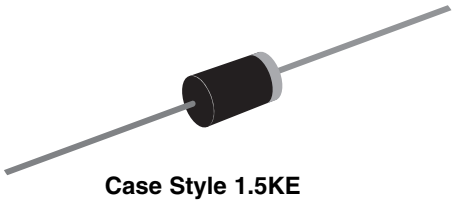
# 1.5KE6.8A thru 1.5KE540A, 1N6267A thru 1N6303A

## 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 µs 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?99912

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 µs waveform (1) (fig. 1) | $P_{PPM}$ | 1500 | W |
| Peak pulse current with a 10/1000 µs waveform (1) | $I_{PPM}$ | 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 (2) | $I_{FSM}$ | 200 | A |
| Maximum instantaneous forward voltage at 100 A for unidirectional only (3) | $V_F$ | 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


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**ELECTRICAL CHARACTERISTICS** ($T_A$ = 25 °C unless otherwise noted)

| JEDEC® TYPE NUMBER | GENERAL SEMICONDUCTOR PART NUMBER | BREAKDOWN VOLTAGE $V_{BR}$ AT $I_T$ (1) (V) | | TEST CURRENT $I_T$ (mA) | STAND-OFF VOLTAGE $V_{WM}$ (V) | MAXIMUM REVERSE LEAKAGE AT $V_{WM}$ $I_D$ (4) (µA) | MAXIMUM PEAK PULSE CURRENT $I_{PPM}$ (2) (A) | MAXIMUM CLAMPING VOLTAGE AT $I_{PPM}$ $V_C$ (V) | MAXIMUM TEMPERATURE COEFFICIENT OF $V_{BR}$ (%/°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: $t_p \leq 50$ 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 $V_R$ 10 V and less the $I_D$ 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


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| THERMAL CHARACTERISTICS ($T_A$ = 25 °C unless otherwise noted) | | | |
|---|---|---|---|
| **PARAMETER** | **SYMBOL** | **VALUE** | **UNIT** |
| Typical thermal resistance, junction to ambient | $R_{\theta JA}$ | 75 | °C/ 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 (1)(2) | 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 °C unless otherwise noted)

