

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

### FEATURES

- 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
- UL recognized file # E-326243
- Compliant to RoHS Directive 2011/65/EU and in accordance to WEEE 2002/96/EC
- Halogen-free according to IEC 61249-2-21



**DO-201**

### MECHANICAL DATA

**Case:** DO-201

Molding compound: UL flammability classification rating 94V-0

Part No. with suffix "H" means AEC-Q101 qualified

Packing code with suffix "G" means green compound (halogen-free)

**Terminal:** Pure tin plated leads, solderable per JESD22-B102

Meet JESD 201 class 2 whisker test

**Weight:** 0.94g (approximately)

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

Note 1: Non-repetitive current pulse per fig. 3 and derated above  $T_A=25^\circ\text{C}$  per fig. 2

Note 2: Mounted on copper pad area of 0.6" x 0.6" (16mm x 16mm)

Note 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

| ORDERING INFORMATION |                 |              |                     |         |                        |
|----------------------|-----------------|--------------|---------------------|---------|------------------------|
| PART NO.             | PART NO. SUFFIX | PACKING CODE | PACKING CODE SUFFIX | PACKAGE | PACKING                |
| 1.5KExxx<br>(Note 1) | H               | A0           | G                   | DO-201  | 500 / Ammo box         |
|                      |                 | R0           |                     | DO-201  | 1,250 / 13" Paper reel |
|                      |                 | B0           |                     | DO-201  | 500 / Bulk packing     |

Note 1: "xxx" defines voltage from 6.8V (1.5KE6.8) to 440V (1.5KE440)

| EXAMPLE          |           |                 |              |                     |                                      |
|------------------|-----------|-----------------|--------------|---------------------|--------------------------------------|
| EXAMPLE PART NO. | PART NO.  | PART NO. SUFFIX | PACKING CODE | PACKING CODE SUFFIX | DESCRIPTION                          |
| 1.5KE100AHR0G    | 1.5KE100A | H               | R0           | G                   | AEC-Q101 qualified<br>Green compound |

RATINGS AND 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 UNIDIRECTIONAL ONLY



FIG. 5 TYPICAL JUNCTION CAPACITANCE



| JEDEC TYPE NUMBER | GENERAL PART NUMBER | Nominal Voltage<br>V | Breakdown Voltage<br>$V_{BR}$ (V)<br>(Note 1) |       | Test Current<br>$I_T$<br>(mA) | Stand-Off Voltage<br>$V_{WM}$<br>(V) | Maximum Reverse Leakage<br>@ $V_{WM}$<br>$I_R$ ( $\mu$ A) | Maximum Peak Pulse Current $I_{PPM}$<br>(A) (Note 2) | Maximum Clamping Voltage<br>@ $I_{PPM}$<br>$V_C$ (V) | Maximum Temperature Coefficient of $V_{BR}$ (%/°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  |
| 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  |

| JEDEC TYPE NUMBER | GENERAL PART NUMBER | Nominal Voltage<br>V | Breakdown Voltage<br>$V_{BR}$ (V)<br>(Note 1) |      | Test Current<br>$I_T$<br>(mA) | Stand-Off Voltage<br>$V_{WM}$<br>(V) | Maximum Reverse Leakage<br>@ $V_{WM}$<br>$I_R$ ( $\mu$ A) | Maximum Peak Pulse Current $I_{PPM}$<br>(A) (Note 2) | Maximum Clamping Voltage<br>@ $I_{PPM}$<br>$V_C$ (V) | Maximum Temperature Coefficient of $V_{BR}$ (%/°C) |
|-------------------|---------------------|----------------------|---|------|-------------------------------|--------------------------------------|---|--|--|--|
|                   |                     |                      | Min   | Max  |                               |                                      |   |  |  |  |
| 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  | 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  |
|                   | 1.5KE440A           | 440                  | 418   | 462  | 1.0                           | 376                                  | 1   | 2.5  | 602  | 0.110  |

Notes:

1.  $V_{BR}$  measure after  $I_T$  applied for 300  $\mu$ s,  $I_T$ =square wave pulse or equivalent.
2. Surge current waveform per figure. 3 and derate per figure. 2.
3. For bipolar types having  $V_{WM}$  of 10 volts and under, the  $I_R$  limit is doubled.
4. All terms and symbols are consistent with ANSI/IEEE C62.35.

PACKAGE OUTLINE DIMENSIONS

**DO-201**



| DIM. | Unit (mm) |      | Unit (inch) |       |
|------|-----------|------|-------------|-------|
|      | Min       | Max  | Min         | Max   |
| A    | 5.00      | 5.60 | 0.197       | 0.220 |
| B    | 0.96      | 1.06 | 0.038       | 0.042 |
| C    | 25.40     | -    | 1.000       | -     |
| D    | 8.50      | 9.50 | 0.335       | 0.375 |
| E    | 25.40     | -    | 1.000       | -     |

MARKING DIAGRAM



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

Note: Cathode band for uni-directional products only

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- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

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## JONHON

«JONHON» (основан в 1970 г.)

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«FORSTAR» (основан в 1998 г.)

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