Microsemi
SCOTTSDALE DIVISION

1N6267 thru 1N6303A, e3
1.5KE6.8 thru 1.5KE400CA, e3

Unidirectional & Bidirectional Transient Voltage Suppressors

ALSO AVAILABLE IN SURFACE MOUNT

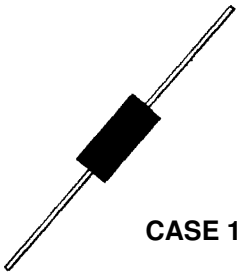
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DESCRIPTION

The Transient Voltage Suppressor (TVS) series for 1N5908 & 1N6267-1N6303A are JEDEC registered selections for unidirectional devices. The popular series of 1.5KE6.8-1.5KE400CA offers similar voltages with an extended voltage range and also provides bidirectional options with a C or CA suffix. All have the same high Peak Pulse Power rating of 1500 W and extremely fast response time. They can protect from secondary lightning effects per IEC61000-4-5 and class levels described herein as well as inductive switching environments and induced RF protection. Since their response time is virtually instantaneous, they can also protect from ESD and EFT per IEC61000-4-2 and IEC61000-4-4.

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

APPEARANCE



CASE 1

FEATURES

- Economical TVS series for thru-hole mounting
- Available in both Unidirectional and Bidirectional (1.5KE series add C or CA suffix for Bidirectional)
- Voltages from 6.8 to 400 V Breakdown (V_{BR})
- Suppresses transients up to 1500 watts @ 10/1000 µs
- Optional 100% **screening for avionics grade** is available by adding MA prefix to part number for added 100% temperature cycle -55°C to +125°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, and JANTXV are also available by adding MQ, MX, or MV prefixes respectively to part numbers.
- Surface mount equivalent packages are available as SMCJ5.0 - SMCJ170CA or SMCG5.0 - SMCG170CA (consult factory for other surface mount options)
- Moisture classification is Level 1 with no dry pack required per IPC/JEDEC J-STD-020B
- RoHS Compliant devices available by adding "e3" suffix

APPLICATIONS / BENEFITS

- Protection from switching transients and induced RF
- Protection from ESD and EFT per IEC 61000-4-2 and IEC 61000-4-4 with fast response
- Secondary lightning protection per IEC61000-4-5 with 42 Ohms source impedance:
  - Class 1: 1.5KE6.8A to 1.5KE200A or CA *
  - Class 2: 1.5KE5.0A to 1.5KE180A or CA *
  - Class 3: 1.5KE5.0A to 1.5KE91A or CA *
  - Class 4: 1.5KE5.0A to 1.5KE43A or CA *
- Secondary lightning protection per IEC61000-4-5 with 12 Ohms source impedance:
  - Class 1 : 1.5KE5.0A to 1.5KE110A or CA *
  - Class 2: 1.5KE5.0A to 1.5KE56A or CA *
  - Class 3: 1.5KE5.0A to 1.5KE27A or CA *
  - Class 4: 1.5KE5.0A to 1.5KE13A or CA *
- Secondary lightning protection per IEC61000-4-5 with 2 Ohms source impedance:
  - Class 2: 1.5KE5.0A to 1.5KE24A or CA *
  - Class 3: 1.5KE5.0 to 1.5KE12A or CA *

* Also applies to 1N5908 and 1Nxxxx of same voltage

MAXIMUM RATINGS

- Peak Pulse Power dissipation at 25°C: 1500 watts at 10/1000 µs (also see Fig 1,2, and 3)
- 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°C to +150°C
- Thermal Resistance: 22°C/W junction to lead at 3/8 inch (10 mm) from body, or 82°C/W junction to ambient when mounted on FR4 PC board with 4 mm^2 copper pads (1oz) and track width 1 mm, length 25 mm
- Steady-State Power dissipation: 5 watts at T_L = 40°C, or 1.52 watts at T_A = 25°C when mounted on FR4 PC board described for thermal resistance
- Forward Surge: 200 Amps peak impulse of 8.3 ms half-sine wave at 25ºC (unidirectional only)
- Solder temperatures: 260°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 matte-Tin plating solderable per MIL-STD-750, method 2026
- POLARITY: Cathode indicated by band. No marking on bidirectional devices
- MARKING: Part number
- TAPE & REEL option: Standard per EIA-296 (add "TR" suffix to part number)
- WEIGHT: 1.5 grams (approximate)
- See package dimensions on last page

