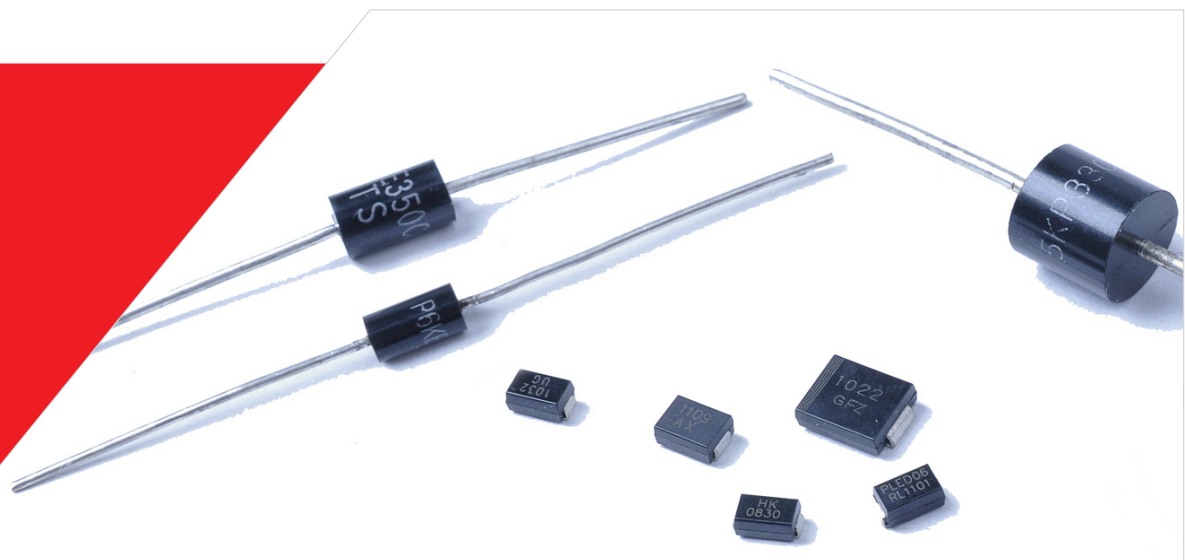




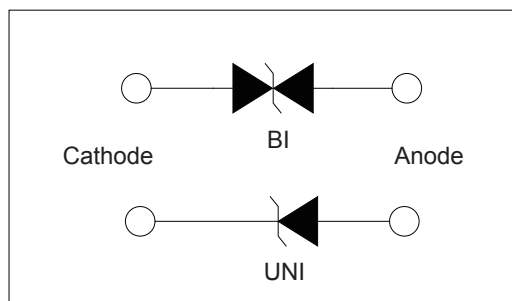
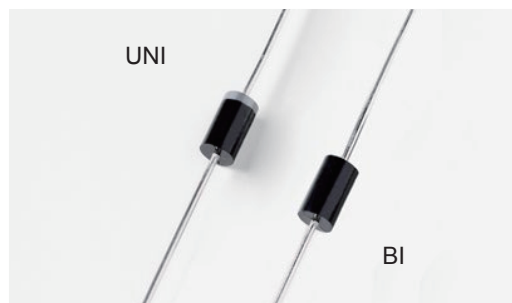
# Transient Voltage Suppressors

**1.5KE Series**

## Transient Voltage Suppressors - 1.5KE Series

### Features

1. Halogen-free
2. Rohs compliant
3. Typical maximum temperature coefficient
4.  $\Delta V_{BR} = 0.1\% \times V_{BR} @ 25^{\circ}\text{C} \times \Delta T$
5. Glass passivated Chip junction in DO-201 package
6. 1500W peak pulse capadility at 10x1000 $\mu\text{s}$  waveform, repetition rate (duty cycles):0.01%
7. Fast response time: typically less than 1.0ps from 0 Volts to BV min
8. Excellent clamping capability
9. Low incremental surge resistance
10. Typical IR less than 5 $\mu\text{A}$  above 11V
11. High temperature soldering guaranteed: 260 $^{\circ}\text{C}$ /40 seconds / 0.375", (9.5mm) lead length, 5lbs., (2.3kg)tension
12. Plastic package has underwriters laboratory flammability classification 94v-0
13. Matte Tin Lead-free plated



### Applications

TVS devices are ideal for the protection of I/O interfaces, VCC bus and other vulnerable circuits used in telecom, computer, industrial and consumer electronic applications.

