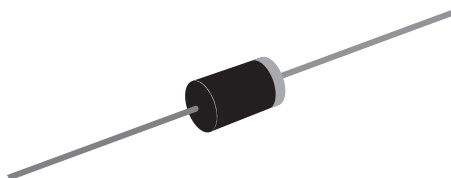


**TRANSZORB® Transient Voltage Suppressors****Case Style 1.5KE****FEATURES**

- Glass passivated chip junction
- Available in unidirectional and bidirectional
- 1500 W peak pulse power capability with a 10/1000  $\mu$ s waveform, repetitive rate (duty cycle): 0.01 %
- Excellent clamping capability
- Very fast response time
- Low incremental surge resistance
- AEC-Q101 qualified available
- Solder dip 275 °C max. 10 s, per JESD 22-B106
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?999912](http://www.vishay.com/doc?999912)

**RoHS**  
COMPLIANT**PRIMARY CHARACTERISTICS**

|                                 |                               |
|---------------------------------|-------------------------------|
| $V_{BR}$ unidirectional         | 6.8 V to 540 V                |
| $V_{BR}$ bidirectional          | 6.8 V to 220 V                |
| $V_{WM}$ unidirectional         | 5.8 V to 459 V                |
| $V_{WM}$ bidirectional          | 5.8 V to 185 V                |
| $P_{PPM}$                       | 1500 W                        |
| $P_D$                           | 6.5 W                         |
| $I_{FSM}$ (unidirectional only) | 200 A                         |
| $T_J$ max.                      | 175 °C                        |
| Polarity                        | Unidirectional, bidirectional |
| Package                         | 1.5KE                         |

**DEVICES FOR BIDIRECTION APPLICATIONS**

For bidirectional types, use CA suffix (e.g. 1.5KE220CA)  
Electrical characteristics apply in both directions.

**TYPICAL APPLICATIONS**

Use in sensitive electronics protection against voltage transients induced by inductive load switching and lighting on ICs, MOSFET, signal lines of sensor units for consumer, computer, industrial, automotive, and telecommunication.

**MECHANICAL DATA**

**Case:** molded epoxy body over passivated junction  
Molding compound meets UL 94 V-0 flammability rating  
Base P/N-E3 - RoHS compliant, commercial grade  
Base P/NHE3\_X - RoHS compliant, and AEC-Q101 qualified  
("X" denotes revision code e.g. A, B, ...)

**Terminals:** matte tin plated leads, solderable per J-STD-002 and JESD 22-B102

E3 suffix meets JESD 201 class 1A whisker test, HE3 suffix meets JESD 201 class 2 whisker test

**Note**

- 1.5KE250A to 1.5KE540A are commercial grade only
- Bidirectional is available from 1.5KE6.8CA to 1.5KE220CA only

**Polarity:** for unidirectional types the color band denotes cathode end, no marking on bidirectional types

**MAXIMUM RATINGS** ( $T_A = 25$  °C unless otherwise noted)

| PARAMETER                                                                                  | SYMBOL         | VALUE          | UNIT |
|--------------------------------------------------------------------------------------------|----------------|----------------|------|
| Peak pulse power dissipation with a 10/1000 $\mu$ s waveform <sup>(1)</sup> (fig. 1)       | $P_{PPM}$      | 1500           | W    |
| Peak pulse current with a 10/1000 $\mu$ s waveform <sup>(1)</sup>                          | $I_{PPM}$      | See next table | A    |
| Power dissipation on infinite heatsink at $T_L = 75$ °C (fig. 5)                           | $P_D$          | 6.5            | W    |
| Peak forward surge current 8.3 ms single half sine-wave unidirectional only <sup>(2)</sup> | $I_{FSM}$      | 200            | A    |
| Maximum instantaneous forward voltage at 100 A for unidirectional only <sup>(3)</sup>      | $V_F$          | 3.5/5.0        | V    |
| Operating junction and storage temperature range                                           | $T_J, T_{STG}$ | -55 to +175    | °C   |

