

## Transient Voltage Suppressors (TVS) Data Sheet

### Features

- Glass passivated junction
- Low zener impedance
- Excellent clamping capability
- 1500W peak pulse power capability at 10/1000 $\mu$ s waveform, repetition rate (duty cycle): 0.01%
- Fast response time
- Typical  $I_R$  less than 1 $\mu$ A above 12V.
- High Temperature soldering guaranteed: 265 $^{\circ}$ C/10 seconds/.375", (9.5mm) lead length, 5lbs (2.3kg) tension
- Plastic package has underwriters laboratory flammability 94V-0
- Meets MSL level 1, per J-STD-020.
- Safety certification: UL: E244458



### Mechanical Data

- Case: JEDEC DO-201 Moulded plastic
- Terminal: Axial leads, solderable per MIL-STD-750, Method 2026
- Polarity: Color band denotes cathode except bi-directional models
- Mounting Position: Any
- Weight: 0.97g

### Applications

- I/O interface
- AC/DC power supply
- Low frequency signal transmission line (RS232, RS485, etc.)

### Maximum Ratings and Characteristics

Ratings at 25 $^{\circ}$ C ambient temperature unless otherwise specified.

| Rating  | Symbol          | Value        | Units          |
|---|-----------------|--------------|----------------|
| Peak pulse power dissipation at 10/1000 $\mu$ s waveform (Note1, Fig.1)   | $P_{PPM}$       | Minimum 1500 | Watts          |
| Peak pulse current of at 10/1000 $\mu$ s waveform (Note 1, Fig.3)   | $I_{PPM}$       | See Table    | Amps           |
| Steady state power dissipation at $T_L=75^{\circ}$ C (Fig.5)  | $P_{M(AV)}$     | 6.5          | Watts          |
| Peak forward surge current, 8.3ms single half sine-wave superimposed on rated load, (JEDEC Method) (Note2, Fig.6) | $I_{FSM}$       | 200          | Amps           |
| Operating junction and Storage Temperature Range.   | $T_J, T_{STG}$  | -55 to +175  | $^{\circ}$ C   |
| Typical thermal resistance junction to lead   | $R_{\theta JL}$ | 15           | $^{\circ}$ C/W |
| Typical thermal resistance junction to ambient  | $R_{\theta JA}$ | 75           | $^{\circ}$ C/W |

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

2. 8.3ms single half sine-wave, or equivalent square wave, duty cycle=4 pulses per minutes maximum.

**Dimensions (DO-201)**

|   | Symbol | Millimeters |       | Inches |       |
|---|--------|-------------|-------|--------|-------|
|   |        | Min.        | Max.  | Min.   | Max.  |
|   | L      | 25.40       | -     | 1.000  | -     |
|   | T      | 7.20        | 9.50  | 0.285  | 0.375 |
|   | d      | 4.80        | 5.30  | 0.190  | 0.210 |
| s | 0.96   | 1.07        | 0.038 | 0.042  |       |