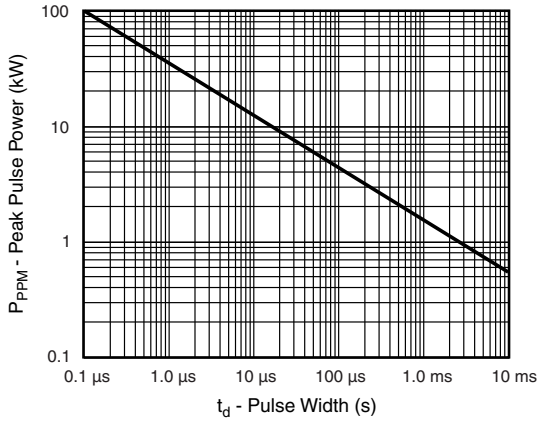



Fig. 1 - Peak Pulse Power Rating Curve

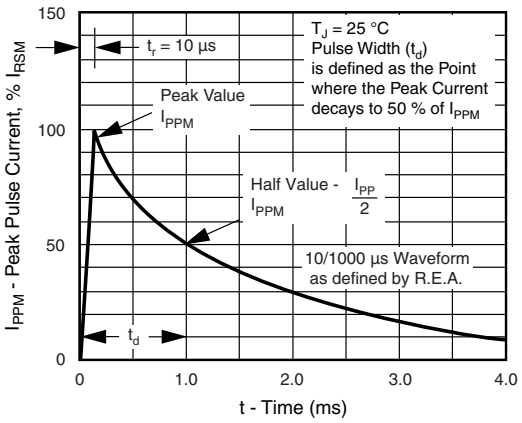



Fig. 3 - Pulse Waveform

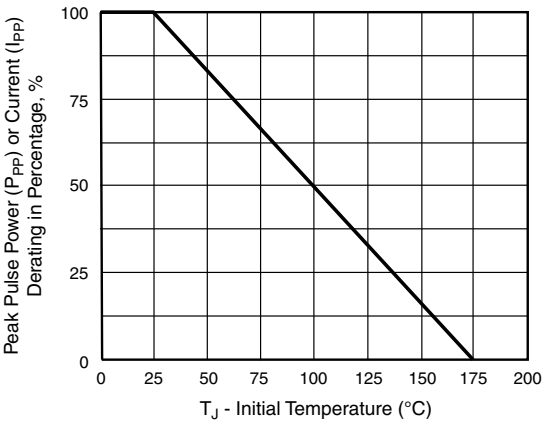



Fig. 2 - Pulse Power or Current vs. Initial Junction Temperature

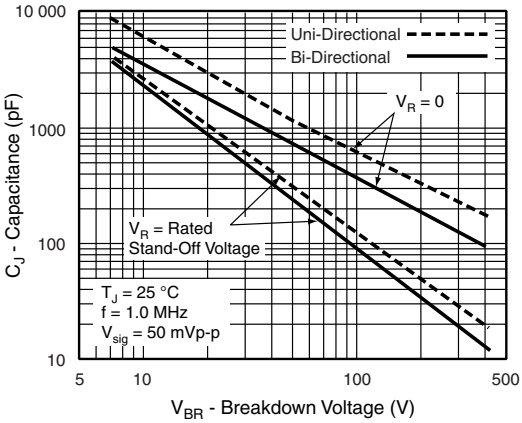



Fig. 4 - Typical Junction Capacitance


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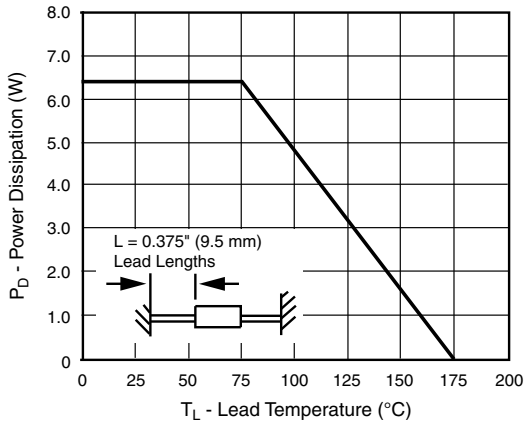



Fig. 5 - Power Derating Curve

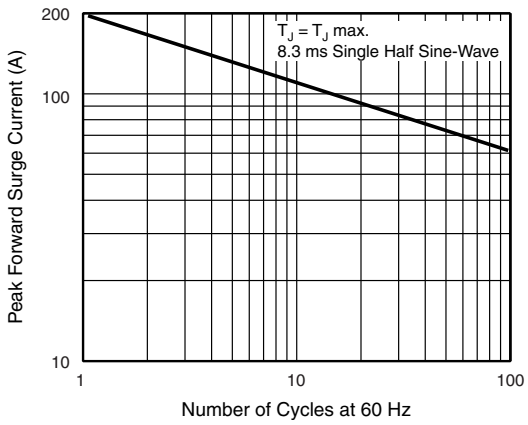



Fig. 6 - Maximum Non-Repetitive Forward Surge Current
Unidirectional only

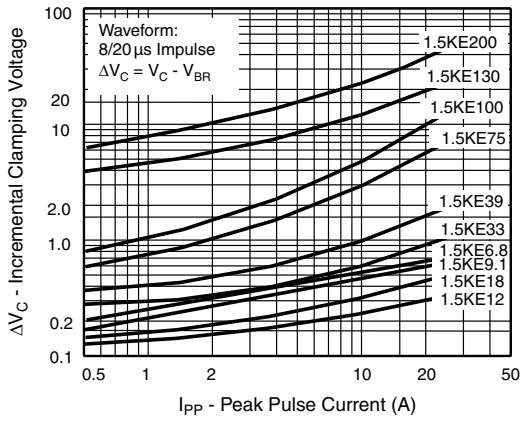



Fig. 7 - Incremental Clamping Voltage Curve (Unidirectional)

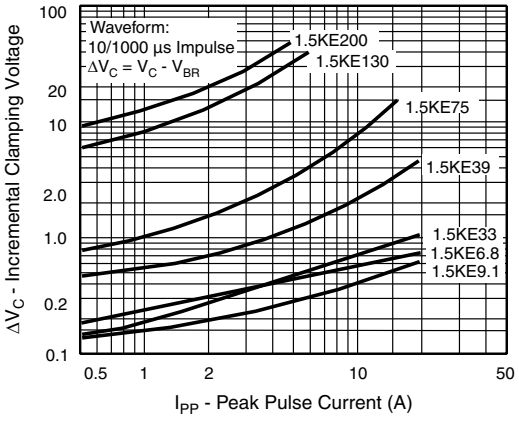



Fig. 8 - Incremental Clamping Voltage Curve (Unidirectional)