**Notes**

- (1) Non-repetitive current pulse, per fig. 3 and derated above  $T_A = 25$  °C per fig. 2  
 (2) Measured on 8.3 ms single half sine-wave or equivalent square wave, duty cycle = 4 pulses per minute maximum  
 (3)  $V_F = 3.5$  V for 1.5KE220A and below;  $V_F = 5.0$  V for 1.5KE250A and above



| ELECTRICAL CHARACTERISTICS (T <sub>A</sub> = 25 °C unless otherwise noted) |                                         |                                                                                 |      |                                           |                                                |                                                                                              |                                                                               |                                                                             |                                                                       |
|----------------------------------------------------------------------------|-----------------------------------------|---------------------------------------------------------------------------------|------|-------------------------------------------|------------------------------------------------|----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------|-----------------------------------------------------------------------|
| JEDEC®<br>TYPE<br>NUMBER                                                   | GENERAL<br>SEMICONDUCTOR<br>PART NUMBER | BREAKDOWN<br>VOLTAGE<br>V <sub>BR</sub> AT I <sub>T</sub> <sup>(1)</sup><br>(V) |      | TEST<br>CURRENT<br>I <sub>T</sub><br>(mA) | STAND-OFF<br>VOLTAGE<br>V <sub>WM</sub><br>(V) | MAXIMUM<br>REVERSE<br>LEAKAGE<br>AT V <sub>WM</sub><br>I <sub>D</sub> <sup>(4)</sup><br>(μA) | MAXIMUM<br>PEAK<br>PULSE<br>CURRENT<br>I <sub>PPM</sub> <sup>(2)</sup><br>(A) | MAXIMUM<br>CLAMPING<br>VOLTAGE<br>AT I <sub>PPM</sub><br>V <sub>C</sub> (V) | MAXIMUM<br>TEMPERATURE<br>COEFFICIENT<br>OF V <sub>BR</sub><br>(%/°C) |
|                                                                            |                                         | MIN.                                                                            | MAX. |                                           |                                                |                                                                                              |                                                                               |                                                                             |                                                                       |
| 1N6267A                                                                    | (+)-1.5KE6.8A                           | 6.45                                                                            | 7.14 | 10                                        | 5.80                                           | 1000                                                                                         | 143                                                                           | 10.5                                                                        | 0.057                                                                 |
| 1N6268A                                                                    | (+)-1.5KE7.5A                           | 7.13                                                                            | 7.88 | 10                                        | 6.40                                           | 500                                                                                          | 133                                                                           | 11.3                                                                        | 0.061                                                                 |
| 1N6269A                                                                    | (+)-1.5KE8.2A                           | 7.79                                                                            | 8.61 | 10                                        | 7.02                                           | 200                                                                                          | 124                                                                           | 12.1                                                                        | 0.065                                                                 |
| 1N6270A                                                                    | (+)-1.5KE9.1A                           | 8.65                                                                            | 9.55 | 1.0                                       | 7.78                                           | 50                                                                                           | 112                                                                           | 13.4                                                                        | 0.068                                                                 |
| 1N6271A                                                                    | (+)-1.5KE10A                            | 9.50                                                                            | 10.5 | 1.0                                       | 8.55                                           | 10                                                                                           | 103                                                                           | 14.5                                                                        | 0.073                                                                 |
| 1N6272A                                                                    | (+)-1.5KE11A                            | 10.5                                                                            | 11.6 | 1.0                                       | 9.40                                           | 5.0                                                                                          | 96.2                                                                          | 15.6                                                                        | 0.075                                                                 |
| 1N6273A                                                                    | (+)-1.5KE12A                            | 11.4                                                                            | 12.6 | 1.0                                       | 10.2                                           | 5.0                                                                                          | 89.8                                                                          | 16.7                                                                        | 0.078                                                                 |
| 1N6274A                                                                    | (+)-1.5KE13A                            | 12.4                                                                            | 13.7 | 1.0                                       | 11.1                                           | 5.0                                                                                          | 82.4                                                                          | 18.2                                                                        | 0.081                                                                 |
| 1N6275A                                                                    | (+)-1.5KE15A                            | 14.3                                                                            | 15.8 | 1.0                                       | 12.8                                           | 1.0                                                                                          | 70.8                                                                          | 21.2                                                                        | 0.084                                                                 |
| 1N6276A                                                                    | (+)-1.5KE16A                            | 15.2                                                                            | 16.8 | 1.0                                       | 13.6                                           | 1.0                                                                                          | 66.7                                                                          | 22.5                                                                        | 0.086                                                                 |
| 1N6277A                                                                    | (+)-1.5KE18A                            | 17.1                                                                            | 18.9 | 1.0                                       | 15.3                                           | 1.0                                                                                          | 59.5                                                                          | 25.2                                                                        | 0.089                                                                 |
| 1N6278A                                                                    | (+)-1.5KE20A                            | 19.0                                                                            | 21.0 | 1.0                                       | 17.1                                           | 1.0                                                                                          | 54.2                                                                          | 27.7                                                                        | 0.090                                                                 |
| 1N6279A                                                                    | (+)-1.5KE22A                            | 20.9                                                                            | 23.1 | 1.0                                       | 18.8                                           | 1.0                                                                                          | 49.0                                                                          | 30.6                                                                        | 0.092                                                                 |