**Electrical Characteristics (T<sub>A</sub>=25°C)**

| Part Number    |               | Reverse Stand-Off Voltage | Breakdown Voltage @I <sub>T</sub> | Test Current        | Maximum Clamping Voltage @I <sub>PP</sub> | Peak Pulse Current  | Reverse Leakage @V <sub>RWM</sub> |
|----------------|---------------|---------------------------|-----------------------------------|---------------------|---|---------------------|-----------------------------------|
| Unidirectional | Bidirectional | V <sub>RWM</sub> (V)      | V <sub>BR</sub> (V)               | I <sub>T</sub> (mA) | V <sub>C</sub> (V)                        | I <sub>PP</sub> (A) | I <sub>R</sub> (μA)               |
| 1.5KE6.8A      | 1.5KE6.8CA    | 5.80                      | 6.45~7.14                         | 10                  | 10.5                                      | 144.8               | 1000                              |
| 1.5KE7.5A      | 1.5KE7.5CA    | 6.40                      | 7.13~7.88                         | 10                  | 11.3                                      | 134.5               | 500                               |
| 1.5KE8.2A      | 1.5KE8.2CA    | 7.02                      | 7.79~8.61                         | 10                  | 12.1                                      | 125.6               | 200                               |
| 1.5KE9.1A      | 1.5KE9.1CA    | 7.78                      | 8.65~9.55                         | 1                   | 13.4                                      | 113.4               | 50                                |
| 1.5KE10A       | 1.5KE10CA     | 8.55                      | 9.50~10.50                        | 1                   | 14.5                                      | 104.8               | 10                                |
| 1.5KE11A       | 1.5KE11CA     | 9.40                      | 10.50~11.60                       | 1                   | 15.6                                      | 97.4                | 5                                 |
| 1.5KE12A       | 1.5KE12CA     | 10.20                     | 11.40~12.60                       | 1                   | 16.7                                      | 91.0                | 5                                 |
| 1.5KE13A       | 1.5KE13CA     | 11.10                     | 12.40~13.70                       | 1                   | 18.2                                      | 83.5                | 1                                 |
| 1.5KE15A       | 1.5KE15CA     | 12.80                     | 14.30~15.80                       | 1                   | 21.2                                      | 71.7                | 1                                 |
| 1.5KE16A       | 1.5KE16CA     | 13.60                     | 15.20~16.80                       | 1                   | 22.5                                      | 67.6                | 1                                 |
| 1.5KE18A       | 1.5KE18CA     | 15.30                     | 17.10~18.90                       | 1                   | 25.2                                      | 60.3                | 1                                 |
| 1.5KE20A       | 1.5KE20CA     | 17.10                     | 19.00~21.00                       | 1                   | 27.7                                      | 54.9                | 1                                 |
| 1.5KE22A       | 1.5KE22CA     | 18.80                     | 20.90~23.10                       | 1                   | 30.6                                      | 49.7                | 1                                 |
| 1.5KE24A       | 1.5KE24CA     | 20.50                     | 22.80~25.20                       | 1                   | 33.2                                      | 45.8                | 1                                 |
| 1.5KE27A       | 1.5KE27CA     | 23.10                     | 25.70~28.40                       | 1                   | 37.5                                      | 40.5                | 1                                 |
| 1.5KE30A       | 1.5KE30CA     | 25.60                     | 28.50~31.50                       | 1                   | 41.4                                      | 36.7                | 1                                 |
| 1.5KE33A       | 1.5KE33CA     | 28.20                     | 31.40~34.70                       | 1                   | 45.7                                      | 33.3                | 1                                 |
| 1.5KE36A       | 1.5KE36CA     | 30.80                     | 34.20~37.80                       | 1                   | 49.9                                      | 30.5                | 1                                 |
| 1.5KE39A       | 1.5KE39CA     | 33.30                     | 37.10~41.00                       | 1                   | 53.9                                      | 28.2                | 1                                 |

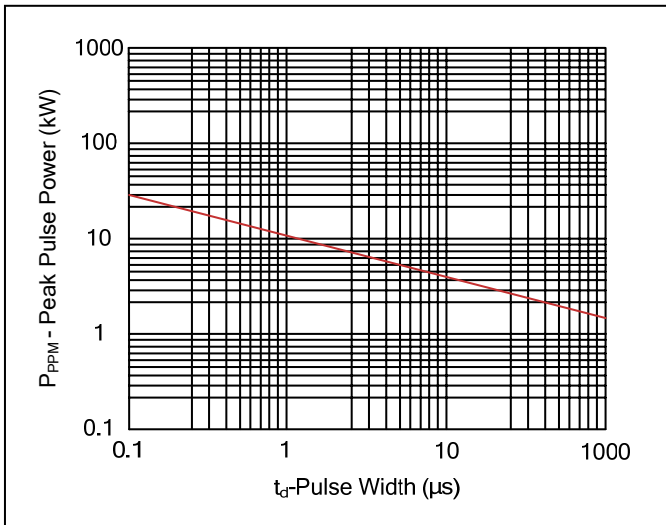
**Electrical Characteristics ( $T_A=25^{\circ}\text{C}$ )**

