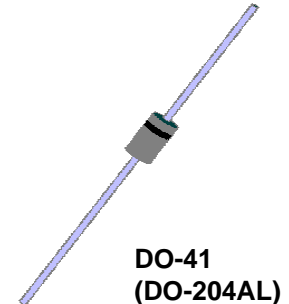


ALSO  
AVAILABLE IN  
SURFACE  
MOUNT

### DESCRIPTION

This 400 W Transient Voltage Suppressor (TVS) series is an economical molded axial-leaded package to protect voltage-sensitive components from destructive or partial degradation. They are available in both unidirectional or bi-directional configurations as well as RoHS Compliant (annealed matte-Tin finish) with an e3 suffix added to the part number. They have a peak pulse power rating of 400 watts for a 10/1000  $\mu$ s as depicted in Figures 1 and 2. The nominal breakdown voltages ( $V_{BR}$ ) in this series extend from 6.8 to 400 volts. Microsemi also offers a broad spectrum of additional TVSs to meet your needs.

### APPEARANCE



**IMPORTANT:** For the most current data, consult MICROSEMI's website: <http://www.microsemi.com>

### FEATURES

- Economical series for thru-hole mounting
- Available in both unidirectional and bi-directional (add C or CA suffix to part number for bidirectional)
- Voltages from 6.8 to 400 V Breakdown ( $V_{BR}$ )
- Fast Response
- Optional 100% **screening for avionics grade** is available by adding MA prefix to part number for added 100% temperature cycle  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$  (10X) as well as surge (3X) and 24 hours HTRB with post test  $V_z$  &  $I_R$  (in the operating direction for unidirectional or both directions for bidirectional)
- Options for screening in accordance with MIL-PRF-19500 for JAN, JANTX, or JANTXV are available by adding MQ, MX, or MV prefixes respectively to part numbers
- RoHS Compliant devices available by adding "e3" suffix
- Surface mount equivalents available as SMAJP4KE6.8 to SMAJP4KE400CA
- Moisture classification is Level 1 with no dry pack required per IPC/JEDEC J-STD-020B

### APPLICATIONS / BENEFITS

- Suppresses transients up to 400 watts @ 10/1000  $\mu$ s (see Figure 1)
- Protects sensitive components such as IC's, CMOS, Bipolar, BiCMOS, ECL, DTL,  $T^2L$ , etc.
- Protection from switching transients & induced RF
- Compliant to IEC61000-4-2 and IEC61000-4-4 for ESD and EFT protection respectively
- Secondary lightning protection per IEC61000-4-5 with 42 Ohms source impedance:
  - Class 1: P4KE5.0 to P4KE91A or CA
  - Class 2: P4KE5.0 to P4KE47A or CA
  - Class 3: P4KE5.0 to P4KE24A or CA
  - Class 4: P4KE5.0 to P4KE12A or CA
- Secondary lightning protection per IEC61000-4-5 with 12 Ohms source impedance:
  - Class 1: P4KE5.0 to P4KE30A or CA
  - Class 2: P4KE5.0 to P4KE15A or CA

### MAXIMUM RATINGS

- Operating and Storage Temperature:  $-65^{\circ}\text{C}$  to  $+150^{\circ}\text{C}$
- Peak Pulse Power: 400 Watts at 10/1000  $\mu$ s (see Figure 1, 2 and 3 for  $t_W$ , waveform and derating effects)
- Impulse repetition rate (duty factor): 0.01%
- Thermal Resistance:  $50^{\circ}\text{C}/\text{W}$  junction to leads @ 3/8 inch (10 mm) from body, or  $110^{\circ}\text{C}/\text{W}$  junction to ambient when mounted on FR4 PC board with 4  $\text{mm}^2$  copper pads (1oz) and track width 1 mm, length 25 mm
- Steady-State Power: 2.5 Watts @  $T_L=25^{\circ}\text{C}$  at 3/8 inch (10 mm) from body, or 1.13 W at  $T_A=25^{\circ}\text{C}$  on FR4 PC board described for thermal resistance
- Forward Voltage at  $25^{\circ}\text{C}$ : 3.5 V @ 30 A with 8.3 ms half-sine wave (unidirectional only)
- Solder temperatures:  $260^{\circ}\text{C}$  for 10 s (maximum)

### MECHANICAL AND PACKAGING

- CASE: Void-free transfer molded thermosetting epoxy body meeting UL94V-0
- FINISH: Tin-Lead or RoHS Compliant annealed matte-Tin plating readily solderable per MIL-STD-750, method 2026
- MARKING: Body marked with part number
- POLARITY: Band denotes cathode. Bidirectional not marked
- WEIGHT: 0.3 grams (approximate)
- TAPE & REEL option: Standard per EIA-296 (add "TR" suffix to part number)
- See package dimensions on last page