| 1N6280A                                                                    | (+)-1.5KE24A                            | 22.8                                                                            | 25.2 | 1.0                                       | 20.5                                           | 1.0                                                                                          | 45.2                                                                          | 33.2                                                                        | 0.094                                                                 |
| 1N6281A                                                                    | (+)-1.5KE27A                            | 25.7                                                                            | 28.4 | 1.0                                       | 23.1                                           | 1.0                                                                                          | 40.0                                                                          | 37.5                                                                        | 0.096                                                                 |
| 1N6282A                                                                    | (+)-1.5KE30A                            | 28.5                                                                            | 31.5 | 1.0                                       | 25.6                                           | 1.0                                                                                          | 36.2                                                                          | 41.4                                                                        | 0.097                                                                 |
| 1N6283A                                                                    | (+)-1.5KE33A                            | 31.4                                                                            | 34.7 | 1.0                                       | 28.2                                           | 1.0                                                                                          | 32.8                                                                          | 45.7                                                                        | 0.098                                                                 |
| 1N6284A                                                                    | (+)-1.5KE36A                            | 34.2                                                                            | 37.8 | 1.0                                       | 30.8                                           | 1.0                                                                                          | 30.1                                                                          | 49.9                                                                        | 0.099                                                                 |
| 1N6285A                                                                    | (+)-1.5KE39A                            | 37.1                                                                            | 41.0 | 1.0                                       | 33.3                                           | 1.0                                                                                          | 27.8                                                                          | 53.9                                                                        | 0.100                                                                 |
| 1N6286A                                                                    | (+)-1.5KE43A                            | 40.9                                                                            | 45.2 | 1.0                                       | 36.8                                           | 1.0                                                                                          | 25.3                                                                          | 59.3                                                                        | 0.101                                                                 |
| 1N6287A                                                                    | (+)-1.5KE47A                            | 44.7                                                                            | 49.4 | 1.0                                       | 40.2                                           | 1.0                                                                                          | 23.1                                                                          | 64.8                                                                        | 0.101                                                                 |
| 1N6288A                                                                    | (+)-1.5KE51A                            | 48.5                                                                            | 53.6 | 1.0                                       | 43.6                                           | 1.0                                                                                          | 21.4                                                                          | 70.1                                                                        | 0.102                                                                 |
| 1N6289A                                                                    | (+)-1.5KE56A                            | 53.2                                                                            | 58.8 | 1.0                                       | 47.8                                           | 1.0                                                                                          | 19.5                                                                          | 77.0                                                                        | 0.103                                                                 |
| 1N6290A                                                                    | (+)-1.5KE62A                            | 58.9                                                                            | 65.1 | 1.0                                       | 53.0                                           | 1.0                                                                                          | 17.6                                                                          | 85.0                                                                        | 0.104                                                                 |
| 1N6291A                                                                    | (+)-1.5KE68A                            | 64.6                                                                            | 71.4 | 1.0                                       | 58.1                                           | 1.0                                                                                          | 16.3                                                                          | 92.0                                                                        | 0.104                                                                 |
| 1N6292A                                                                    | (+)-1.5KE75A                            | 71.3                                                                            | 78.8 | 1.0                                       | 64.1                                           | 1.0                                                                                          | 14.6                                                                          | 104                                                                         | 0.105                                                                 |
| 1N6293A                                                                    | (+)-1.5KE82A                            | 77.9                                                                            | 86.1 | 1.0                                       | 70.1                                           | 1.0                                                                                          | 13.3                                                                          | 113                                                                         | 0.105                                                                 |
| 1N6294A                                                                    | (+)-1.5KE91A                            | 86.5                                                                            | 95.5 | 1.0                                       | 77.8                                           | 1.0                                                                                          | 12.0                                                                          | 125                                                                         | 0.106                                                                 |
| 1N6295A                                                                    | (+)-1.5KE100A                           | 95.0                                                                            | 105  | 1.0                                       | 85.5                                           | 1.0                                                                                          | 10.9                                                                          | 137                                                                         | 0.106                                                                 |
