

# DATA SHEET

## TRANSIENT VOLTAGE SUPPRESSORS

### AC/DC POWER SUPPLY

1.5KE series

RoHS compliant & Halogen free



Product specification— April 29, 2019 V.0



## 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  |      |

**Part Number Code**



**Ordering Code for different package**

Box package: Add suffix “/B” at the end of the part number, such as 1.5KE100CA/B

Reel package: Add suffix “/TR13” at the end of the part number, such as 1.5KE75A/TR13

**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 | $V_{RWM}(V)$              | $V_{BR}(V)$               | $I_T(mA)$    | $V_C(V)$                            | $I_{PP}(A)$        | $I_R(\mu A)$                |
| 1.5KE6.8A      | 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                           |

**Transient Voltage Suppressors** 1.5KE**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)               |
| 1.5KE20A       | 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<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)               |
| 1.5KE43A       | 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                                 |

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| 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 | $V_{RWM}(V)$              | $V_{BR}(V)$               | $I_T(mA)$    | $V_C(V)$                            | $I_{PP}(A)$        | $I_R(\mu A)$                |
| 1.5KE180A      | 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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