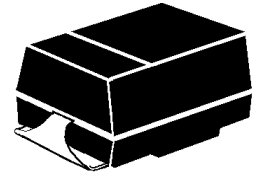


**DESCRIPTION**

This Transient Voltage Suppressor (TVS) series is an economical molded surface mount package with very low thermal resistance due to its unique axial subassembly. It is used for automotive applications and others to protect voltage sensitive components from destructive or partial degradation. They have a peak pulse power rating of 400 watts for 1 ms as depicted in Figures 1 and 2. The package is configured for easy pick and place onto PC Boards for automated handling. The J-bend terminations also provide stress relief for use on a variety of PC Board materials.

**PACKAGE**



**DO-214AC or BA  
(SMAJ)**

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

**FEATURES**

- Economical series for surface 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
- Moisture classification is Level 1 per IPC/JEDEC J-STD-020B with no dry pack
- 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, JANTXV, or JANS are available by adding MQ, MX, MV, or MSP prefixes respectively to part numbers
- Equivalent axial-lead packages available as P4KE6.8 to P4KE400CA

**APPLICATIONS / BENEFITS**

- Suppresses transient up to 400 watts @ 10/1000  $\mu\text{s}$  (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: SMAJP4KE6.8 to SMAJP4KE91A or CA
  - Class 2: SMAJP4KE6.8 to SMAJP4KE47A or CA
  - Class 3: SMAJP4KE6.8 to SMAJP4KE24A or CA
  - Class 4: SMAJP4KE6.8 to SMAJP4KE12A or CA
- Secondary lightning protection per IEC61000-4-5 with 12 Ohms source impedance:
  - Class 1: SMAJP4KE6.8 to SMAJP4KE30A or CA
  - Class 2: SMAJP4KE6.8 to SMAJP4KE15A or CA

**MAXIMUM RATINGS**

- Peak Pulse Power dissipation at  $25^{\circ}\text{C}$ : 400 watts at 10/1000  $\mu\text{s}$  (also see Fig 1,2, and 4)
- Impulse repetition rate (duty factor): 0.01%
- $t_{clamping}$  (0 volts to  $V_{(BR)}$  min.): < 100 ps theoretical for unidirectional and < 5 ns for bidirectional
- Operating and Storage temperature:  $-65^{\circ}\text{C}$  to  $+150^{\circ}\text{C}$
- Thermal resistance:  $17^{\circ}\text{C/W}$  junction to lead or  $82^{\circ}\text{C/W}$  junction to ambient when mounted on FR4 PC board (1 oz Cu) with recommended footprint (see last page)
- Steady-State Power dissipation: 5 watts at  $T_L = 65^{\circ}\text{C}$  or 1.52 watts at  $T_A = 25^{\circ}\text{C}$  when mounted on FR4 PC board with recommended footprint
- Forward Surge Current at  $25^{\circ}\text{C}$ : 40 amps peak, 8.3 ms half-sine wave. Maximum voltage of 3.50 V (unidirectional only)
- Solder temperatures:  $260^{\circ}\text{C}$  for 10 s (maximum)

**MECHANICAL AND PACKAGING**

- Molded epoxy package meets UL94V-0
- Terminations are tin-lead plated solderable per MIL-STD-750, method 2026
- Cathode designated by cathode band for unidirectional (none for bidirectional)
- Weight: 0.1 grams (approximate)
- Tape & Reel option: Standard per EIA-481-1-A with 12 mm tape (add "TR" suffix to part number) 750 per 7 inch reel or 2500 per 13 inch reel
- Marking only shows 4KExxx digits of part number (e.g. 4KE6.8, 4KE12CA, 4KE30A, etc.)