| 1N6296A                                                                    | (+)-1.5KE110A                           | 105                                                                             | 116  | 1.0                                       | 94.0                                           | 1.0                                                                                          | 9.9                                                                           | 152                                                                         | 0.107                                                                 |
| 1N6297A                                                                    | (+)-1.5KE120A                           | 114                                                                             | 126  | 1.0                                       | 102                                            | 1.0                                                                                          | 9.1                                                                           | 165                                                                         | 0.107                                                                 |
| 1N6298A                                                                    | (+)-1.5KE130A                           | 124                                                                             | 137  | 1.0                                       | 111                                            | 1.0                                                                                          | 8.4                                                                           | 179                                                                         | 0.107                                                                 |
| 1N6299A                                                                    | (+)-1.5KE150A                           | 143                                                                             | 158  | 1.0                                       | 128                                            | 1.0                                                                                          | 7.2                                                                           | 207                                                                         | 0.106                                                                 |
| 1N6300A                                                                    | (+)-1.5KE160A                           | 152                                                                             | 168  | 1.0                                       | 136                                            | 1.0                                                                                          | 6.8                                                                           | 219                                                                         | 0.108                                                                 |
| 1N6301A                                                                    | (+)-1.5KE170A                           | 162                                                                             | 179  | 1.0                                       | 145                                            | 1.0                                                                                          | 6.4                                                                           | 234                                                                         | 0.108                                                                 |
| 1N6302A                                                                    | (+)-1.5KE180A                           | 171                                                                             | 189  | 1.0                                       | 154                                            | 1.0                                                                                          | 6.1                                                                           | 246                                                                         | 0.108                                                                 |
| 1N6303A                                                                    | (+)-1.5KE200A                           | 190                                                                             | 210  | 1.0                                       | 171                                            | 1.0                                                                                          | 5.5                                                                           | 274                                                                         | 0.108                                                                 |
| -                                                                          | (+)-1.5KE220A                           | 209                                                                             | 231  | 1.0                                       | 185                                            | 1.0                                                                                          | 4.6                                                                           | 328                                                                         | 0.108                                                                 |
| -                                                                          | 1.5KE250A                               | 237                                                                             | 263  | 1.0                                       | 214                                            | 1.0                                                                                          | 4.4                                                                           | 344                                                                         | 0.110                                                                 |
| -                                                                          | 1.5KE300A                               | 285                                                                             | 315  | 1.0                                       | 256                                            | 1.0                                                                                          | 3.6                                                                           | 414                                                                         | 0.110                                                                 |
| -                                                                          | 1.5KE350A                               | 333                                                                             | 368  | 1.0                                       | 300                                            | 1.0                                                                                          | 3.1                                                                           | 482                                                                         | 0.110                                                                 |
| -                                                                          | 1.5KE400A                               | 380                                                                             | 420  | 1.0                                       | 342                                            | 1.0                                                                                          | 2.7                                                                           | 548                                                                         | 0.110                                                                 |
| -                                                                          | 1.5KE440A                               | 418                                                                             | 462  | 1.0                                       | 376                                            | 1.0                                                                                          | 2.5                                                                           | 602                                                                         | 0.110                                                                 |
| -                                                                          | 1.5KE480A                               | 456                                                                             | 504  | 1.0                                       | 408                                            | 1.0                                                                                          | 2.28                                                                          | 658                                                                         | 0.110                                                                 |
| -                                                                          | 1.5KE510A                               | 485                                                                             | 535  | 1.0                                       | 434                                            | 1.0                                                                                          | 2.15                                                                          | 698                                                                         | 0.110                                                                 |
| -                                                                          | 1.5KE540A                               | 513                                                                             | 567  | 1.0                                       | 459                                            | 1.0                                                                                          | 2.03                                                                          | 740                                                                         | 0.110                                                                 |