| Part Number    |               | Reverse Stand-Off Voltage | Breakdown Voltage @ $I_T$ | Test Current | Maximum Clamping Voltage @ $I_{PP}$ | Peak Pulse Current | Reverse Leakage @ $V_{RWM}$ |
|----------------|---------------|---------------------------|---------------------------|--------------|-------------------------------------|--------------------|-----------------------------|
| Unidirectional | Bidirectional | $V_{RWM}(V)$              | $V_{BR}(V)$               | $I_T(mA)$    | $V_C(V)$                            | $I_{PP}(A)$        | $I_R(\mu A)$                |
| 1.5KE43A       | 1.5KE43CA     | 36.80                     | 40.90~45.20               | 1            | 59.3                                | 25.6               | 1                           |
| 1.5KE47A       | 1.5KE47CA     | 40.20                     | 44.70~49.40               | 1            | 64.8                                | 23.5               | 1                           |
| 1.5KE51A       | 1.5KE51CA     | 43.60                     | 48.50~53.60               | 1            | 70.1                                | 21.7               | 1                           |
| 1.5KE56A       | 1.5KE56CA     | 47.80                     | 53.20~58.80               | 1            | 77.0                                | 19.7               | 1                           |
| 1.5KE62A       | 1.5KE62CA     | 53.00                     | 58.90~65.10               | 1            | 85.0                                | 17.9               | 1                           |
| 1.5KE68A       | 1.5KE68CA     | 58.10                     | 64.60~71.40               | 1            | 92.0                                | 16.5               | 1                           |
| 1.5KE75A       | 1.5KE75CA     | 64.10                     | 71.30~78.80               | 1            | 103.0                               | 14.8               | 1                           |
| 1.5KE82A       | 1.5KE82CA     | 70.10                     | 77.90~86.10               | 1            | 113.0                               | 13.5               | 1                           |
| 1.5KE91A       | 1.5KE91CA     | 77.80                     | 86.50~95.50               | 1            | 125.0                               | 12.2               | 1                           |
| 1.5KE100A      | 1.5KE100CA    | 85.50                     | 95.00~105.00              | 1            | 137.0                               | 11.1               | 1                           |
| 1.5KE110A      | 1.5KE110CA    | 94.00                     | 105.00~116.00             | 1            | 152.0                               | 10.0               | 1                           |
| 1.5KE120A      | 1.5KE120CA    | 102.00                    | 114.00~126.00             | 1            | 165.0                               | 9.2                | 1                           |
| 1.5KE130A      | 1.5KE130CA    | 111.00                    | 124.00~137.00             | 1            | 179.0                               | 8.5                | 1                           |
| 1.5KE150A      | 1.5KE150CA    | 128.00                    | 143.00~158.00             | 1            | 207.0                               | 7.3                | 1                           |
| 1.5KE160A      | 1.5KE160CA    | 136.00                    | 152.00~168.00             | 1            | 219.0                               | 6.9                | 1                           |
| 1.5KE170A      | 1.5KE170CA    | 145.00                    | 162.00~179.00             | 1            | 234.0                               | 6.5                | 1                           |
| 1.5KE180A      | 1.5KE180CA    | 154.00                    | 171.00~189.00             | 1            | 246.0                               | 6.2                | 1                           |
| 1.5KE200A      | 1.5KE200CA    | 171.00                    | 190.00~210.00             | 1            | 274.0                               | 5.5                | 1                           |
| 1.5KE220A      | 1.5KE220CA    | 185.00                    | 209.00~231.00             | 1            | 328.0                               | 4.6                | 1                           |
| 1.5KE250A      | 1.5KE250CA    | 214.00                    | 237.00~263.00             | 1            | 344.0                               | 4.4                | 1                           |
| 1.5KE300A      | 1.5KE300CA    | 256.00                    | 285.00~315.00             | 1            | 414.0                               | 3.7                | 1                           |
| 1.5KE350A      | 1.5KE350CA    | 300.00                    | 332.00~368.00             | 1            | 482.0                               | 3.2                | 1                           |
| 1.5KE400A      | 1.5KE400CA    | 342.00                    | 380.00~420.00             | 1            | 548.0                               | 2.8                | 1                           |
| 1.5KE440A      | 1.5KE440CA    | 376.00                    | 418.00~462.00             | 1            | 602.0                               | 2.5                | 1                           |
| 1.5KE480A      | 1.5KE480CA    | 408.00                    | 456.00~504.00             | 1            | 658.0                               | 2.3                | 1                           |
| 1.5KE510A      | 1.5KE510CA    | 434.00                    | 485.00~535.00             | 1            | 698.0                               | 2.1                | 1                           |
| 1.5KE530A      | 1.5KE530CA    | 450.00                    | 503.50~556.50             | 1            | 725.0                               | 2.1                | 1                           |
| 1.5KE540A      | 1.5KE540CA    | 459.00                    | 513.00~567.00             | 1            | 740.0                               | 2.0                | 1                           |
| 1.5KE550A      | 1.5KE550CA    | 467.00                    | 522.50~577.50             | 1            | 760.0                               | 2.0                | 1                           |