**ELECTRICAL CHARACTERISTICS @ 25°C**

TYPE NUMBER	RATED STAND-OFF VOLTAGE $V_{WM}$	BREAKDOWN VOLTAGE $V_{(BR)}$ @ $I_{(BR)}$			MAXIMUM CLAMPING VOLTAGE VC MAX. @ $I_{PP}$	MAXIMUM REVERSE LEAKAGE CURRENT $I_D$ @ $V_{WM}$	MAXIMUM PEAK PULSE CURRENT $I_{PP}$	MAXIMUM TEMPERATURE COEFFICIENT of $V_{(BR)}$ $\alpha_{V(BR)}$
		MIN.	MAX.					
		V	V	mA				
SMAJP4KE6.8	5.50	6.12	7.48	10	10.8	500	37	.057
SMAJP4KE6.8A	5.80	6.45	7.14	10	10.5	500	38	.057
SMAJP4KE7.5	6.05	6.75	8.25	10	11.7	200	34	.061
SMAJP4KE7.5A	6.40	7.13	7.88	10	11.3	200	35	.061
SMAJP4KE8.2	6.63	7.38	9.02	10	12.5	100	32	.065
SMAJP4KE8.2A	7.02	7.79	8.61	10	12.1	100	33	.065
SMAJP4KE9.1	7.37	8.19	10.0	1	13.8	20	29	.068
SMAJP4KE9.1A	7.78	8.65	9.55	1	13.4	20	30	.068
SMAJP4KE10	8.10	9.00	11.0	1	15.0	20	27	.073
SMAJP4KE10A	8.55	9.50	10.5	1	14.5	5	28	.073
SMAJP4KE11	8.92	9.90	12.1	1	16.2	2	25	.075
SMAJP4KE11A	9.40	10.5	11.6	1	15.6	2	26	.075
SMAJP4KE12	9.72	10.8	13.2	1	17.3	1	23	.078
SMAJP4KE12A	10.2	11.4	12.6	1	16.7	1	24	.078
SMAJP4KE13	10.5	11.7	14.3	1	19.0	1	21	.081
SMAJP4KE13A	11.1	12.4	13.7	1	18.2	1	22	.081
SMAJP4KE15	12.1	13.5	16.5	1	22.0	1	18	.084
SMAJP4KE15A	12.8	14.3	15.8	1	21.2	1	19	.084
SMAJP4KE16	12.9	14.4	17.6	1	23.5	1	17	.086
SMAJP4KE16A	13.6	15.2	16.8	1	22.5	1	18	.086
SMAJP4KE18	14.5	16.2	19.8	1	26.5	1	15	.088
SMAJP4KE18A	15.3	17.1	18.0	1	25.2	1	16	.088
SMAJP4KE20	16.2	18.0	22.0	1	29.1	1	14	.090
SMAJP4KE20A	17.1	19.0	21.0	1	27.7	1	14.5	.090
SMAJP4KE22	17.8	19.8	24.2	1	31.9	1	12.5	.092
SMAJP4KE22A	18.8	20.9	23.1	1	30.6	1	13	.092
SMAJP4KE24	19.4	21.6	26.4	1	34.7	1	11.5	.094
SMAJP4KE24A	20.5	22.8	25.2	1	33.2	1	12	.094
SMAJP4KE27	21.8	24.3	29.7	1	39.1	1	10	.096
SMAJP4KE27A	23.1	25.7	28.4	1	37.5	1	11	.096
SMAJP4KE30	24.3	27.0	33.0	1	43.5	1	9.0	.097
SMAJP4KE30A	55.6	28.5	31.5	1	41.4	1	9.5	.097
SMAJP4KE33	26.8	29.7	36.3	1	47.7	1	8.5	.098
SMAJP4KE33A	28.2	31.4	34.7	1	45.7	1	9.0	.098
SMAJP4KE36	29.1	32.4	39.6	1	52.0	1	7.5	.099
SMAJP4KE36A	30.8	34.2	37.8	1	49.9	1	8.0	.099
SMAJP4KE39	31.6	35.1	42.9	1	56.4	1	7.0	.100
SMAJP4KE39A	33.3	37.1	41.0	1	53.9	1	7.5	.100
SMAJP4KE43	34.8	38.7	47.3	1	61.9	1	6.5	.101
SMAJP4KE43A	36.8	40.9	45.2	1	59.3	1	7.0	.101
SMAJP4KE47	38.1	42.3	51.7	1	67.8	1	5.9	.101
SMAJP4KE47A	40.2	44.7	49.4	1	64.8	1	6.2	.101
SMAJP4KE51	41.3	45.9	56.1	1	73.5	1	5.4	.102
SMAJP4KE51A	43.6	48.5	53.6	1	70.1	1	5.7	.102
SMAJP4KE56	45.4	50.4	61.6	1	80.5	1	5.0	.103
SMAJP4KE56A	47.8	53.2	58.8	1	77.0	1	5.2	.103
SMAJP4KE62	50.2	55.8	68.2	1	89.0	1	4.5	.104
SMAJP4KE62A	53.0	58.9	65.1	1	85.0	1	4.7	.104
SMAJP4KE68	55.1	61.2	74.8	1	98.0	1	4.1	.104
SMAJP4KE68A	58.1	64.6	71.4	1	92.0	1	4.4	.104
SMAJP4KE75	60.7	67.5	82.5	1	108.0	1	3.7	.105
SMAJP4KE75A	64.1	71.3	78.8	1	103.0	1	3.9	.105
SMAJP4KE82	66.4	73.8	90.2	1	118.0	1	3.4	.105
SMAJP4KE82A	70.1	77.9	86.1	1	113.0	1	3.5	.105
SMAJP4KE91	73.7	81.9	100.0	1	131.0	1	3.1	.106
SMAJP4KE91A	77.8	86.5	95.5	1	125.0	1	3.2	.106
SMAJP4KE100	81.0	90.0	110.0	1	144.0	1	2.8	.106
SMAJP4KE100A	85.5	95.0	105.0	1	137.0	1	2.9	.106
SMAJP4KE110	89.2	99.0	121.0	1	158.0	1	2.5	.107
SMAJP4KE110A	94.0	105.0	116.0	1	152.0	1	2.6	.107



