

## 1500W, 6.8V - 440V Transient Voltage Suppressor

### FEATURES

- AEC-Q101 qualified available
- Excellent clamping capability
- Low dynamic impedance
- 1500W surge capability at 10/1000 $\mu$ s waveform
- Fast response time: Typically less than 1.0ps from 0 volt to  $V_{BR}$  for unidirectional and 5.0ns for bidirectional
- Typical  $I_R$  less than 1 $\mu$ A above 10V
- Meets ISO 7637-2 (Pulse 1/2a/2b/3a/3b)
- RoHS Compliant
- Halogen-free according to IEC 61249-2-21

| KEY PARAMETERS               |            |      |
|------------------------------|------------|------|
| PARAMETER                    | VALUE      | UNIT |
| $V_{WM}$                     | 5.5 - 376  | V    |
| $V_{BR}$ (uni - directional) | 6.12 - 462 | V    |
| $V_{BR}$ (bi - directional)  | 6.12 - 462 | V    |
| $P_{PK}$                     | 1500       | W    |
| $T_{JMAX}$                   | 175        |      |
| Package                      | DO-201     |      |

### APPLICATIONS

- Protect sensitive circuit from damage by high voltage transients
- Lighting, ESD transient voltage protection of IC, system
- Inductive switching load protection of IC, system
- Electrical Fast Transient Immunity protection of IC, system



### MECHANICAL DATA

- Case: DO-201
- Molding compound meets UL 94V-0 flammability rating
- Terminal: Pure tin plated leads, solderable per J-STD-002
- Meet JESD 201 class 2 whisker test
- Polarity: As marked
- Weight: 0.090g (approximately)



DO-201

| ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)                                 |           |              |                  |
|---|-----------|--------------|------------------|
| PARAMETER   | SYMBOL    | VALUE        | UNIT             |
| Peak power dissipation at $T_A = 25^\circ\text{C}$ , $T_p = 1\text{ms}^{(1)}$                               | $P_{PK}$  | 1500         | W                |
| Steady state power dissipation at $T_L = 75^\circ\text{C}$ lead lengths .375", 9.5mm <sup>(2)</sup>         | $P_D$     | 5            | W                |
| Peak forward surge current, 8.3ms single half sine-wave superimposed on rated load for Uni-directional only | $I_{FSM}$ | 200          | A                |
| Forward Voltage @ $I_F = 50\text{A}$ for Uni-directional only <sup>(3)</sup>                                | $V_F$     | 3.5 / 5.0    | V                |
| Junction temperature  | $T_J$     | - 55 to +175 | $^\circ\text{C}$ |
| Storage temperature   | $T_{STG}$ | - 55 to +175 | $^\circ\text{C}$ |

#### Notes:

1. Non-repetitive Current Pulse Per Fig.3 and Derated above  $T_A = 25^\circ\text{C}$  Per Fig.2
2. Mounted on Copper Pad Area of 0.6" x 0.6" (16mm x 16mm)
3.  $V_F = 3.5\text{V}$  for Devices of  $V_{BR} \leq 200\text{V}$  and  $V_F = 5.0\text{V}$  Max. for Devices  $V_{BR} > 200\text{V}$

#### Devices for Bipolar Applications

1. For bidirectional use C or CA suffix for types 1.5KE6.8 - Types 1.5KE440
2. Electrical characteristics apply in both directions