### Mechanical Characteristics

| Rating                                                                                      | Symbol          | Value                                            | Units                       |
|---------------------------------------------------------------------------------------------|-----------------|--------------------------------------------------|-----------------------------|
| Peak Pulse Power Dissipation by 10x1000 $\mu\text{s}$ test waveform (Fig.1)(Note 1)         | $P_{PPM}$       | 1500                                             | Watts                       |
| Steady State Power Dissipation on infinite heat sink at $T_L = 75^{\circ}\text{C}$ (Fig. 5) | $P_D$           | 6.5                                              | Watts                       |
| Peak Forward Surge Current, 8.3ms Single Half Sine Wave Unidirectional only (Note 2)        | $I_{FSM}$       | 200                                              | Amps                        |
| Maximum Instantaneous Forward Voltage at 25A for Unidirectional only (Note 3)               | $V_F$           | 3.5/5.0                                          | V                           |
| Operating junction and Storage Temperature Range.                                           | $T_J, T_{STG}$  | -55 $^{\circ}\text{C}$ to 175 $^{\circ}\text{C}$ | $^{\circ}\text{C}$          |
| Typical Thermal Resistance Junction to Lead                                                 | $R_{\theta JL}$ | 15                                               | $^{\circ}\text{C}/\text{W}$ |
| Typical Thermal Resistance Junction to Ambient                                              | $R_{\theta JA}$ | 75                                               | $^{\circ}\text{C}/\text{W}$ |
| Reverse current                                                                             | $I_F$           | 100                                              | A                           |

Notes:

1. Non-repetitive current pulse , per Fig. 3 and derated above  $T_A = 25^{\circ}\text{C}$  per Fig. 2.
2. Measured on 8.3ms single half sine wave or equivalent square wave, duty cycle=4 perminute maximum.
3.  $V_F < 3.5\text{V}$  for devices of  $V_{BR} < 200\text{V}$  and  $V_F < 5.0\text{V}$  for devices of  $V_{BR} > 201\text{V}$ .