1N6267 – 1N6303A, e3
1.5KE6.8 – 1.5KE400A, e3

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ELECTRICAL CHARACTERISTICS

Industry Type Number	JEDEC Type Number	Rated Standoff Voltage V_{WM} (NOTE 1)	Breakdown Voltage $V_{(BR)}$ @ $I_{(BR)}$		Maximum Clamping Voltage V_C @ I_{PP}	Maximum Standby Current I_D @ V_{WM}	Maximum Peak Pulse Current I_{PP} (Fig. 2)	Maximum Temperature Coefficient of $V_{(BR)}$ $\alpha_{V(BR)}$
		Volts	Volts Min. Max.	mA	Volts	µA	A	%/°C
-	1N5908	5.0	6.0 – -	1	7.6	300	30	.057
1.5KE6.8	1N6267	5.50	6.12 – 7.48	10	10.8	1000	139.0	.057
1.5KE6.8A	1N6267A	5.80	6.45 – 7.14	10	10.5	1000	143.0	.057
1.5KE7.5	1N6268	6.05	6.75 – 8.25	10	11.7	500	128.0	.061
1.5KE7.5A	1N6268A	6.40	7.13 – 7.88	10	11.3	500	132.0	.061
1.5KE8.2	1N6269	6.63	7.38 – 9.02	10	12.5	200	120.0	.065
1.5KE8.2A	1N6269A	7.02	7.79 – 8.61	10	12.1	200	124.0	.065
1.5KE9.1	1N6270	7.37	8.19 – 10.00	1	13.8	50	109.0	.068
1.5KE9.1A	1N6270A	7.78	8.65 – 9.55	1	13.4	50	112.0	.068
1.5KE10	1N6271	8.10	9.00 – 11.00	1	15.0	10	100.0	.073
1.5KE10A	1N6271A	8.55	9.50 – 10.50	1	14.5	10	103.0	.073
1.5KE11	1N6272	8.92	9.90 – 12.10	1	16.2	5	93.0	.075
1.5KE11A	1N6272A	9.40	10.50 – 11.60	1	15.6	5	96.0	.075
1.5KE12	1N6273	9.72	10.80 – 13.20	1	17.3	5	87.0	.078
1.5KE12A	1N6273A	10.220	11.40 – 12.60	1	16.7	5	90.0	.078
1.5KE13	1N6274	10.50	11.70 – 14.30	1	19.0	5	79.0	.081
1.5KE13A	1N6274A	11.10	12.40 – 13.70	1	18.2	5	82.0	.081
1.5KE15	1N6275	12.10	13.50 – 16.50	1	22.0	1	68.0	.084
1.5KE15A	1N6275A	12.80	14.30 – 15.80	1	21.2	1	71.0	.084
1.5KE16	1N6276	12.90	14.40 – 17.60	1	23.5	1	64.0	.086
1.5KE16A	1N6276A	13.60	15.20 – 16.80	1	22.5	1	67.0	.086
1.5KE18	1N6277	14.50	16.20 – 19.80	1	26.5	1	56.5	.088
1.5KE18A	1N6277A	15.30	17.10 – 18.90	1	25.2	1	59.5	.088
1.5KE20	1N6278	16.20	18.00 – 22.00	1	29.1	1	51.5	.090
1.5KE20A	1N6278A	17.10	19.00 – 21.00	1	27.7	1	54.0	.090
1.5KE22	1N6279	17.80	19.80 – 24.20	1	31.9	1	47.0	.092
1.5KE22A	1N6279A	18.80	20.90 – 23.10	1	30.6	1	49.0	.092
1.5KE24	1N6280	19.40	21.60 – 26.40	1	34.7	1	43.0	.094
1.5KE24A	1N6280A	20.50	22.80 – 25.20	1	33.2	1	45.0	.094
1.5KE27	1N6281	21.80	24.30 – 29.70	1	39.1	1	38.5	.096
1.5KE27A	1N6281A	23.10	25.70 – 28.40	1	37.5	1	40.0	.096
1.5KE30	1N6282	24.30	27.00 – 33.00	1	43.5	1	34.5	.097
1.5KE30A	1N6282A	25.60	28.50 – 31.50	1	41.4	1	36.0	.097
1.5KE33	1N6283	26.80	29.70 – 36.30	1	47.7	1	31.5	.098
1.5KE33A	1N6283A	28.20	31.40 – 34.70	1	45.7	1	33.0	.098
1.5KE36	1N6284	29.10	32.40 – 39.60	1	52.0	1	29.0	.099
1.5KE36A	1N6284A	30.80	34.20 – 37.80	1	49.9	1	30.0	.099
1.5KE39	1N6285	31.60	35.10 – 42.90	1	56.4	1	26.5	.100
1.5KE39A	1N6285A	33.30	37.10 – 41.00	1	53.9	1	28.0	.100
1.5KE43	1N6286	34.80	38.70 – 47.30	1	61.9	1	24.0	.101
1.5KE43A	1N6286A	36.80	40.90 – 45.20	1	59.3	1	25.3	.101
1.5KE47	1N6287	38.10	42.30 – 51.70	1	67.8	1	22.2	.101
1.5KE47A	1N6287A	40.20	44.70 – 49.40	1	64.8	1	23.2	.101
1.5KE51	1N6288	41.30	45.90 – 56.10	1	73.5	1	20.4	.102
1.5KE51A	1N6288A	43.60	48.50 – 53.60	1	70.1	1	21.4	.102
1.5KE56	1N6289	45.40	50.40 – 61.60	1	80.5	1	18.6	.103
1.5KE56A	1N6289A	47.80	53.20 – 58.80	1	77.0	1	19.5	.103
1.5KE62	1N6290	50.20	55.80 – 68.20	1	89.0	1	16.9	.104
1.5KE62A	1N6290A	53.00	58.90 – 65.10	1	85.0	1	17.7	.104
1.5KE68	1N6291	55.10	61.20 – 74.80	1	98.0	1	15.3	.104
1.5KE68A	1N6291A	58.10	64.60 – 71.40	1	92.0	1	16.3	.104
1.5KE75	1N6292	60.70	67.50 – 82.50	1	108.0	1	13.9	.105
1.5KE75A	1N6292A	64.10	71.30 – 78.80	1	103.0	1	14.6	.105