**ELECTRICAL CHARACTERISTICS @ 25°C**

TYPE NUMBER	RATED STAND-OFF VOLTAGE $V_{WM}$	BREAKDOWN VOLTAGE			MAXIMUM CLAMPING VOLTAGE $V_C$ @ $I_{PP}$	MAXIMUM STANDBY CURRENT $I_D$ @ $V_{WM}$	MAXIMUM PEAK PULSE CURRENT $I_{PP}$	MAXIMUM TEMPERATURE COEFFICIENT of $V_{(BR)}$ $\alpha_{V(BR)}$
		$V_{(BR)}$ @ $I_{(BR)}$		$I_{(BR)}$ mA				
		MIN. VDC	MAX. VDC					
	V	VDC	VDC		V	$\mu$ ADC	A	% / °C
P4KE6.8	5.50	6.12	7.48	10	10.8	500	37	.057
P4KE6.8A	5.80	6.45	7.14	10	10.5	500	38	.057
P4KE7.5	6.05	6.75	8.25	10	11.7	200	34	.061
P4KE7.5A	6.40	7.13	7.88	10	11.3	200	35	.061
P4KE8.2	6.63	7.38	9.02	10	12.5	100	32	.065
P4KE8.2A	7.02	7.79	8.61	10	12.1	100	33	.065
P4KE9.1	7.37	8.19	10.0	1	13.8	20	29	.068
P4KE9.1A	7.78	8.65	9.55	1	13.4	20	30	.068
P4KE10	8.10	9.00	11.0	1	15.0	20	27	.073
P4KE10A	8.55	9.50	10.5	1	14.5	5	28	.073
P4KE11	8.92	9.90	12.1	1	16.2	2	25	.075
P4KE11A	9.40	10.5	11.6	1	15.6	2	26	.075
P4KE12	9.72	10.8	13.2	1	17.3	1	23	.078
P4KE12A	10.2	11.4	12.6	1	16.7	1	24	.078
P4KE13	10.5	11.7	14.3	1	19.0	1	21	.081
P4KE13A	11.1	12.4	13.7	1	18.2	1	22	.081
P4KE15	12.1	13.5	16.5	1	22.0	1	18	.084
P4KE15A	12.8	14.3	15.8	1	21.2	1	19	.084
P4KE16	12.9	14.4	17.6	1	23.5	1	17	.086
P4KE16A	13.6	15.2	16.8	1	22.5	1	18	.086
P4KE18	14.5	16.2	19.8	1	26.5	1	15	.088
P4KE18A	15.3	17.1	18.0	1	25.2	1	16	.088
P4KE20	16.2	18.0	22.0	1	29.1	1	14	.090
P4KE20A	17.1	19.0	21.0	1	27.7	1	14.5	.090
P4KE22	17.8	19.8	24.2	1	31.9	1	12.5	.092
P4KE22A	18.8	20.9	23.1	1	30.6	1	13	.092
P4KE24	19.4	21.6	26.4	1	34.7	1	11.5	.094
P4KE24A	20.5	22.8	25.2	1	33.2	1	12	.094
P4KE27	21.8	24.3	29.7	1	39.1	1	10	.096
P4KE27A	23.1	25.7	28.4	1	37.5	1	11	.096
P4KE30	24.3	27.0	33.0	1	43.5	1	9.0	.097
P4KE30A	25.6	28.5	31.5	1	41.4	1	9.5	.097
P4KE33	26.8	29.7	36.3	1	47.7	1	8.5	.098
P4KE33A	28.2	31.4	34.7	1	45.7	1	9.0	.098
P4KE36	39.1	32.4	39.6	1	52.0	1	7.5	.099
P4KE36A	30.8	34.2	37.8	1	49.9	1	8.0	.099
P4KE39	31.6	35.1	42.9	1	56.4	1	7.0	.100
P4KE39A	33.3	37.1	41.0	1	53.9	1	7.5	.100
P4KE43	34.8	38.7	47.3	1	61.9	1	6.5	.101
P4KE43A	36.8	40.9	45.2	1	59.3	1	7.0	.101
P4KE47	38.1	42.3	51.7	1	67.8	1	5.9	.101
P4KE47A	40.2	44.7	49.4	1	64.8	1	6.2	.101
P4KE51	41.3	45.9	56.1	1	73.5	1	5.4	.102
P4KE51A	43.6	48.5	53.6	1	70.1	1	5.7	.102
P4KE56	45.4	50.4	61.6	1	80.5	1	5.0	.103
P4KE56A	47.8	53.2	58.8	1	77.0	1	5.2	.103
P4KE62	50.2	55.8	68.2	1	89.0	1	4.5	.104
P4KE62A	53.0	58.9	65.1	1	85.0	1	4.7	.104
P4KE68	55.1	61.2	74.8	1	98.0	1	4.1	.104
P4KE68A	58.1	64.6	71.4	1	92.0	1	4.4	.104
P4KE75	60.7	67.5	82.5	1	108.0	1	3.7	.105
P4KE75A	64.1	71.3	78.8	1	103.0	1	3.9	.105



