	P6KE110CA	94	5	105	110.5	116	1	152	4	0.107
P6KE120CA	P6KE120CA	102	5	114	120	126	1	165	3.6	0.107
P6KE130CA	P6KE130CA	111	5	124	130.5	137	1	179	3.3	0.107
P6KE150CA	P6KE150CA	128	5	143	150.5	158	1	207	2.9	0.108
P6KE160CA	P6KE160CA	136	5	152	160	168	1	219	2.7	0.108
P6KE170CA*	P6KE170CA*	145	5	162	170.5	179	1	234	2.6	0.108
P6KE180CA	P6KE180CA	154	5	171	180	189	1	246	2.4	0.108
P6KE200CA	P6KE200CA	171	5	190	200	210	1	274	2.2	0.108

1. A transient suppressor is normally selected according to the maximum working peak reverse voltage (V_{RWM}), which should be equal to or greater than the dc or continuous peak operating voltage level.
2. V_{BR} measured at pulse test current I_T at an ambient temperature of 25°C.
3. Surge current waveform per Figure 3 and derate per Figures 1 and 2.

*Not Available in the 4,000/Tape & Reel.

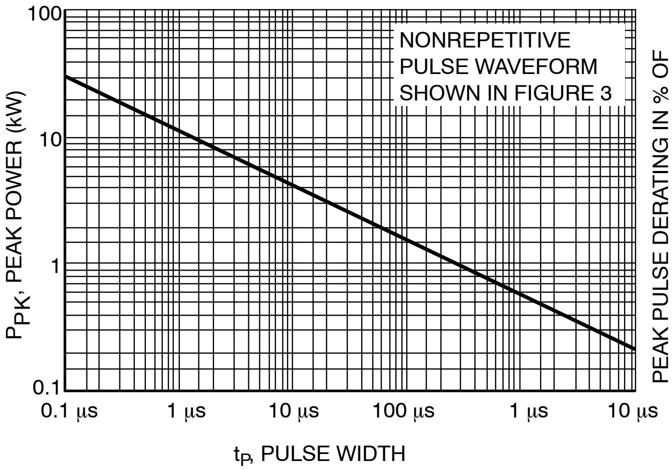


Figure 1. Pulse Rating Curve

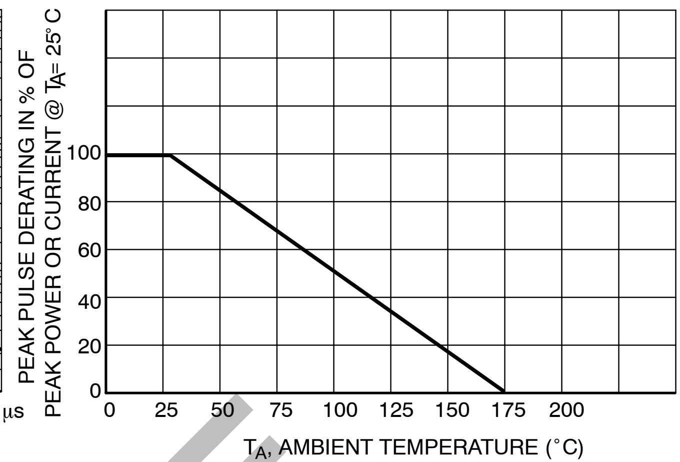


Figure 2. Pulse Derating Curve

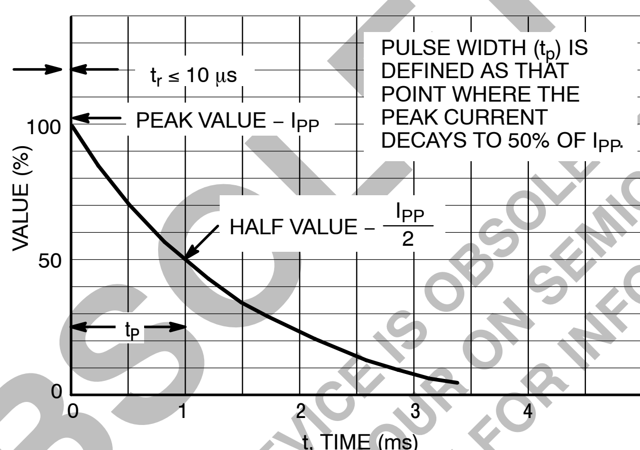


Figure 3. Pulse Waveform

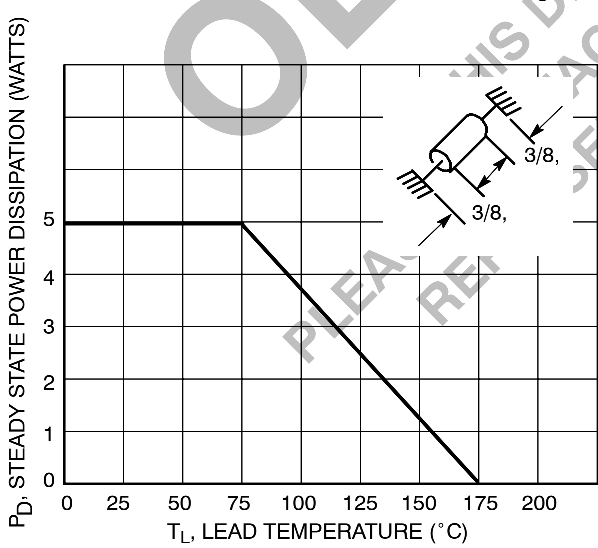


Figure 4. Steady State Power Derating

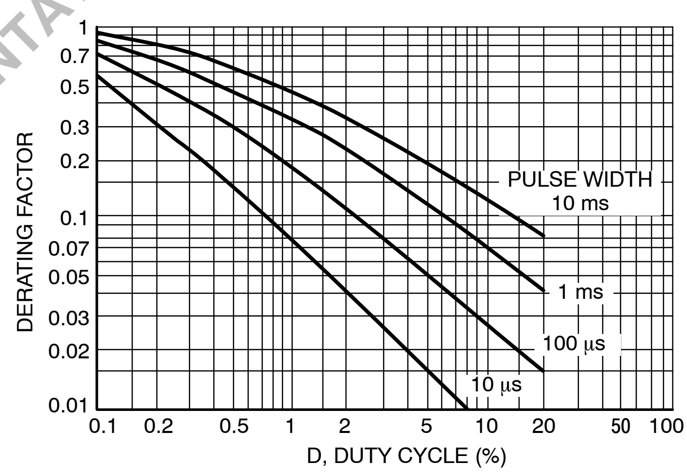


Figure 5. Typical Derating Factor for Duty Cycle

APPLICATION NOTES

RESPONSE TIME