**SMAJP4KE6.8 thru SMAJP4KE400CA**

**TRANSIENT VOLTAGE SUPPRESSOR**

TYPE NUMBER	RATED STAND-OFF VOLTAGE $V_{WM}$	BREAKDOWN VOLTAGE $V_{(BR)}$ @ $I_{(BR)}$			MAXIMUM CLAMPING VOLTAGE VC MAX. @ $I_{PP}$	MAXIMUM REVERSE LEAKAGE CURRENT $I_D$ @ $V_{WM}$	MAXIMUM PEAK PULSE CURRENT $I_{PP}$	MAXIMUM TEMPERATURE COEFFICIENT of $V_{(BR)}$ $\alpha_{V(BR)}$
		MIN.	MAX.					
	V	V	V	mA	V	$\mu A$	A	% / °C
SMAJP4KE120	97.2	108.0	132.0	1	173.0	1	2.3	.107
SMAJP4KE120A	102.0	114.0	126.0	1	165.0	1	2.4	.107
SMAJP4KE130	105.0	117.0	143.0	1	187.0	1	2.1	.107
SMAJP4KE130A	111.0	124.0	137.0	1	179.0	1	2.2	.107
SMAJP4KE150	121.0	135.0	165.0	1	215.0	1	1.9	.108
SMAJP4KE150A	128.0	143.0	158.0	1	207.0	1	1.95	.108
SMAJP4KE160	130.0	144.0	176.0	1	230.0	1	1.7	.108
SMAJP4KE160A	136.0	152.0	168.0	1	219.0	1	1.8	.108
SMAJP4KE170	138.0	153.0	187.0	1	244.0	1	1.6	.108
SMAJP4KE170A	145.0	162.0	179.0	1	234.0	1	1.7	.108
SMAJP4KE180	146.0	162.0	198.0	1	258.0	1	1.5	.108
SMAJP4KE180A	154.0	171.0	189.0	1	246.0	1	1.6	.108
SMAJP4KE200	162.0	180.0	220.0	1	287.0	1	1.4	.108
SMAJP4KE200A	171.0	190.0	210.0	1	274.0	1	1.5	.108
SMAJP4KE220	175.0	198.0	242.0	1	344.0	1	1.0	.110
SMAJP4KE220A	185.0	209.0	231.0	1	328.0	1	1.0	.110
SMAJP4KE250	202.0	225.0	275.0	1	360.0	1	1.0	.110
SMAJP4KE250A	214.0	237.0	263.0	1	344.0	1	1.0	.110
SMAJP4KE300	243.0	270.0	330.0	1	430.0	1	1.0	.110
SMAJP4KE300A	256.0	285.0	315.0	1	414.0	1	1.0	.110
SMAJP4KE350	284.0	315.0	385.0	1	504.0	1	1.0	.110
SMAJP4KE350A	300.0	333.0	368.0	1	482.0	1	1.0	.110
SMAJP4KE400	324.0	360.0	440.0	1	574.0	1	1.0	.110
SMAJP4KE400A	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 SMAJP4KE6.8 to 200. (Excluding Bidirectional)  
For bi-directional construction, indicate a C or CA suffix after part number, i.e. SMAJP4KE170CA.

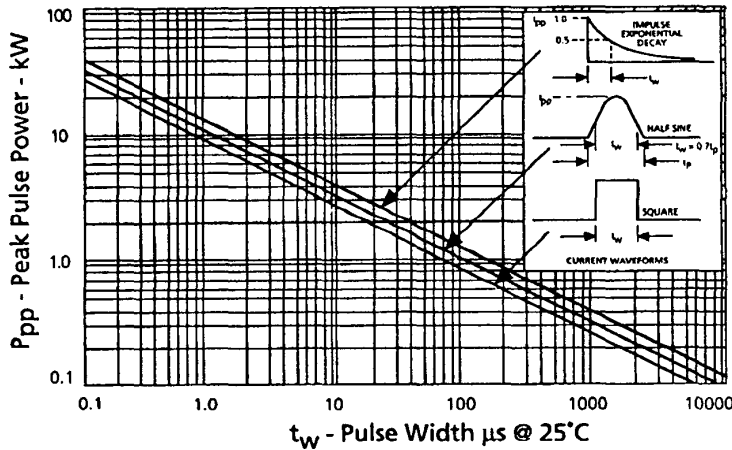
**SYMBOLS & DEFINITIONS**

Symbol	Definition	Symbol	Definition
$V_{WM}$	Rated Stand-Off Voltage	$I_{PP}$	Peak Pulse Current
$P_{PP}$	Peak Pulse Power	$V_{C(MAX)}$	Maximum Clamping Voltage
$V_{(BR)}$	Breakdown Voltage	$I_T$	Test Current
$I_D$	Reverse leakage		