**P4KE6.8 thru P4KE400CA, e3**

**400 Watt Transient Voltage Suppressor**

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P4KE6.8 thru 400

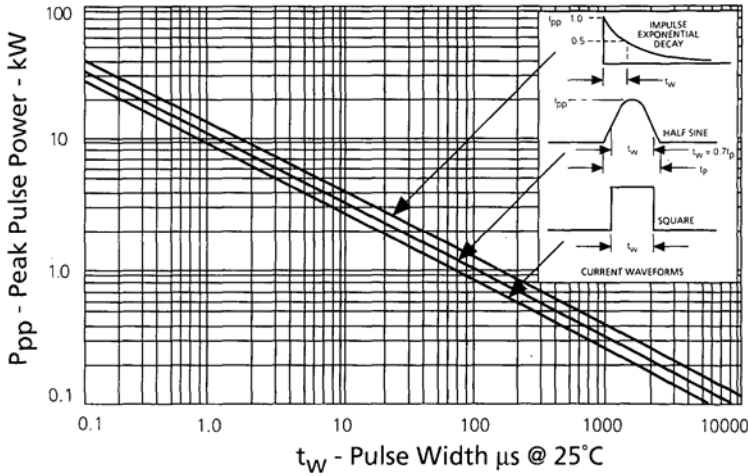
TYPE NUMBER	RATED STAND-OFF VOLTAGE $V_{WM}$	BREAKDOWN VOLTAGE			MAXIMUM CLAMPING VOLTAGE $V_C$ @ $I_{PP}$	MAXIMUM STANDBY CURRENT $I_D$ @ $V_{WM}$	MAXIMUM PEAK PULSE CURRENT $I_{PP}$	MAXIMUM TEMPERATURE COEFFICIENT of $V_{(BR)}$ $\alpha_{V(BR)}$
		$V_{(BR)}$ @ $I_{(BR)}$		$I_{(BR)}$ mA				
		MIN. VDC	MAX. VDC					
	V	VDC	VDC		V	$\mu$ ADC	A	% / °C
P4KE82	66.4	73.8	90.2	1	118.0	1	3.4	.105
P4KE82A	70.1	77.9	86.1	1	113.0	1	3.5	.105
P4KE91	73.7	81.9	100.0	1	131.0	1	3.1	.106
P4KE91A	77.8	86.5	95.5	1	125.0	1	3.2	.106
P4KE100	81.0	90.0	110.0	1	144.0	1	2.8	.106
P4KE100A	85.5	95.0	105.0	1	137.0	1	2.9	.106
P4KE110	89.2	99.0	121.0	1	158.0	1	2.5	.107
P4KE110A	94.0	105.0	116.0	1	152.0	1	2.6	.107
P4KE120	97.2	108.0	132.0	1	173.0	1	2.3	.107
P4KE120A	102.0	114.0	126.0	1	165.0	1	2.4	.107
P4KE130	105.0	117.0	143.0	1	187.0	1	2.1	.107
P4KE130A	111.0	124.0	137.0	1	179.0	1	2.2	.107
P4KE150	121.0	135.0	165.0	1	215.0	1	1.9	.108
P4KE150A	128.0	143.0	158.0	1	207.0	1	1.95	.108
P4KE160	130.0	144.0	176.0	1	230.0	1	1.7	.108
P4KE160A	136.0	152.0	168.0	1	219.0	1	1.8	.108
P4KE170	138.0	153.0	187.0	1	244.0	1	1.6	.108
P4KE170A	145.0	162.0	179.0	1	234.0	1	1.7	.108
P4KE180	146.0	162.0	198.0	1	258.0	1	1.5	.108
P4KE180A	154.0	171.0	189.0	1	246.0	1	1.6	.108
P4KE200	162.0	180.0	220.0	1	287.0	1	1.4	.108
P4KE200A	171.0	190.0	210.0	1	274.0	1	1.5	.108
P4KE220	175.0	198.0	242.0	1	344.0	1	1.0	.110
P4KE220A	185.0	209.0	231.0	1	328.0	1	1.0	.110
P4KE250	202.0	225.0	275.0	1	360.0	1	1.0	.110
P4KE250A	214.0	237.0	263.0	1	344.0	1	1.0	.110
P4KE300	243.0	270.0	330.0	1	430.0	1	1.0	.110
P4KE300A	256.0	285.0	315.0	1	414.0	1	1.0	.110
P4KE350	284.0	315.0	385.0	1	504.0	1	1.0	.110
P4KE350A	300.0	333.0	368.0	1	482.0	1	1.0	.110
P4KE400	324.0	360.0	440.0	1	574.0	1	1.0	.110
P4KE400A	342.0	380.0	420.0	1	548.0	1	1.0	.110

Forward Voltage (Vf) @ 30 amps peak, 8.3 ms sine wave equal to 3.5 volts maximum for P4KE6.8 TO 200. (excluding Bidirectional)  
For bi-directional construction, indicate a C or CA suffix after part number, i.e. P4KE170CA.