## Notes

- (1) Pulse test: t<sub>p</sub> ≤ 50 ms
- (2) Surge current waveform per fig. 3 and derate per fig. 2
- (3) All terms and symbols are consistent with ANSI/IEEE CA62.35
- (4) For bidirectional types with V<sub>R</sub> 10 V and less the I<sub>D</sub> limit is doubled
- (+) Underwriters laboratory recognition for the classification of protectors (QVGQ2) under the UL standard for safety 497B and file number E136766 for both unidirectional and bidirectional devices



| THERMAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted) |                 |       |                           |
|----------------------------------------------------------------------------|-----------------|-------|---------------------------|
| PARAMETER                                                                  | SYMBOL          | VALUE | UNIT                      |
| Typical thermal resistance, junction to ambient                            | $R_{\theta JA}$ | 75    | $^\circ\text{C}/\text{W}$ |
| Typical thermal resistance, junction to lead                               | $R_{\theta JL}$ | 15.4  |                           |

| ORDERING INFORMATION (Example)     |                 |                        |               |                                  |
|------------------------------------|-----------------|------------------------|---------------|----------------------------------|
| PREFERRED PIN                      | UNIT WEIGHT (g) | PREFERRED PACKAGE CODE | BASE QUANTITY | DELIVERY MODE                    |
| 1.5KE6.8A-E3/54                    | 0.968           | 54                     | 1400          | 13" diameter paper tape and reel |
| 1.5KE6.8AHE3_B/C <sup>(1)(2)</sup> | 0.968           | C                      | 1400          | 13" diameter paper tape and reel |

#### Notes

(1) AEC-Q101 qualified

(2) Applied for 1.5KE6.8AHE3\_B to 1.5KE220AHE3\_B, and 1.5KE6.8CAHE3\_B to 1.5KE220CAHE3\_B

