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TECHNICAL DATA SHEET

Unidirectional and Bidirectional
Transient Voltage Suppressor

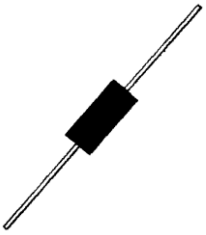
- **High Reliability controlled devices**
- **Economical series for thru hole mounting**
- **Unidirectional (A) and Bidirectional (CA) construction**
- **Selections for 5.8 V to 324 V standoff voltages (V_{WM})**

DEVICES **M1.5KE6.8A thru M1.5KE400CA, e3**

LEVELS
M, MA, MX, MXL

FEATURES

- High reliability controlled devices with wafer fabrication and assembly lot traceability
- 100 % surge tested devices
- Suppresses transients up to 1500 watts @ 10/1000 µs
- Optional upscreening available by replacing the M prefix with MA, MX or MXL. These prefixes specify various screening and conformance inspection options based on MIL-PRF-19500. Refer to MicroNote 129 for more details on the screening options.
- Surface mount equivalent packages are available as MSMC(G)(J)5.0A - SMC(G)(J)170CA (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
- 3σ lot norm screening performed on Standby Current I_D



CASE 1

Datasheet Directory

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 IEC 61000-4-5 with 42 Ohms source impedance:
  - Class 1: M1.5KE6.8A to M1.5KE200CA
  - Class 2: M1.5KE5.0A to M1.5KE180CA
  - Class 3: M1.5KE5.0A to M1.5KE91CA
  - Class 4: M1.5KE5.0A to M1.5KE43CA
- Secondary lightning protection per IEC61000-4-5 with 12 Ohms source impedance:
  - Class 1 : M1.5KE5.0A to M1.5KE110CA
  - Class 2: M1.5KE5.0A to M1.5KE56CA
  - Class 3: M1.5KE5.0A to M1.5KE27ACA
  - Class 4: M1.5KE5.0A to M1.5KE13CA
- Secondary lightning protection per IEC61000-4-5 with 2 Ohms source impedance:
  - Class 2: M1.5KE5.0A to M1.5KE24CA
  - Class 3: M1.5KE5.0A to M1.5KE12CA

MAXIMUM RATINGS

- Peak Pulse Power dissipation at 25 °C: 1500 watts at 10/1000 µs (also see Figures 1, 2, and 3) with impulse repetition rate (duty factor) of 0.01 % or less
- $t_{clamping}$ (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)

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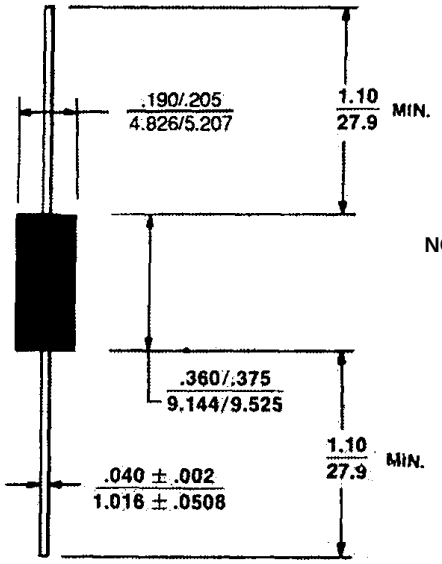
MECHANICAL AND PACKAGING

- Void-free transfer molded thermosetting epoxy body meeting UL94V-0
- Tin-Lead (90 % Sn, 10 % Pb) or RoHS (100% Sn) Compliant annealed matte-Tin plating readily solderable per MIL-STD-750, method 2026
- Body marked with part number
- Cathode indicated by band. No cathode band on bi-directional devices.
- Available in bulk or custom tape-and-reel packaging
- TAPE-AND-REEL standard per EIA-296 (add "TR" suffix to part number)
- WEIGHT: 1.5 gram (approximate)

PACKAGE DIMENSIONS



NOTE: Cathode indicated by band
All dimensions in inches
millimeters

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		

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ELECTRICAL CHARACTERISTICS @ 25°C