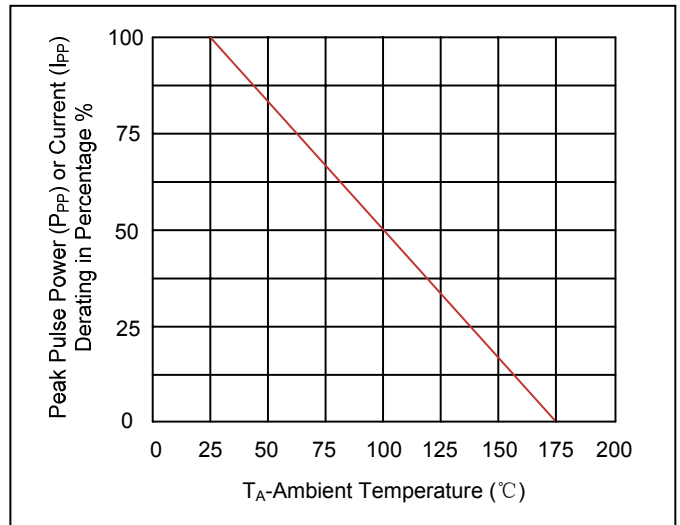
Notes: For bidirectional type having  $V_{RWM}$  of 10V and less, the  $I_R$  limit is double.