## ELECTRICAL SPECIFICATIONS (T<sub>A</sub> = 25°C unless otherwise noted)

| JEDEC type number | General part number | Nominal Voltage | Breakdown voltage V <sub>BR</sub> @I <sub>T</sub> (V) (Note 1) |       | Test current I <sub>T</sub> (mA) | Working stand-off voltage V <sub>WM</sub> (V) | Maximum blocking leakage current I <sub>D</sub> @V <sub>WM</sub> (μA) | Maximum peak impulse current I <sub>PP</sub> (A) (Note 2) | Maximum clamping voltage V <sub>C</sub> @I <sub>PP</sub> (V) | Maximum temperature coefficient of V <sub>BR</sub> (%/°C) |
|-------------------|---------------------|-----------------|--|-------|----------------------------------|---|---|---|--|---|
|                   |                     |                 | Min  | Max   |                                  |   |   |   |  |   |
| 1N6267            | 1.5KE6.8            | 6.8             | 6.12   | 7.48  | 10                               | 5.50  | 1000  | 145   | 10.8   | 0.057   |
| 1N6267A           | 1.5KE6.8A           | 6.8             | 6.45   | 7.14  | 10                               | 5.80  | 1000  | 150   | 10.5   | 0.057   |
| 1N6268            | 1.5KE7.5            | 7.5             | 6.75   | 8.25  | 10                               | 6.05  | 500   | 134   | 11.7   | 0.061   |
| 1N6268A           | 1.5KE7.5A           | 7.5             | 7.13   | 7.88  | 10                               | 6.40  | 500   | 139   | 11.3   | 0.061   |
| 1N6269            | 1.5KE8.2            | 8.2             | 7.38   | 9.02  | 10                               | 6.63  | 200   | 126   | 12.5   | 0.065   |
| 1N6269A           | 1.5KE8.2A           | 8.2             | 7.79   | 8.61  | 10                               | 7.02  | 200   | 130   | 12.1   | 0.065   |
| 1N6270            | 1.5KE9.1            | 9.1             | 8.19   | 10.00 | 1.0                              | 7.37  | 50  | 114   | 13.8   | 0.068   |
| 1N6270A           | 1.5KE9.1A           | 9.1             | 8.65   | 9.55  | 1.0                              | 7.78  | 50  | 117   | 13.4   | 0.068   |
| 1N6271            | 1.5KE10             | 10              | 9.00   | 11.00 | 1.0                              | 8.10  | 10  | 105   | 15.0   | 0.073   |
| 1N6271A           | 1.5KE10A            | 10              | 9.50   | 10.5  | 1.0                              | 8.55  | 10  | 108   | 14.5   | 0.073   |
| 1N6272            | 1.5KE11             | 11              | 9.90   | 12.1  | 1.0                              | 8.92  | 1   | 97  | 16.2   | 0.075   |
| 1N6272A           | 1.5KE11A            | 11              | 10.5   | 11.6  | 1.0                              | 9.40  | 1   | 100   | 15.6   | 0.075   |
| 1N6273            | 1.5KE12             | 12              | 10.8   | 13.2  | 1.0                              | 9.72  | 1   | 91  | 17.3   | 0.078   |
| 1N6273A           | 1.5KE12A            | 12              | 11.4   | 12.6  | 1.0                              | 10.20   | 1   | 94  | 16.7   | 0.078   |
| 1N6274            | 1.5KE13             | 13              | 11.7   | 14.3  | 1.0                              | 10.50   | 1   | 82  | 19.0   | 0.081   |
| 1N6274A           | 1.5KE13A            | 13              | 12.4   | 13.7  | 1.0                              | 11.10   | 1   | 86  | 18.2   | 0.081   |
| 1N6275            | 1.5KE15             | 15              | 13.5   | 16.5  | 1.0                              | 12.10   | 1   | 71  | 22.0   | 0.084   |
| 1N6275A           | 1.5KE15A            | 15              | 14.3   | 15.8  | 1.0                              | 12.80   | 1   | 74  | 21.2   | 0.084   |