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		Volts	Volts Min. Max.	mA	Volts	µA	A	%/°C
1.5KE82	1N6293	66.40	73.80 – 90.20	1	118.0	1	12.7	.105
1.5KE82A	1N6293A	70.10	77.90 – 86.10	1	113.0	1	13.3	.105
1.5KE91	1N6294	73.70	81.90 – 100.00	1	131.0	1	11.4	.106
1.5KE91A	1N6294A	77.80	86.50 – 95.50	1	125.0	1	12.0	.106
1.5KE100	1N6295	81.00	90.00 – 110.00	1	144.0	1	10.4	.106
1.5KE100A	1N6295A	85.50	95.00 – 105.00	1	137.0	1	11.0	.106
1.5KE110	1N6296	89.20	99.00 – 121.00	1	158.0	1	9.5	.107
1.5KE110A	1N6296A	94.00	105.00 – 116.00	1	152.0	1	9.9	.107
1.5KE120	1N6297	97.20	108.00 – 132.00	1	173.0	1	8.7	.107
1.5KE120A	1N6297A	102.00	114.00 – 126.00	1	165.0	1	9.1	.107
1.5KE130	1N6298	105.00	117.00 – 143.00	1	187.0	1	8.0	.107
1.5KE130A	1N6298A	111.00	124.00 – 137.00	1	179.0	1	8.4	.107
1.5KE150	1N6299	121.00	135.00 – 165.00	1	215.0	1	7.0	.108
1.5KE150A	1N6299A	128.00	143.00 – 158.00	1	207.0	1	7.2	.108
1.5KE160	1N6300	130.00	144.00 – 176.00	1	230.0	1	6.5	.108
1.5KE160A	1N6300A	136.00	152.00 – 168.00	1	219.0	1	6.8	.108
1.5KE170	1N6301	138.00	153.00 – 187.00	1	244.0	1	6.2	.108
1.5KE170A	1N6301A	145.00	162.00 – 179.00	1	234.0	1	6.4	.108
1.5KE180	1N6303	146.00	162.00 – 198.00	1	258.0	1	5.8	.108
1.5KE180A	1N6303A	154.00	171.00 – 189.00	1	246.0	1	6.1	.108
1.5KE200	-	162.00	180.00 – 220.00	1	287.0	1	5.2	.108
1.5KE200A		171.00	190.00 – 210.00	1	274.0	1	5.5	.108
1.5KE220		175.00	198.00 – 242.00	1	344.0	1	4.3	.110
1.5KE220A		185.00	209.00 – 231.00	1	328.0	1	4.6	.110
1.5KE250	-	202.00	225.00 – 275.00	1	360.0	1	5.0	.110
1.5KE250A		214.00	237.00 – 263.00	1	344.0	1	5.0	.110
1.5KE300		243.00	270.00 – 330.00	1	430.0	1	5.0	.111
1.5KE300A		256.00	285.00 – 315.00	1	414.0	1	5.0	.111
1.5KE350	-	284.00	315.00 – 385.00	1	504.0	1	4.0	.111
1.5KE350A		300.00	332.00 – 368.00	1	482.0	1	4.0	.111
1.5KE400		324.00	360.00 – 440.00	1	574.0	1	4.0	.111
1.5KE400A		324.00	380.00 – 420.00	1	548.0	1	4.0	.111