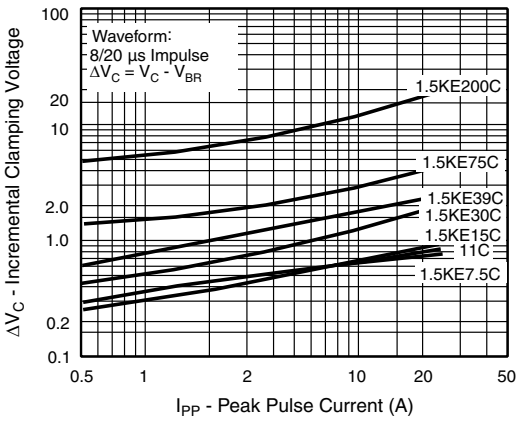



Fig. 9 - Incremental Clamping Voltage Curve (Bidirectional)

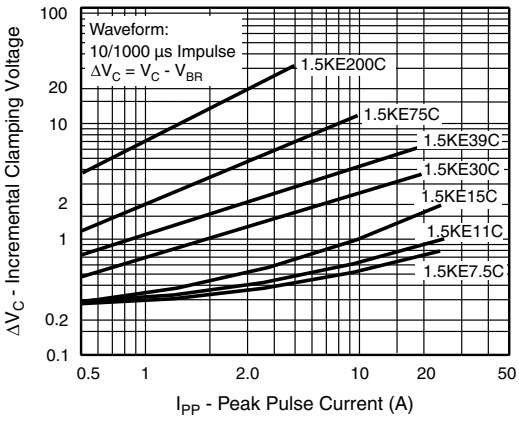



Fig. 10 - Incremental Clamping Voltage Curve (Bidirectional)


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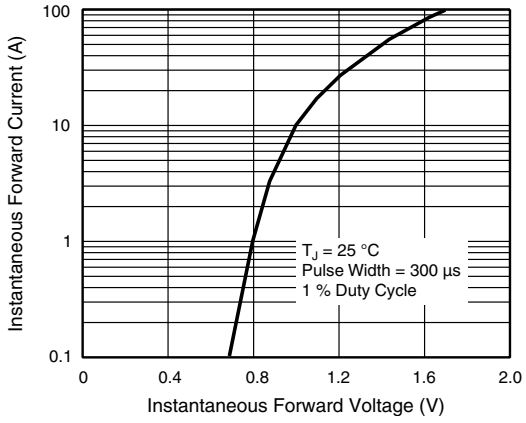



Fig. 11 - Instantaneous Forward Voltage Characteristics Curve

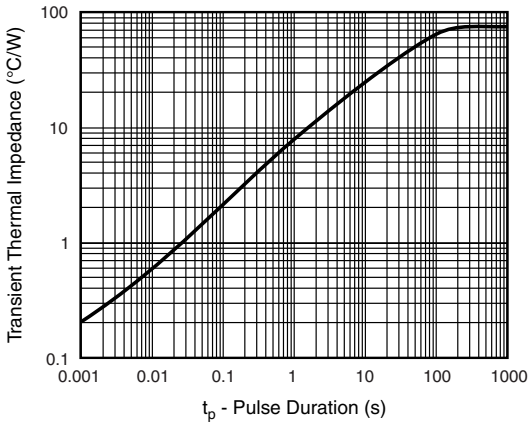
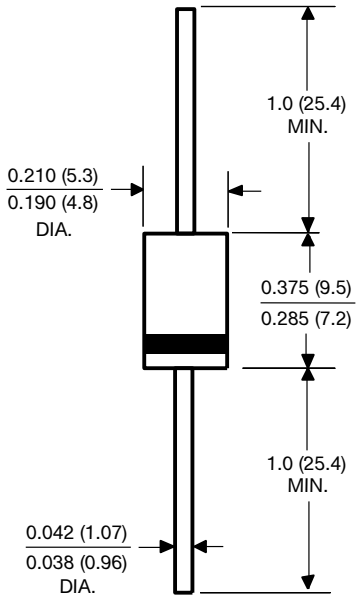



Fig. 12 - Typical Transient Thermal Impedance

## PACKAGE OUTLINE DIMENSIONS in inches (millimeters)

**Case Style 1.5KE**




## 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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