| 1N6276            | 1.5KE16             | 16              | 14.4   | 17.6  | 1.0                              | 12.90   | 1   | 67  | 23.5   | 0.086   |
| 1N6276A           | 1.5KE16A            | 16              | 15.2   | 16.8  | 1.0                              | 13.60   | 1   | 70  | 22.5   | 0.086   |
| 1N6277            | 1.5KE18             | 18              | 16.2   | 19.8  | 1.0                              | 14.50   | 1   | 59  | 26.5   | 0.088   |
| 1N6277A           | 1.5KE18A            | 18              | 17.1   | 18.9  | 1.0                              | 15.30   | 1   | 60  | 25.5   | 0.088   |
| 1N6278            | 1.5KE20             | 20              | 18.0   | 22.0  | 1.0                              | 16.20   | 1   | 54  | 29.1   | 0.090   |
| 1N6278A           | 1.5KE20A            | 20              | 19.0   | 21.0  | 1.0                              | 17.10   | 1   | 56  | 27.7   | 0.090   |
| 1N6279            | 1.5KE22             | 22              | 19.8   | 24.2  | 1.0                              | 17.80   | 1   | 49  | 31.9   | 0.092   |
| 1N6279A           | 1.5KE22A            | 22              | 20.9   | 23.1  | 1.0                              | 18.80   | 1   | 51  | 30.6   | 0.092   |
| 1N6280            | 1.5KE24             | 24              | 21.6   | 26.4  | 1.0                              | 19.40   | 1   | 45  | 34.7   | 0.094   |
| 1N6280A           | 1.5KE24A            | 24              | 22.8   | 25.2  | 1.0                              | 20.50   | 1   | 47  | 33.2   | 0.094   |
| 1N6281            | 1.5KE27             | 27              | 24.3   | 29.7  | 1.0                              | 21.80   | 1   | 40  | 39.1   | 0.096   |
| 1N6281A           | 1.5KE27A            | 27              | 25.7   | 28.4  | 1.0                              | 23.10   | 1   | 42  | 37.5   | 0.096   |
| 1N6282            | 1.5KE30             | 30              | 27.0   | 33.0  | 1.0                              | 24.30   | 1   | 36  | 43.5   | 0.097   |
| 1N6282A           | 1.5KE30A            | 30              | 28.5   | 31.5  | 1.0                              | 25.60   | 1   | 38  | 41.4   | 0.097   |
| 1N6283            | 1.5KE33             | 33              | 29.7   | 36.3  | 1.0                              | 26.80   | 1   | 33  | 47.7   | 0.098   |
| 1N6283A           | 1.5KE33A            | 33              | 31.4   | 34.7  | 1.0                              | 28.20   | 1   | 34  | 45.7   | 0.098   |
| 1N6284            | 1.5KE36             | 36              | 32.4   | 39.6  | 1.0                              | 29.10   | 1   | 30  | 52.0   | 0.099   |
| 1N6284A           | 1.5KE36A            | 36              | 34.2   | 37.8  | 1.0                              | 30.80   | 1   | 31  | 49.9   | 0.099   |
| 1N6285            | 1.5KE39             | 39              | 35.1   | 42.9  | 1.0                              | 31.60   | 1   | 27  | 56.4   | 0.100   |
| 1N6285A           | 1.5KE39A            | 39              | 37.1   | 41.0  | 1.0                              | 33.30   | 1   | 29  | 53.9   | 0.100   |
| 1N6286            | 1.5KE43             | 43              | 38.7   | 47.3  | 1.0                              | 34.80   | 1   | 25  | 61.9   | 0.101   |
| 1N6286A           | 1.5KE43A            | 43              | 40.9   | 45.2  | 1.0                              | 36.80   | 1   | 26  | 59.3   | 0.101   |
| 1N6287            | 1.5KE47             | 47              | 42.3   | 51.7  | 1.0                              | 38.10   | 1   | 23  | 67.8   | 0.101   |
| 1N6287A           | 1.5KE47A            | 47              | 44.7   | 49.4  | 1.0                              | 40.20   | 1   | 24  | 64.8   | 0.101   |