In most applications, the transient suppressor device is placed in parallel with the equipment or component to be protected. In this situation, there is a time delay associated with the capacitance of the device and an overshoot condition associated with the inductance of the device and the inductance of the connection method. The capacitance effect is of minor importance in the parallel protection scheme because it only produces a time delay in the transition from the operating voltage to the clamp voltage as shown in Figure 6.

The inductive effects in the device are due to actual turn-on time (time required for the device to go from zero current to full current) and lead inductance. This inductive effect produces an overshoot in the voltage across the equipment or component being protected as shown in Figure 7. Minimizing this overshoot is very important in the application, since the main purpose for adding a transient suppressor is to clamp voltage spikes. The P6KE6.8A series has very good response time, typically < 1 ns and negligible inductance. However, external inductive effects could produce unacceptable overshoot. Proper circuit layout, minimum lead lengths and placing the suppressor device as close as possible to the equipment or components to be protected will minimize this overshoot.

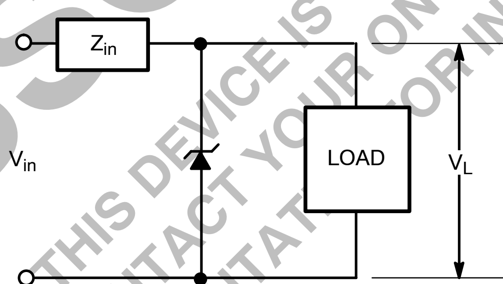
Some input impedance represented by Z_{in} is essential to prevent overstress of the protection device. This impedance should be as high as possible, without restricting the circuit operation.