## Transient Voltage Suppressors - 1.5KE Series

### Electrical Characteristics

| Type Number |            | Reverse Stand-Off Voltage | Breakdown Voltage Min. @IT |             | Test Current | Maximum Clamping Voltage @IPP | Peak Pulse Current | Reverse Leakage @VRWM |
|-------------|------------|---------------------------|----------------------------|-------------|--------------|-------------------------------|--------------------|-----------------------|
| (UNI)       | (BI)       | VRWM(V)                   | VBR MIN.(V)                | VBR.MAX.(V) | IT(mA)       | VC(V)                         | IPP(A)             | IR(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                       | 9.50        | 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               | 5                     |
| 1.5KE15A    | 1.5KE15CA  | 12.80                     | 14.30                      | 15.80       | 1            | 21.2                          | 71.7               | 5                     |
| 1.5KE16A    | 1.5KE16CA  | 13.60                     | 15.20                      | 16.80       | 1            | 22.5                          | 67.6               | 5                     |
| 1.5KE18A    | 1.5KE18CA  | 15.30                     | 17.10                      | 18.90       | 1            | 25.2                          | 60.3               | 5                     |
| 1.5KE20A    | 1.5KE20CA  | 17.10                     | 19.00                      | 21.00       | 1            | 27.7                          | 54.9               | 5                     |
| 1.5KE22A    | 1.5KE22CA  | 18.80                     | 20.90                      | 23.10       | 1            | 30.6                          | 49.7               | 5                     |
| 1.5KE24A    | 1.5KE24CA  | 20.50                     | 22.80                      | 25.20       | 1            | 33.2                          | 45.8               | 5                     |
| 1.5KE27A    | 1.5KE27CA  | 23.10                     | 25.70                      | 28.40       | 1            | 37.5                          | 40.5               | 5                     |
| 1.5KE30A    | 1.5KE30CA  | 25.60                     | 28.50                      | 31.50       | 1            | 41.4                          | 36.7               | 5                     |
| 1.5KE33A    | 1.5KE33CA  | 28.20                     | 31.40                      | 34.70       | 1            | 45.7                          | 33.3               | 5                     |
| 1.5KE36A    | 1.5KE36CA  | 30.80                     | 34.20                      | 37.80       | 1            | 49.9                          | 30.5               | 5                     |
| 1.5KE39A    | 1.5KE39CA  | 33.30                     | 37.10                      | 41.00       | 1            | 53.9                          | 28.2               | 5                     |
| 1.5KE43A    | 1.5KE43CA  | 36.80                     | 40.90                      | 45.20       | 1            | 59.3                          | 25.6               | 5                     |
| 1.5KE47A    | 1.5KE47CA  | 40.20                     | 44.70                      | 49.40       | 1            | 64.8                          | 23.5               | 5                     |
| 1.5KE51A    | 1.5KE51CA  | 43.60                     | 48.50                      | 53.60       | 1            | 70.1                          | 21.7               | 5                     |
| 1.5KE56A    | 1.5KE56CA  | 47.80                     | 53.20                      | 58.80       | 1            | 77.0                          | 19.7               | 5                     |
| 1.5KE62A    | 1.5KE62CA  | 53.00                     | 58.90                      | 65.10       | 1            | 85.0                          | 17.9               | 5                     |
| 1.5KE68A    | 1.5KE68CA  | 58.10                     | 64.60                      | 71.40       | 1            | 92.0                          | 16.5               | 5                     |
| 1.5KE75A    | 1.5KE75CA  | 64.10                     | 71.30                      | 78.80       | 1            | 103.0                         | 14.8               | 5                     |
| 1.5KE82A    | 1.5KE82CA  | 70.10                     | 77.90                      | 86.10       | 1            | 113.0                         | 13.5               | 5                     |
| 1.5KE91A    | 1.5KE91CA  | 77.80                     | 86.50                      | 95.50       | 1            | 125.0                         | 12.2               | 5                     |
| 1.5KE100A   | 1.5KE100CA | 85.50                     | 95.00                      | 105.00      | 1            | 137.0                         | 11.1               | 5                     |
| 1.5KE110A   | 1.5KE110CA | 94.00                     | 105.00                     | 116.00      | 1            | 152.0                         | 10.0               | 5                     |
| 1.5KE120A   | 1.5KE120CA | 102.00                    | 114.00                     | 126.00      | 1            | 165.0                         | 9.20               | 5                     |
| 1.5KE130A   | 1.5KE130CA | 111.00                    | 124.00                     | 137.00      | 1            | 179.0                         | 8.50               | 5                     |
| 1.5KE150A   | 1.5KE150CA | 128.00                    | 143.00                     | 158.00      | 1            | 207.0                         | 7.30               | 5                     |
| 1.5KE160A   | 1.5KE160CA | 136.00                    | 152.00                     | 168.00      | 1            | 219.0                         | 6.60               | 5                     |
| 1.5KE170A   | 1.5KE170CA | 145.00                    | 162.00                     | 179.00      | 1            | 234.0                         | 6.50               | 5                     |
| 1.5KE180A   | 1.5KE180CA | 154.00                    | 171.00                     | 189.00      | 1            | 246.0                         | 6.20               | 5                     |
| 1.5KE200A   | 1.5KE200CA | 171.00                    | 190.00                     | 210.00      | 1            | 274.0                         | 5.50               | 5                     |
| 1.5KE220A   | 1.5KE220CA | 185.00                    | 209.00                     | 231.00      | 1            | 328.0                         | 4.60               | 5                     |
| 1.5KE250A   | 1.5KE250CA | 214.00                    | 237.00                     | 263.00      | 1            | 344.0                         | 4.40               | 5                     |
| 1.5KE300A   | 1.5KE300CA | 256.00                    | 285.00                     | 315.00      | 1            | 414.0                         | 3.70               | 5                     |
| 1.5KE350A   | 1.5KE350CA | 300.00                    | 332.00                     | 368.00      | 1            | 482.0                         | 3.20               | 5                     |
| 1.5KE400A   | 1.5KE400CA | 342.00                    | 380.00                     | 420.00      | 1            | 548.0                         | 2.80               | 5                     |
| 1.5KE440A   | 1.5KE440CA | 376.00                    | 418.00                     | 462.00      | 1            | 602.0                         | 2.50               | 5                     |
| 1.5KE480A   | 1.5KE480CA | 408.00                    | 456.00                     | 504.00      | 1            | 658.0                         | 2.30               | 5                     |

For bidirectional type having VR of 10 volts and less, the IR limit is double.

For parts without A, the VBR is +10% and VC is 5% higher than with A parts.