## ELECTRICAL SPECIFICATIONS (T<sub>A</sub> = 25°C unless otherwise noted)

| JEDEC type number | General part number | Nominal Voltage | Breakdown voltage V <sub>BR@I<sub>T</sub></sub> (V) (Note 1) |       | Test current I <sub>T</sub> (mA) | Working stand-off voltage V <sub>WM</sub> (V) | Maximum blocking leakage current I <sub>D@V<sub>WM</sub></sub> (μA) | Maximum peak impulse current I <sub>PP</sub> (A) (Note 2) | Maximum clamping voltage V <sub>C@I<sub>PP</sub></sub> (V) | Maximum temperature coefficient of V <sub>BR</sub> (%/°C) |
|-------------------|---------------------|-----------------|--|-------|----------------------------------|---|---|---|--|---|
|                   |                     |                 | Min  | Max   |                                  |   |   |   |  |   |
| 1N6288            | 1.5KE51             | 51              | 45.9   | 56.1  | 1.0                              | 41.30   | 1   | 21  | 73.5   | 0.102   |
| 1N6288A           | 1.5KE51A            | 51              | 48.5   | 53.6  | 1.0                              | 43.60   | 1   | 22  | 70.1   | 0.102   |
| 1N6289            | 1.5KE56             | 56              | 50.4   | 61.6  | 1.0                              | 45.40   | 1   | 19  | 80.5   | 0.103   |
| 1N6289A           | 1.5KE56A            | 56              | 53.2   | 58.8  | 1.0                              | 47.80   | 1   | 20  | 77.0   | 0.103   |
| 1N6290            | 1.5KE62             | 62              | 55.8   | 68.2  | 1.0                              | 50.2  | 1   | 17  | 89.0   | 0.104   |
| 1N6290A           | 1.5KE62A            | 62              | 58.9   | 65.1  | 1.0                              | 53.0  | 1   | 18  | 85.0   | 0.104   |
| 1N6291            | 1.5KE68             | 68              | 61.2   | 74.8  | 1.0                              | 55.1  | 1   | 16  | 98.0   | 0.104   |
| 1N6291A           | 1.5KE68A            | 68              | 64.6   | 71.4  | 1.0                              | 58.1  | 1   | 17  | 92.0   | 0.104   |
| 1N6292            | 1.5KE75             | 75              | 67.5   | 82.5  | 1.0                              | 60.7  | 1   | 14  | 108  | 0.105   |
| 1N6292A           | 1.5KE75A            | 75              | 71.3   | 78.8  | 1.0                              | 64.1  | 1   | 15  | 103  | 0.105   |
| 1N6293            | 1.5KE82             | 82              | 73.8   | 90.2  | 1.0                              | 66.4  | 1   | 13  | 118  | 0.105   |
| 1N6293A           | 1.5KE82A            | 82              | 77.9   | 86.1  | 1.0                              | 70.1  | 1   | 13.9  | 113  | 0.105   |
| 1N6294            | 1.5KE91             | 91              | 81.9   | 100   | 1.0                              | 73.7  | 1   | 12  | 131  | 0.106   |
| 1N6294A           | 1.5KE91A            | 91              | 86.5   | 95.5  | 1.0                              | 77.8  | 1   | 12.6  | 125  | 0.106   |
| 1N6295            | 1.5KE100            | 100             | 90   | 110   | 1.0                              | 81.0  | 1   | 10.9  | 144  | 0.106   |
| 1N6295A           | 1.5KE100A           | 100             | 95   | 105   | 1.0                              | 85.5  | 1   | 11.4  | 137  | 0.106   |
| 1N6296            | 1.5KE110            | 110             | 99   | 121   | 1.0                              | 89.2  | 1   | 9.9   | 158  | 0.107   |
| 1N6296A           | 1.5KE110A           | 110             | 105  | 116   | 1.0                              | 94.0  | 1   | 10.3  | 152  | 0.107   |
| 1N6297            | 1.5KE120            | 120             | 108  | 132   | 1.0                              | 97.2  | 1   | 9.1   | 173  | 0.107   |
| 1N6297A           | 1.5KE120A           | 120             | 114  | 126   | 1.0                              | 102   | 1   | 9.5   | 165  | 0.107   |
| 1N6298            | 1.5KE130            | 130             | 117  | 143   | 1.0                              | 105   | 1   | 8.4   | 187  | 0.107   |
| 1N6298A           | 1.5KE130A           | 130             | 124  | 137   | 1.0                              | 111   | 1   | 8.7   | 179  | 0.107   |
| 1N6299            | 1.5KE150            | 150             | 135  | 165   | 1.0                              | 121   | 1   | 7.3   | 215  | 0.108   |
| 1N6299A           | 1.5KE150A           | 150             | 143  | 158   | 1.0                              | 128   | 1   | 7.6   | 207  | 0.108   |
| 1N6300            | 1.5KE160            | 160             | 144  | 176   | 1.0                              | 130   | 1   | 6.8   | 230  | 0.108   |
| 1N6300A           | 1.5KE160A           | 160             | 152  | 168   | 1.0                              | 136   | 1   | 7.1   | 219  | 0.108   |
| 1N6301            | 1.5KE170            | 170             | 153  | 187   | 1.0                              | 138   | 1   | 6.4   | 244  | 0.108   |
| 1N6301A           | 1.5KE170A           | 170             | 162  | 179   | 1.0                              | 145   | 1   | 6.7   | 234  | 0.108   |
| 1N6302            | 1.5KE180            | 180             | 162  | 198   | 1.0                              | 146   | 1   | 6.1   | 258  | 0.108   |
| 1N6302A           | 1.5KE180A           | 180             | 171  | 189   | 1.0                              | 154   | 1   | 6.4   | 246  | 0.108   |
| 1N6303            | 1.5KE200            | 200             | 180  | 220   | 1.0                              | 162   | 1   | 5.4   | 287  | 0.108   |
| 1N6303A           | 1.5KE200A           | 200             | 190  | 210   | 1.0                              | 171   | 1   | 5.7   | 274  | 0.108   |
|                   | 1.5KE220            | 220             | 198  | 242   | 1.0                              | 175   | 1   | 4.5   | 344  | 0.110   |
|                   | 1.5KE220A           | 220             | 209  | 231   | 1.0                              | 185   | 1   | 4.8   | 328  | 0.110   |
|                   | 1.5KE250            | 250             | 225  | 275   | 1.0                              | 202   | 1   | 4.3   | 360  | 0.110   |
|                   | 1.5KE250A           | 250             | 237  | 263   | 1.0                              | 214   | 1   | 4.5   | 344  | 0.110   |
|                   | 1.5KE300            | 300             | 270  | 330   | 1.0                              | 243   | 1   | 3.6   | 430  | 0.110   |
|                   | 1.5KE300A           | 300             | 285  | 315.0 | 1.0                              | 256   | 1   | 3.8   | 414  | 0.110   |
|                   | 1.5KE350            | 350             | 315  | 385   | 1.0                              | 284   | 1   | 3.1   | 504  | 0.110   |
|                   | 1.5KE350A           | 350             | 333  | 368   | 1.0                              | 300   | 1   | 3.2   | 482  | 0.110   |
|                   | 1.5KE400            | 400             | 360  | 440   | 1.0                              | 324   | 1   | 2.7   | 574  | 0.110   |
|                   | 1.5KE400A           | 400             | 380  | 420   | 1.0                              | 342   | 1   | 2.8   | 548  | 0.110   |
|                   | 1.5KE440            | 440             | 396  | 484   | 1.0                              | 356   | 1   | 2.4   | 631  | 0.110   |