**Ratings and Characteristic Curves ( $T_A=25^\circ\text{C}$  unless otherwise noted)**

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



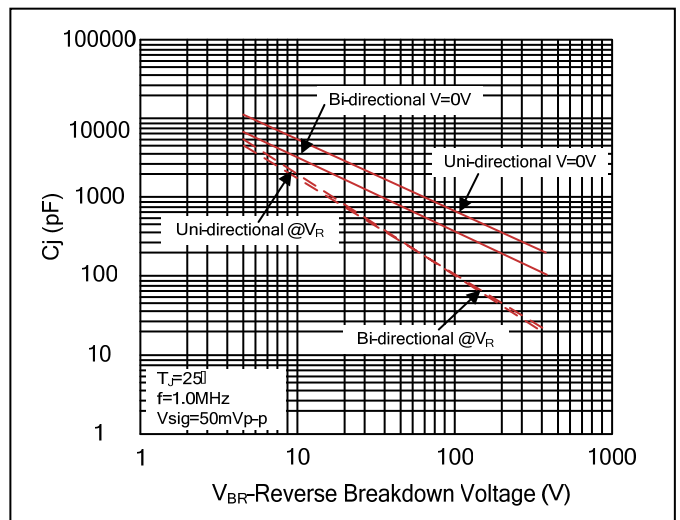
**Figure 2. Pulse Derating Curve**



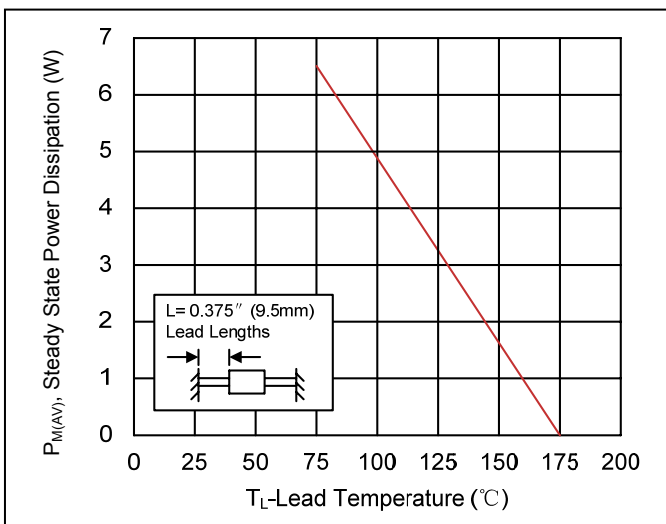
**Figure 3. Pulse Waveform**



**Figure 4. Typical Junction Capacitance**



**Figure 5. Steady State Power Dissipation Derating Curve**



**Figure 6. Maximum Non-Repetitive Forward Surge Current Uni-Directional Only**



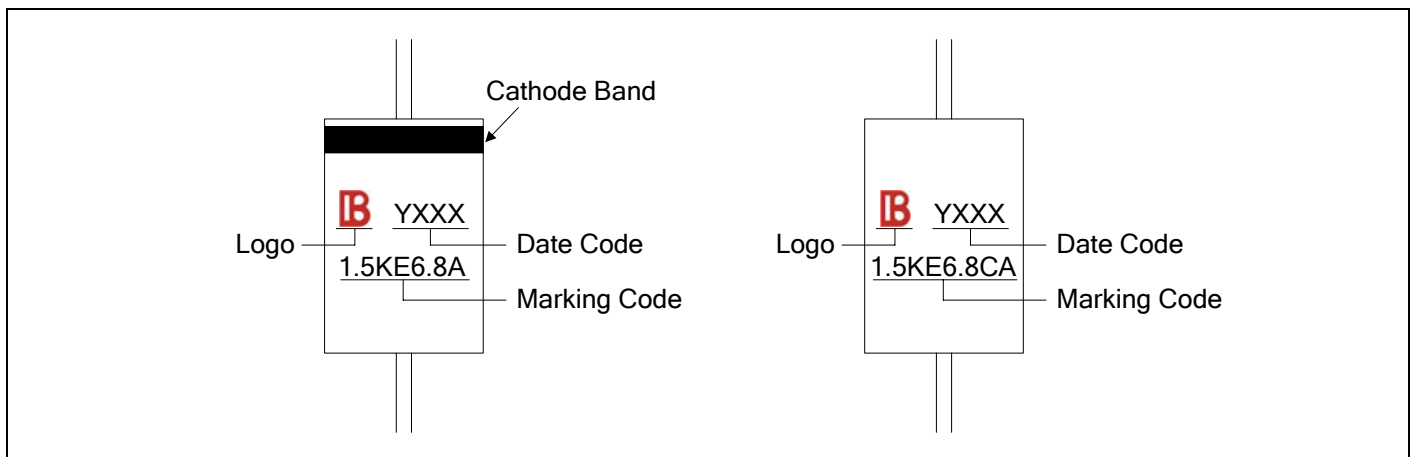
**Recommended Soldering Conditions**

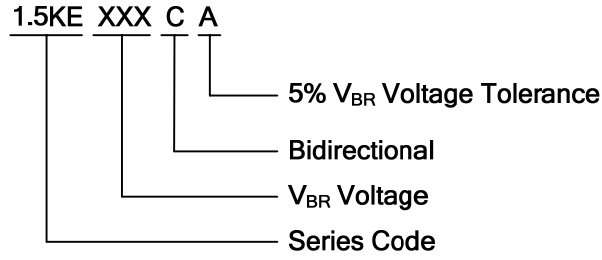
Wave Soldering



| Item             | Conditions |
|------------------|------------|
| Peak Temperature | 265°C      |
| Dipping Time     | 10 seconds |
| Soldering        | 1 time     |

**Marking Code**





**Packaging**

| Tape | Symbol            | Dimension (mm) |
|------|-------------------|----------------|
|      | A                 | 10.0±0.5       |
|      | B                 | 53.0±1.0       |
|      | Z                 | 1.2Max.        |
|      | T                 | 6.0±0.4        |
|      | E                 | 0.8Max.        |
|      | L1-L2             | 1.0Max.        |
|      | L                 | 250.0±5.0      |
|      | W                 | 75.0±5.0       |
|      | H                 | 114.0±5.0      |
|      | Quantity: 1000PCS |                |
|      | D                 | 330.0±3.0      |
|      | D0                | 16.4±2.0       |
|      | D1                | 86.0±2.0       |
|      | W1                | 76.0±3.0       |
|      | Quantity: 1200PCS |                |

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