# Transient Voltage Suppressors - 1.5KE Series

## Ratings and Characteristic Curves

Figure 1 - Peak Pulse Power Rating Curve

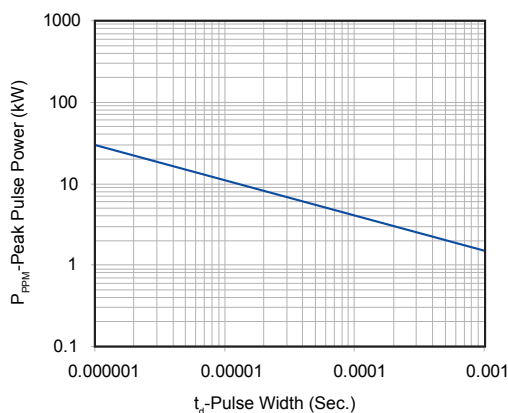


Figure 2 - Pulse Derating Curve

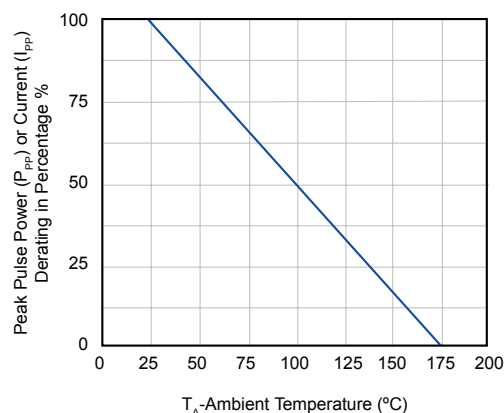


Figure 3 - Pulse Waveform

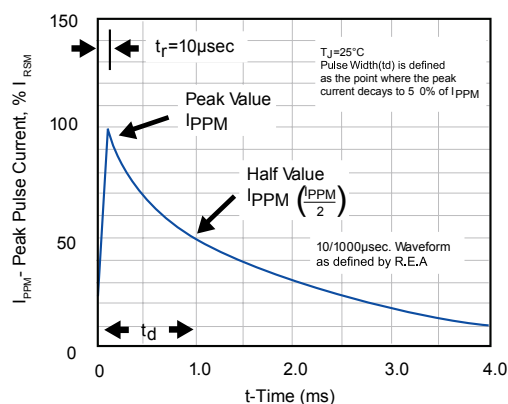


Figure 4 - Typical Junction Capacitance

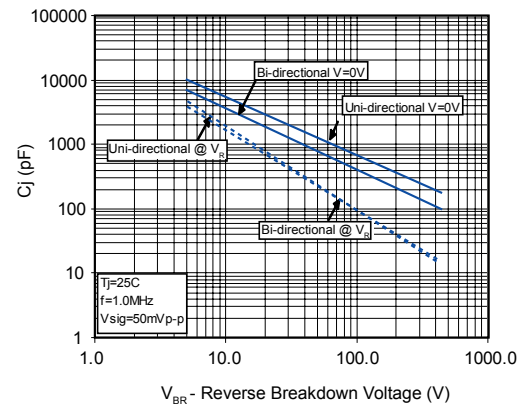


Figure 5 - Steady State Power Derating Curve

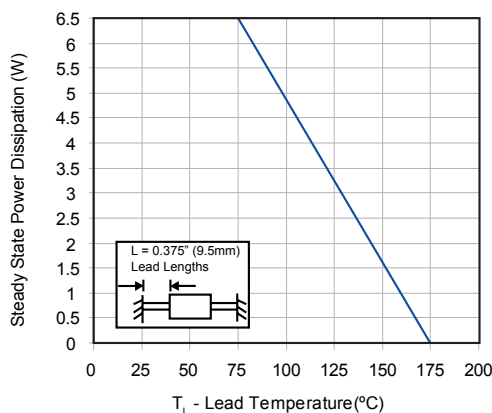
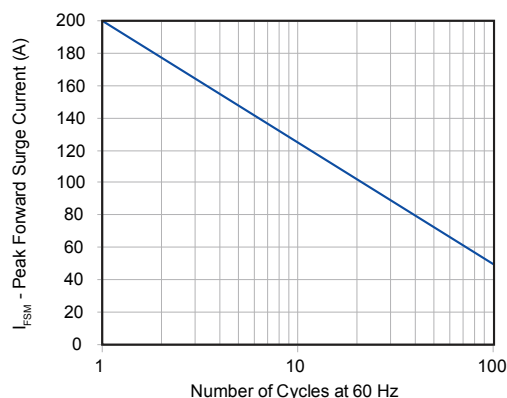