NOTES: **1.** Normal selection criteria for TVS devices is by rated stand-off voltage (V_{WM}) and should be equal or greater than dc or continuous peak operating voltage.

2. TVS devices are tested to maximum peak pulse current (I_{PP}) with clamping voltage monitored. This surge capability is one of the most significant electrical characteristics of the device and should be considered as part of customer quality inspections.

3. For Bidirectional part number add C or CA as suffix (e.e., 1.5KE33C or 1.5KE33CA). For Bidirectional types having V_{WM} of 8 volts and under, the I_D leakage current is doubled. 1N62XX or 1N5908 not available as Bidirectional. For Bipolar capacitance will be .5 that shown in Fig. 2 for zero bias.

4. For unidirectional, the forward voltage (V_F) is 3.5 volts maximum at 100 Amps peak for 8.3 ms half-sine wave.

SYMBOLS & DEFINITIONS

Symbol	Definition
V_{WM}	Working Peak (Standoff) Voltage
I_{PP}	Peak Pulse Current
P_{PP}	Peak Pulse Power
$V_{C(MAX)}$	Maximum Clamping Voltage
$V_{(BR)}$	Breakdown Voltage
$I_{(BR)}$	Test Current
I_D	Standby Current

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GRAPHS

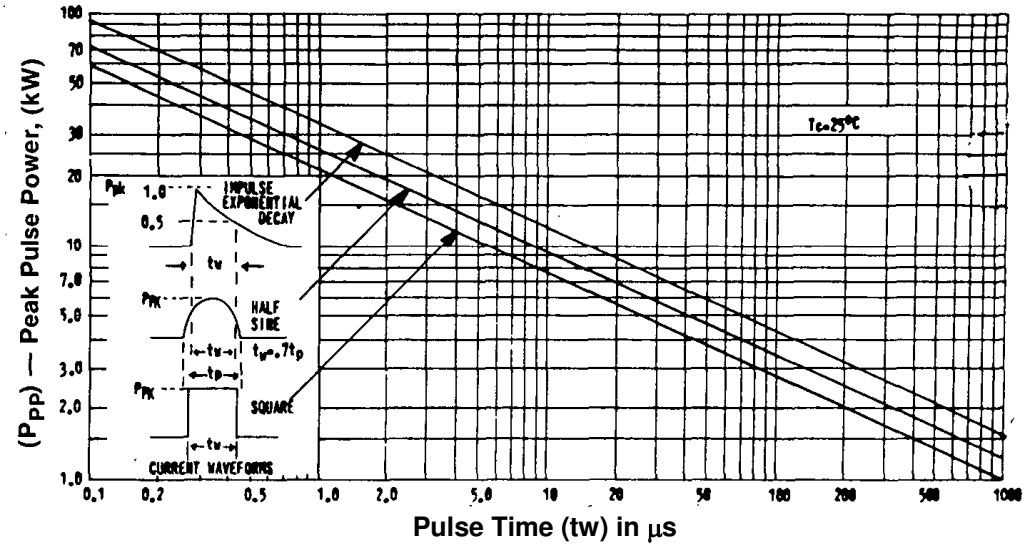


FIGURE 1
Peak Pulse Power vs.
Pulse Time (t_W) in μs

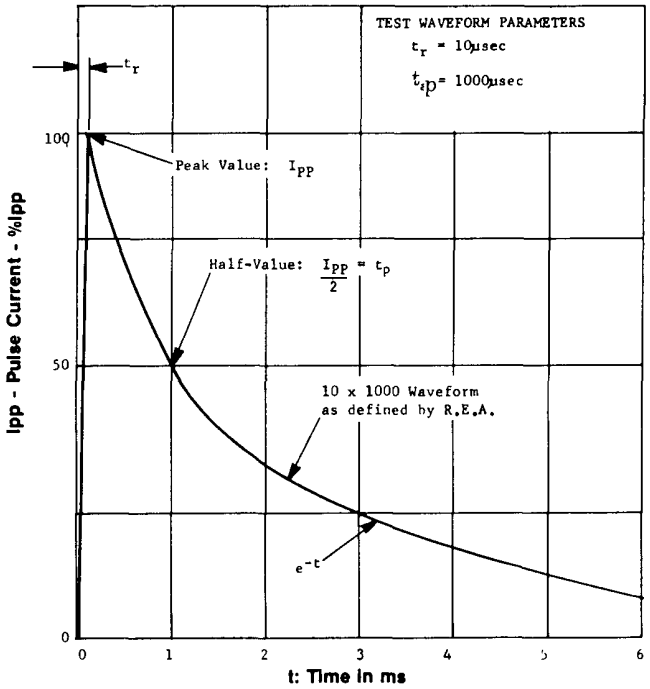


FIGURE 2 Pulse Wave Form

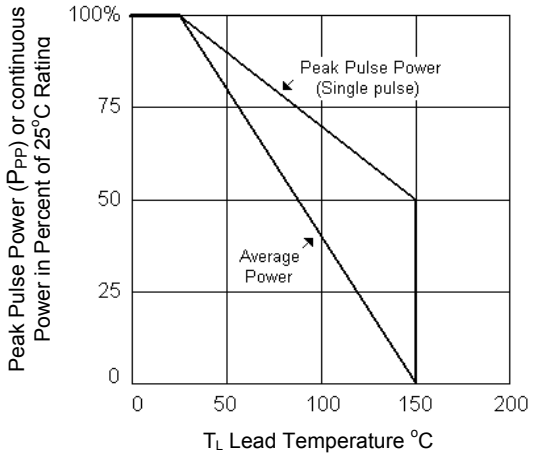


FIGURE 3 Derating Curve

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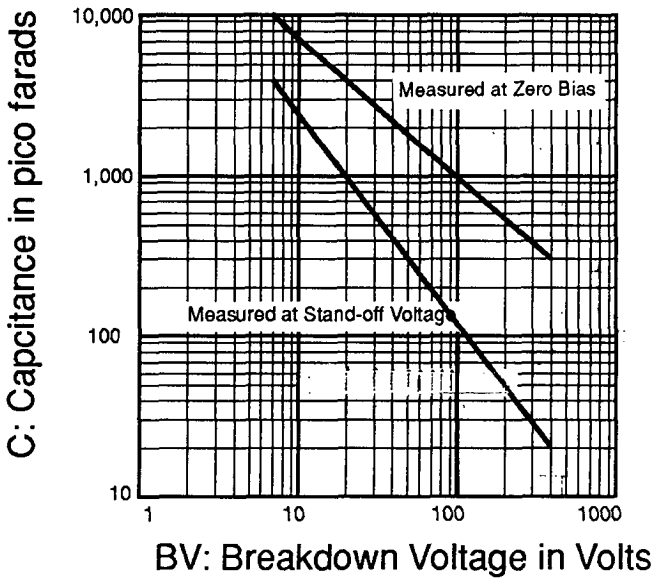
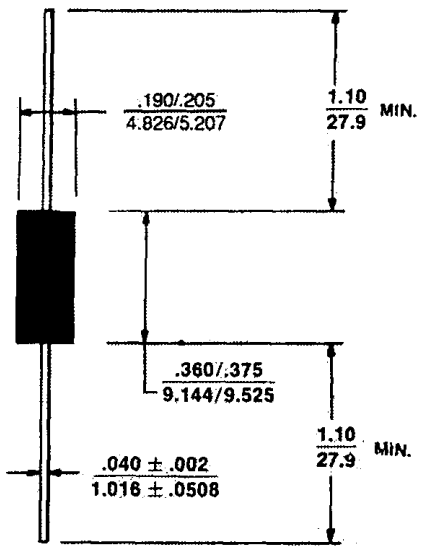


FIGURE 4 Typical Capacitance vs. Breakdown Voltage

PACKAGE DIMENSIONS



NOTE: Dimensions are in inches / mm

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