DUTY CYCLE DERATING

The data of Figure 1 applies for non-repetitive conditions and at a lead temperature of 25°C. If the duty cycle increases, the peak power must be reduced as indicated by the curves of Figure 5. Average power must be derated as the lead or ambient temperature rises above 25°C. The average power derating curve normally given on data sheets may be normalized and used for this purpose.

At first glance the derating curves of Figure 5 appear to be in error as the 10 ms pulse has a higher derating factor than the 10 μs pulse. However, when the derating factor for a given pulse of Figure 5 is multiplied by the peak power value of Figure 1 for the same pulse, the results follow the expected trend.

TYPICAL PROTECTION CIRCUIT



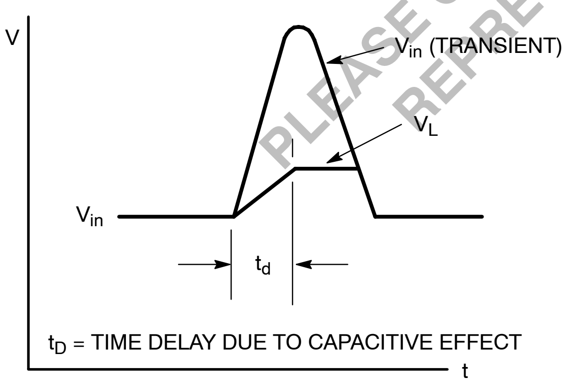


Figure 6.

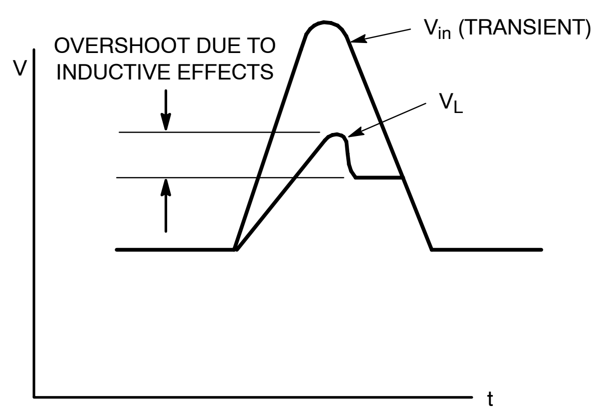


Figure 7.

UL RECOGNITION*

The entire series including the bidirectional CA suffix has *Underwriters Laboratory Recognition* for the classification of protectors (QVGV2) under the UL standard for safety 497B and File #E 116110. Many competitors only have one or two devices recognized or have recognition in a non-protective category. Some competitors have no recognition at all. With the UL497B recognition, our parts successfully passed several tests including Strike Voltage Breakdown test, Endurance Conditioning, Temperature test, Dielectric Voltage-Withstand test, Discharge test and several more.

Whereas, some competitors have only passed a flammability test for the package material, we have been recognized for much more to be included in their protector category.

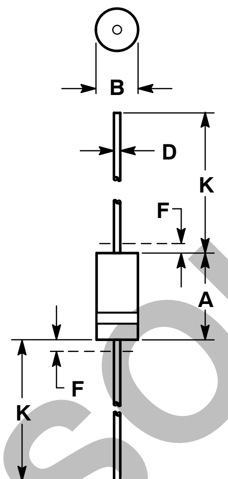
*Applies to P6KE6.8A, CA − P6KE200A, CA.

OUTLINE DIMENSIONS

Transient Voltage Suppressors – Axial Leaded

600 Watt Peak Power Surmetic™ –40

SURMETIC 40
CASE 17−02
ISSUE C



NOTES:
1. CONTROLLING DIMENSION: INCH
2. LEAD FINISH AND DIAMETER UNCONTROLLED IN DIM F.
3. FOR BIDIRECTIONAL DIODE, CATHODE BAND DOES NOT IMPLY POLARITY

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.330	0.350	8.38	8.89
B	0.130	0.145	3.30	3.68
D	0.037	0.043	0.94	1.09
K	---	0.050	---	1.27
F	1.000	1.250	25.40	31.75

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PUBLICATION ORDERING INFORMATION

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