| <b>ELECTRICAL SPECIFICATIONS</b> ( $T_A = 25^\circ\text{C}$ unless otherwise noted) |                     |                 |   |     |                         |  |   |  |   |   |
|---|---------------------|-----------------|---|-----|-------------------------|--|---|--|---|---|
| JEDEC type number   | General part number | Nominal Voltage | Breakdown voltage $V_{BR}@I_T$ (V) (Note 1) |     | Test current $I_T$ (mA) | Working stand-off voltage $V_{WM}$ (V) | Maximum blocking leakage current $I_D@V_{WM}$ ( $\mu\text{A}$ ) | Maximum peak impulse current $I_{PP}$ (A) (Note 2) | Maximum clamping voltage $V_C@I_{PP}$ (V) | Maximum temperature coefficient of $V_{BR}$ ( $\%/^\circ\text{C}$ ) |
|   |                     |                 | Min   | Max |                         |  |   |  |   |   |
|   | 1.5KE440A           | 440             | 418   | 462 | 1.0                     | 376                                    | 1   | 2.5  | 602                                       | 0.110   |

**Notes:**

1.  $V_{BR}$  measure after  $I_T$  applied for 30ms,  $I_T =$  square wave pulse or equivalent.
2. Surge current waveform per Fig.3 and derate per Fig.2.
3. For bipolar types having  $V_{WM}$  of 10 volts and under, the  $I_D$  limit is doubled.
4. All terms and symbols are consistent with ANSI/IEEE C62.35.

| <b>ORDERING INFORMATION</b>            |                |                     |
|--|----------------|---------------------|
| <b>ORDERING CODE</b> <sup>(1)(2)</sup> | <b>PACKAGE</b> | <b>PACKING</b>      |
| 1.5KE $x$                              | DO-201         | 1,250 / Tape & Reel |
| 1.5KE $x$ A0G                          | DO-201         | 500 / Ammo box      |
| 1.5KE $x$ H                            | DO-201         | 1,250 / Tape & Reel |
| 1.5KE $x$ HA0G                         | DO-201         | 500 / Ammo box      |

**Notes:**

1. "x" defines voltage from 6.8V(1.5KE6.8) to 440V(1.5KE440A)
2. "H" means AEC-Q101 qualified

**CHARACTERISTICS CURVES**

( $T_A = 25^\circ\text{C}$  unless otherwise noted)

**Fig.1 Peak Pulse Power Rating Curve**



**Fig.2 Pulse Derating Curve**



**Fig.3 Clamping Power Pulse Waveform**



**Fig.4 Maximum Non-Repetitive Forward Surge Current**



**CHARACTERISTICS CURVES**

( $T_A = 25^\circ\text{C}$  unless otherwise noted)

**Fig.5 Typical Junction Capacitance**



**PACKAGE OUTLINE DIMENSIONS**



| DIM. | Unit (mm) |      | Unit (inch) |       |
|------|-----------|------|-------------|-------|
|      | Min.      | Max. | Min.        | Max.  |
| A    | 25.40     | -    | 1.000       | -     |
| B    | 8.50      | 9.50 | 0.335       | 0.374 |
| C    | 0.96      | 1.06 | 0.038       | 0.042 |
| D    | 5.00      | 5.60 | 0.197       | 0.220 |

**MARKING DIAGRAM**

Cathode band for uni-directional products only



- P/N = Marking Code
- G = Green Compound
- YWW = Date Code
- F = Factory Code