Industry Type Number (Note 2)	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}	Peak Pulse Current (see Fig. 2) I_{PP}	Maximum Temperature Coefficient of V_{BR} ($\alpha_{V(BR)}$)
		V	V	mA	V	µA	A	%/°C
M1.5KE6.8A	1N6267A	5.80	6.45 – 7.14	10	10.5	1000	143.0	.057
M1.5KE7.5A	1N6268A	6.40	7.13 – 7.88	10	11.3	500	132.0	.061
M1.5KE8.2A	1N6269A	7.02	7.79 – 8.61	10	12.1	200	124.0	.065
M1.5KE9.1A	1N6270A	7.78	8.65 – 9.55	1	13.4	50	112.0	.068
M1.5KE10A	1N6271A	8.55	9.50 – 10.50	1	14.5	10	103.0	.073
M1.5KE11A	1N6272A	9.40	10.50 – 11.60	1	15.6	5	96.0	.075
M1.5KE12A	1N6273A	10.220	11.40 – 12.60	1	16.7	5	90.0	.078
M1.5KE13A	1N6274A	11.10	12.40 – 13.70	1	18.2	5	82.0	.081
M1.5KE15A	1N6275A	12.80	14.30 – 15.80	1	21.2	1	71.0	.084
M1.5KE16A	1N6276A	13.60	15.20 – 16.80	1	22.5	1	67.0	.086
M1.5KE18A	1N6277A	15.30	17.10 – 18.90	1	25.2	1	59.5	.088
M1.5KE20A	1N6278A	17.10	19.00 – 21.00	1	27.7	1	54.0	.090
M1.5KE22A	1N6279A	18.80	20.90 – 23.10	1	30.6	1	49.0	.092
M1.5KE24A	1N6280A	20.50	22.80 – 25.20	1	33.2	1	45.0	.094
M1.5KE27A	1N6281A	23.10	25.70 – 28.40	1	37.5	1	40.0	.096
M1.5KE30A	1N6282A	25.60	28.50 – 31.50	1	41.4	1	36.0	.097
M1.5KE33A	1N6283A	28.20	31.40 – 34.70	1	45.7	1	33.0	.098
M1.5KE36A	1N6284A	30.80	34.20 – 37.80	1	49.9	1	30.0	.099
M1.5KE39A	1N6285A	33.30	37.10 – 41.00	1	53.9	1	28.0	.100
M1.5KE43A	1N6286A	36.80	40.90 – 45.20	1	59.3	1	25.3	.101
M1.5KE47A	1N6287A	40.20	44.70 – 49.40	1	64.8	1	23.2	.101
M1.5KE51A	1N6288A	43.60	48.50 – 53.60	1	70.1	1	21.4	.102
M1.5KE56A	1N6289A	47.80	53.20 – 58.80	1	77.0	1	19.5	.103
M1.5KE62A	1N6290A	53.00	58.90 – 65.10	1	85.0	1	17.7	.104
M1.5KE68A	1N6291A	58.10	64.60 – 71.40	1	92.0	1	16.3	.104
M1.5KE75A	1N6292A	64.10	71.30 – 78.80	1	103.0	1	14.6	.105
M1.5KE82A	1N6293A	70.10	77.90 – 86.10	1	113.0	1	13.3	.105
M1.5KE91A	1N6294A	77.80	86.50 – 95.50	1	125.0	1	12.0	.106
M1.5KE100A	1N6295A	85.50	95.00 – 105.00	1	137.0	1	11.0	.106
M1.5KE110A	1N6296A	94.00	105.00 – 116.00	1	152.0	1	9.9	.107
M1.5KE120A	1N6297A	102.00	114.00 – 126.00	1	165.0	1	9.1	.107
M1.5KE130A	1N6298A	111.00	124.00 – 137.00	1	179.0	1	8.4	.107
M1.5KE150A	1N6299A	128.00	143.00 – 158.00	1	207.0	1	7.2	.108
M1.5KE160A	1N6300A	136.00	152.00 – 168.00	1	219.0	1	6.8	.108
M1.5KE170A	1N6301A	145.00	162.00 – 179.00	1	234.0	1	6.4	.108
M1.5KE180A	1N6303A	154.00	171.00 – 189.00	1	246.0	1	6.1	.108
M1.5KE200A	-	171.00	190.00 – 210.00	1	274.0	1	5.5	.108
M1.5KE220A		185.00	209.00 – 231.00	1	328.0	1	4.6	.110
M1.5KE250A	-	214.00	237.00 – 263.00	1	344.0	1	5.0	.110
M1.5KE300A		256.00	285.00 – 315.00	1	414.0	1	5.0	.111
M1.5KE350A	-	300.00	332.00 – 368.00	1	482.0	1	4.0	.111
M1.5KE400A		324.00	380.00 – 420.00	1	548.0	1	4.0	.111