### RATINGS AND CHARACTERISTICS CURVES ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

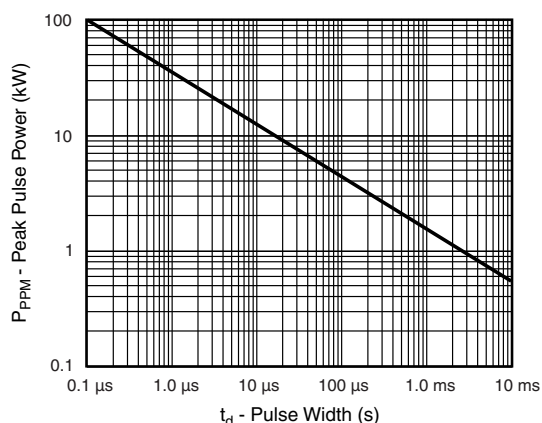


Fig. 1 - Peak Pulse Power Rating Curve

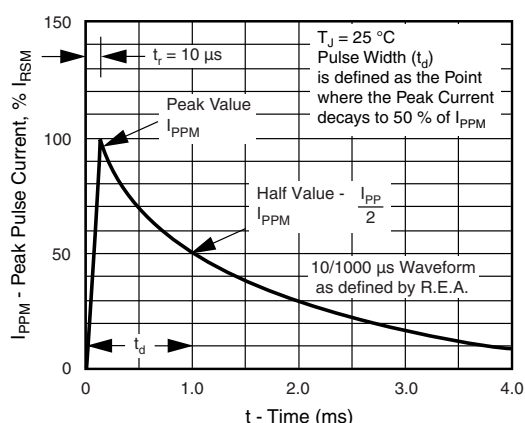


Fig. 3 - Pulse Waveform

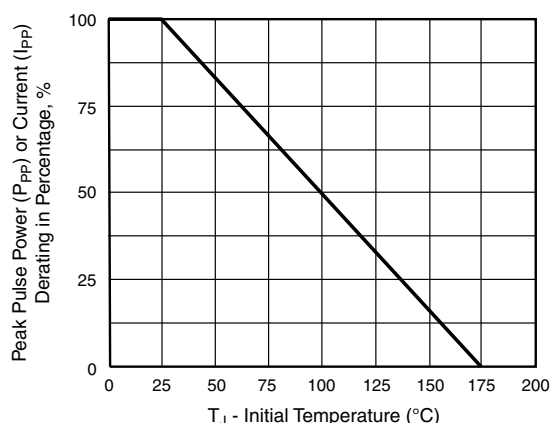


Fig. 2 - Pulse Power or Current vs. Initial Junction Temperature

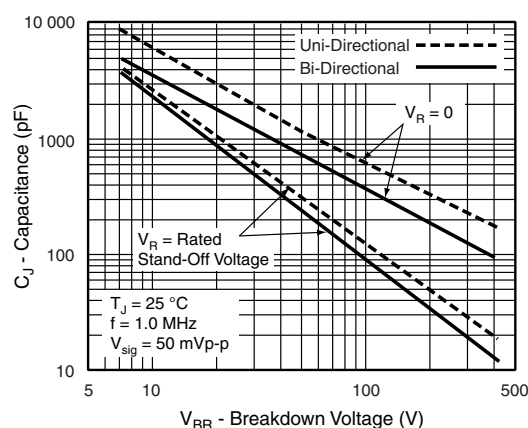


Fig. 4 - Typical Junction Capacitance

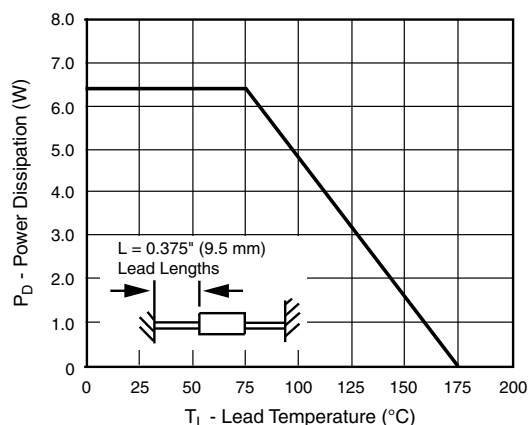


Fig. 5 - Power Derating Curve

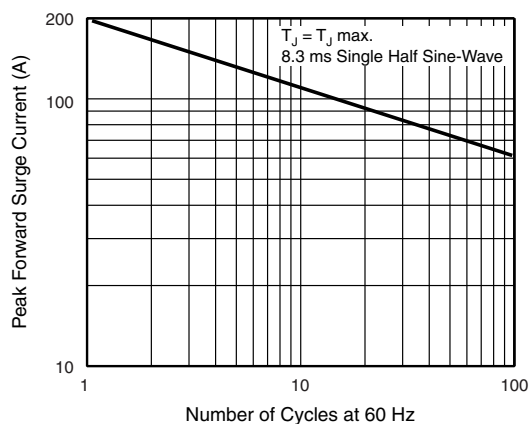


Fig. 6 - Maximum Non-Repetitive Forward Surge Current  
Unidirectional only

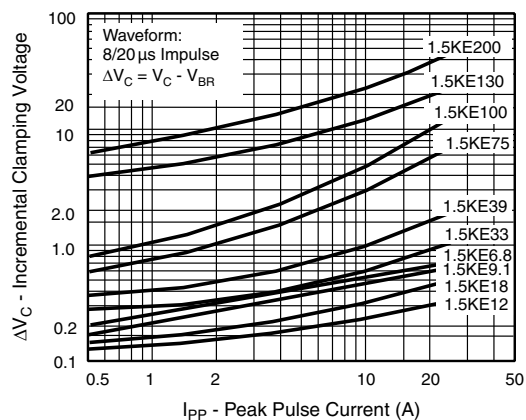


Fig. 7 - Incremental Clamping Voltage Curve (Unidirectional)

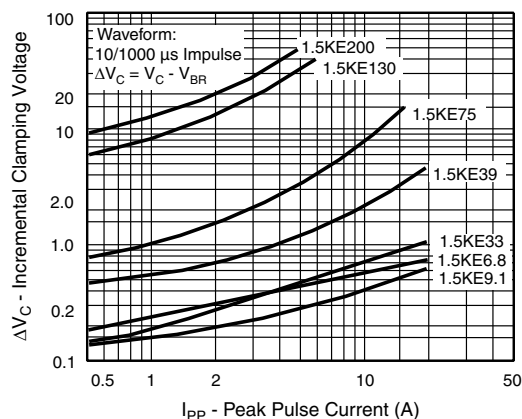


Fig. 8 - Incremental Clamping Voltage Curve (Unidirectional)

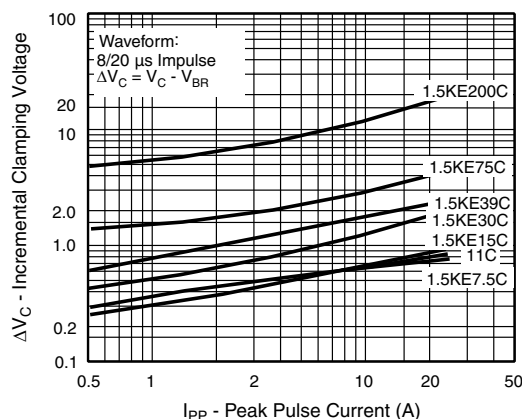


Fig. 9 - Incremental Clamping Voltage Curve (Bidirectional)