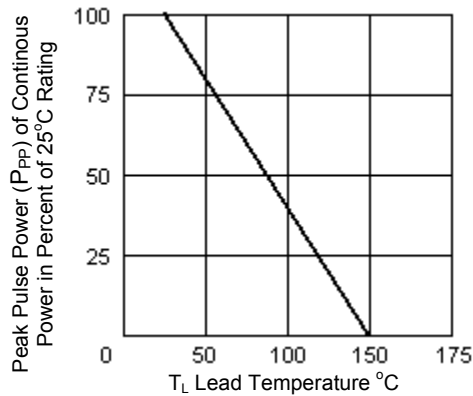
www.Microsemi.com

SMAJP4KE6.8 thru  
SMAJP4KE400CA

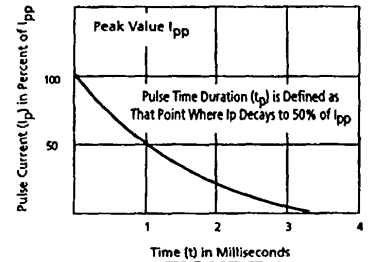
**OUTLINE AND CIRCUIT**



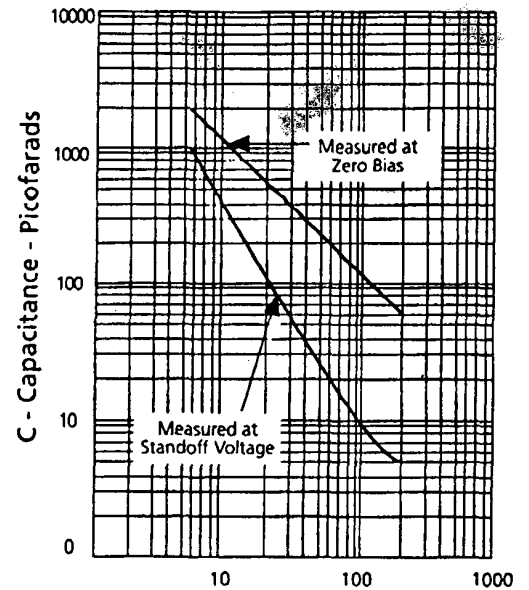
**FIGURE 1**  
Peak Pulse Power vs Pulse Time



**FIGURE 3**  
Derating Curve

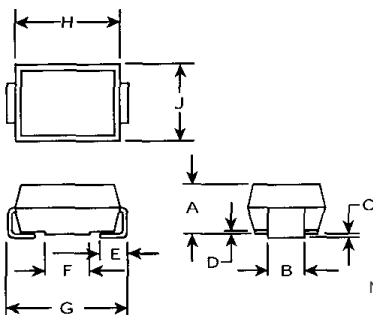


**FIGURE 2**  
Pulse Waveform for Exponential Surge

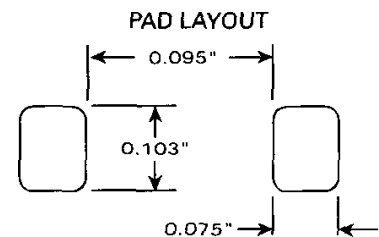


**FIGURE 4**  
P4KE Typical Capacitance vs Breakdown Voltage (Unipolar)

**PACKAGE DIMENSIONS**



DIM	INCHES		MILLIMETERS		NOTE
	MIN	MAX	MIN	MAX	
A	.078	.115	1.98	2.92	1
B	.052	.103	1.32	2.61	1
C	-	.005	-	.127	
D	-	.02	-	.51	
E	.030	.060	.76	1.52	
F	.055	.075	1.65	2.13	
G	.194	.216	4.93	5.48	
H	.160	.180	3.99	4.50	
J	.100	.110	2.57	2.79	



NOTE 1: DIMENSION A IS WITHIN DO-214BA BUT HIGHER THAN DO-214AC STANDARD JEDEC OUTLINES. DIMENSION B IS WIDER THAN BOTH JEDEC OUTLINES FOR LOWER THERMAL RESISTANCE.