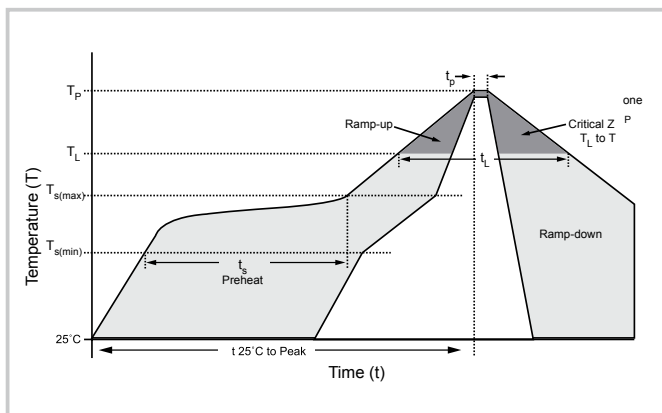
Figure 6 - Maximum Non-Repetitive Peak Forward Surge Current Uni-Directional Only



# Transient Voltage Suppressors - 1.5KE Series

## Soldering Parameters

|                                                        | Reflow Condition                   | Lead-free assembly      |
|--------------------------------------------------------|------------------------------------|-------------------------|
| Pre Heat                                               | - Temperature Min ( $T_{s(min)}$ ) | 150°C                   |
|                                                        | - Temperature Max ( $T_{s(max)}$ ) | 200°C                   |
|                                                        | - Time (min to max) ( $t_s$ )      | 60-180 secs             |
| Average ramp up rate (Liquidus Temp ( $T_L$ ) to peak) |                                    | 3°C/second max          |
| $T_{s(max)}$ to $T_L$ - Ramp-up Rate                   |                                    | 3°C/second max          |
| Reflow                                                 | - Temperature ( $T_L$ ) (Liquidus) | 217°C                   |
|                                                        | - Time (min to max) ( $t_s$ )      | 60-150 seconds          |
| Peak Temperature ( $T_p$ )                             |                                    | 260 <sup>+0/-5</sup> °C |
| Time within 5°C of actual peak Temperature ( $t_p$ )   |                                    | 20-40 seconds           |
| Ramp-down Rate                                         |                                    | 6°C/second max          |
| Time 25°C to peak Temperature ( $T_p$ )                |                                    | 8 minutes Max.          |
| Do not exceed                                          |                                    | 280°C                   |



## Physical Specifications

|           |                                                            |
|-----------|------------------------------------------------------------|
| Weight    | 0.045oz., 1.2g                                             |
| Case      | JEDEC DO-201 molded plastic body over passivated junction. |
| Polarity  | Color band denotes the cathode except Bipolar.             |
| Terminals | Matte Tin axial leads, solderable per JESD22-B102D.        |

## Environmental Specifications

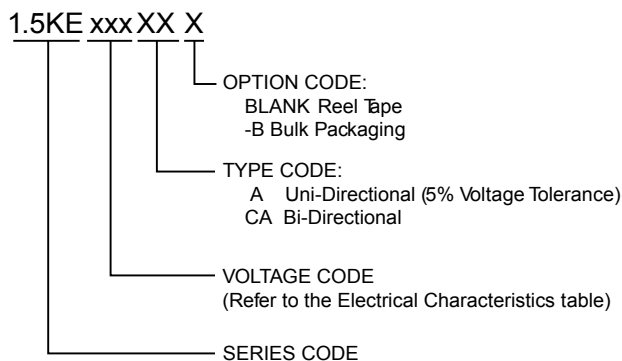
|                    |              |
|--------------------|--------------|
| Temperature Cycle  | JESD22-A104  |
| Pressure Cooker    | JESD 22-A102 |
| High Temp. Storage | JESD22-A103  |
| HTRB               | JESD22-A108  |
| Thermal Shock      | JESD22-A106  |

## Flow/Wave Soldering

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

## Transient Voltage Suppressors - 1.5KE Series

### Part Numbering System



### Packaging

| Part Number  | Component Package | Quantity | Packaging Option | Packaging Specification |
|--------------|-------------------|----------|------------------|-------------------------|
| 1.5KExxxXX   | DO-201            | 1000     | Tape & Reel      | ELA STD RS-296E         |
| 1.5KExxxXX-B | DO-201            | 500      | BULK             | Concord Packing Spec    |

### Warehouse Storage Conditions of Products

- Storage Conditions:
  1. Storage Temperature: -10°C~+40°C
  2. Relative Humidity: ≤75%RH
  3. Keep away from corrosive atmosphere and sunlight.
- Period of Storage: 1 year

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