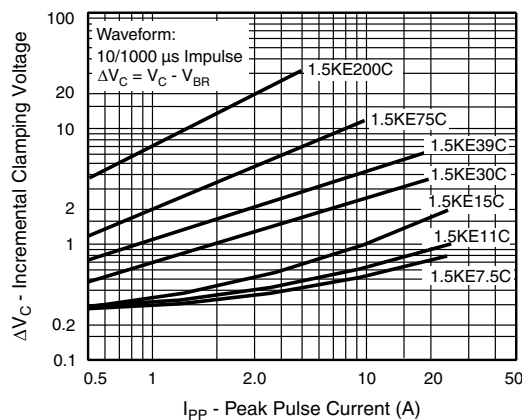


Fig. 10 - Incremental Clamping Voltage Curve (Bidirectional)

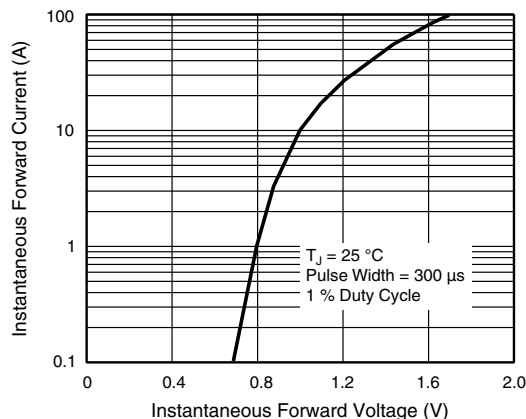


Fig. 11 - Instantaneous Forward Voltage Characteristics Curve

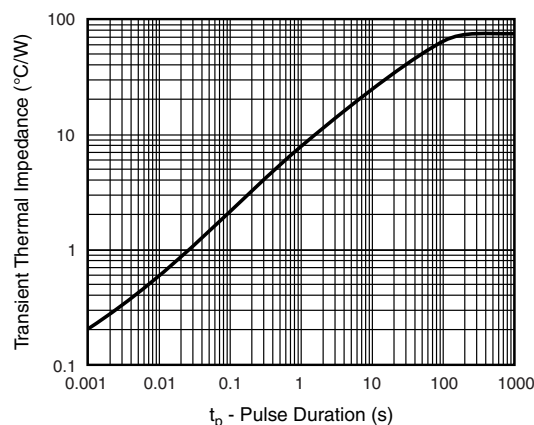
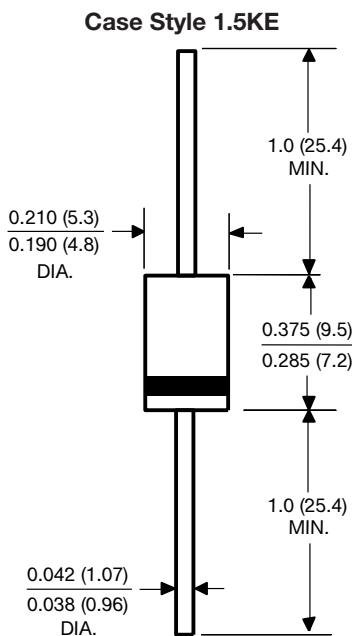


Fig. 12 - Typical Transient Thermal Impedance

## PACKAGE OUTLINE DIMENSIONS in inches (millimeters)



## APPLICATION NOTES

- This series of Silicon Transient Suppressors is used in applications where large voltage transients can permanently damage voltage-sensitive components.
- The TVS diode can be used in applications where induced lightning on rural or remote transmission lines presents a hazard to electronic circuitry (ref: R.E.A. specification P.E. 60).
- This Transient Voltage Suppressor diode has a pulse power rating of 1500 W for 1 ms. The response time of TVS diode clamping action is effectively instantaneous ( $1 \times 10^{-9}$  s bi-directional); therefore, they can protect integrated circuits, MOS devices, hybrids, and other voltage sensitive semiconductors and components. TVS diodes can also be used in series or parallel to increase the peak power ratings.



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