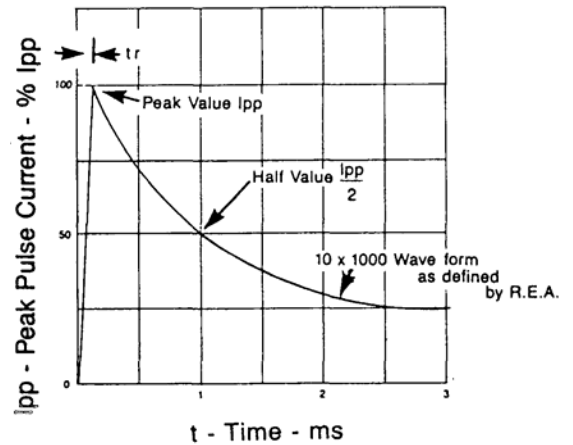
**SYMBOLS & DEFINITIONS**

Symbol	Definition	Symbol	Definition
$V_{WM}$	Working peak (Standoff) Voltage	$I_{PP}$	Peak Pulse Current
$P_{PP}$	Peak Pulse Power	$V_C$	Clamping Voltage
$V_{(BR)}$	Breakdown Voltage	$I_{(BR)}$	Breakdown Current for $V_{(BR)}$
$I_D$	Standby Current		

GRAPHS

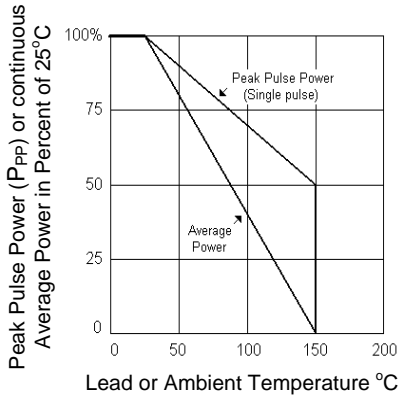


**FIGURE 1**  
Peak Pulse Power vs. Pulse Time

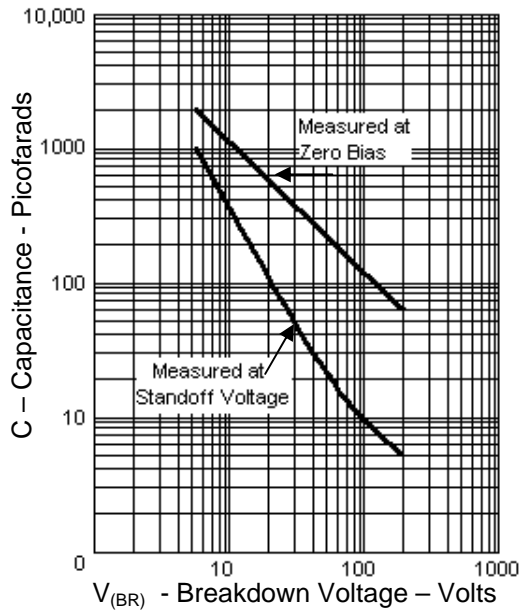


Test waveform parameters:  $t_r=10 \mu s$ ,  $t_p=1000 \mu s$

**FIGURE 2**  
Pulse Waveform for Exponential Surge

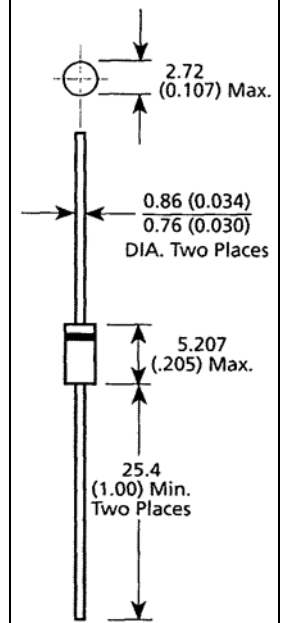


**FIGURE 3**  
Derating Curve



**FIGURE 4**  
P4KE Typical Capacitance vs. Breakdown Voltage (Unipolar)

PACKAGE DIMENSIONS



**NOTE:** Cathode indicated by band. All dimensions in millimeters (inches)