NOTE 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.

NOTE 2: For bidirectional construction, indicate a CA as suffix after part number (e.g. M1.5KE33CA). For Bidirectional types having VWM of 8 volts and under, the ID leakage current is doubled. Bidirectional capacitance is half that shown in Figure 4 at zero volts.

NOTE 3: For unidirectional, the forward voltage (V_F) is 3.5 volts maximum at 100 Amps peak for 8.3 ms half-sine wave.

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GRAPHS

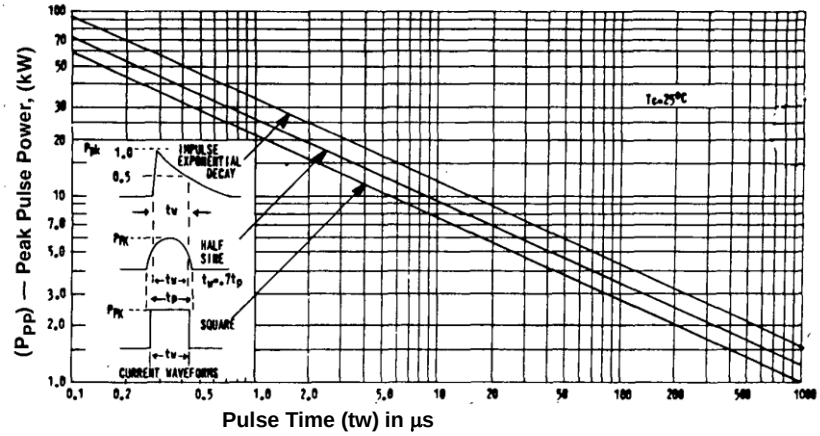

FIGURE 1 – Peak Pulse Power vs. Pulse Time (tw) in µs

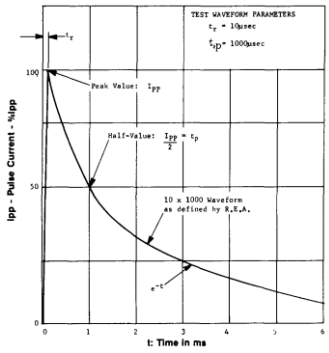

FIGURE 2 Pulse Wave Form

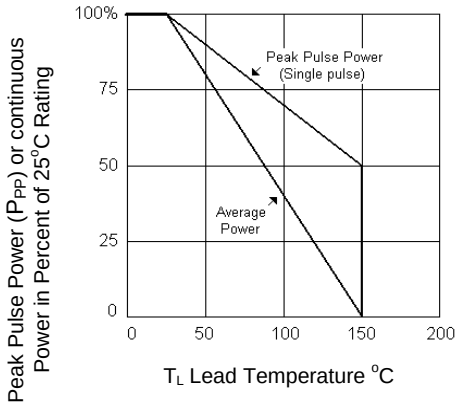

FIGURE 3 Derating Curve

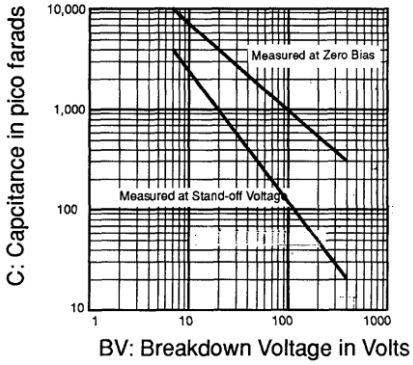

FIGURE 4 Typical Capacitance vs. Breakdown Voltage