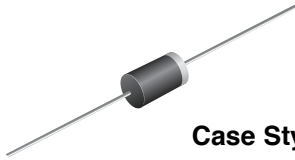


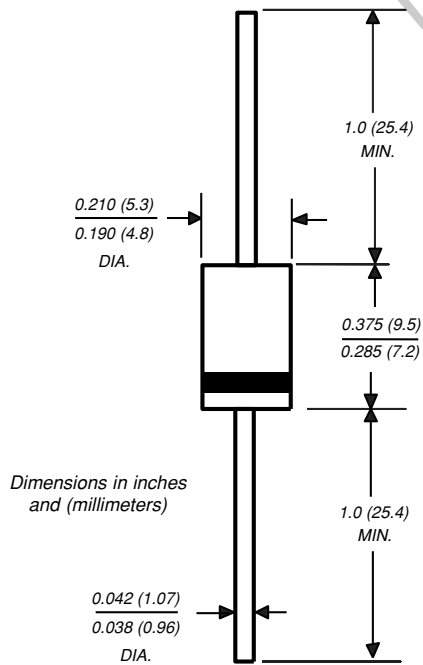


TRANSZORB® Transient Voltage Suppressors

$V_{(BR)}$ Unidirectional 6.8 to 540V
 $V_{(BR)}$ Bidirectional 6.8 to 440V
Peak Pulse Power 1500W



Case Style 1.5KE



Extended Voltage Range

Features

- Underwriters Laboratory Recognition under UL standard for safety 497B: Isolated Loop Circuit Protection
- Glass passivated junction
- 1500W peak pulse power capability on 10/1000 μ s waveform, repetition rate (duty cycle): 0.05%
- Excellent clamping capability
- Low incremental surge resistance
- Very fast response time
- Includes 1N6267 thru 1N6303A

Mechanical Data

Case: Molded plastic body over passivated junction

Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026

High temperature soldering guaranteed: 265°C/10 seconds, 0.375" (9.5mm) lead length, 5lbs. (2.3 kg) tension

Polarity: For unidirectional types the color band denotes the cathode, which is positive with respect to the anode under normal TVS operation

Mounting Position: Any **Weight:** 0.045 oz., 1.2 g

Flammability: Epoxy is rated UL 94V-0

Packaging Codes – Options (Antistatic):

- 51 – 1K per Bulk box, 10K/carton
- 54 – 1.4K per 13" paper Reel (52mm horiz. tape), 4.2K/carton
- 73 – 1K per horiz. tape & Ammo box, 10K/carton

Devices for Bidirectional Applications

For bi-directional, use C or CA suffix for types 1.5KE6.8 thru types 1.5KE440 (e.g. 1.5KE6.8C, 1.5KE440CA). Electrical characteristics apply in both directions.

Maximum Ratings and Characteristics (T_A = 25°C unless otherwise noted)

| Parameter | Symbol | Limit | Unit |
|---|------------------------------------|----------------|------|
| Peak power dissipation with a 10/1000 μ s waveform ⁽¹⁾ (Fig. 1) | PPPM | 1500 | W |
| Peak pulse current with a 10/1000 μ s waveform ⁽¹⁾ | IPPM | See Next Table | A |
| Steady state power dissipation at T _L = 75°C, lead lengths 0.375" (9.5mm) ⁽²⁾ | P _{M(AV)} | 6.5 | W |
| Peak forward surge current, 8.3ms single half sine-wave unidirectional only ⁽³⁾ | I _{FSM} | 200 | A |
| Maximum instantaneous forward voltage at 100A for unidirectional only ⁽⁴⁾ | V _F | 3.5/5.0 | V |
| Typical thermal resistance junction-to-lead | R _{θJL} | 20 | °C/W |
| Typical thermal resistance junction-to-ambient | R _{θJA} | 75 | °C/W |
| 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) Mounted on copper pad area of 1.6 x 1.6" (40 x 40mm) per Fig. 5
(3) Measured on 8.3ms single half sine-wave or equivalent square wave, duty cycle = 4 pulses per minute maximum
(4) V_F = 3.5V for 1.5KE220(A) & below; V_F = 5.0V for 1.5KE250(A) & above

1.5KE Series and 1N6267 thru 1N6303A



Vishay Semiconductors
formerly General Semiconductor

Electrical Characteristics (TA = 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 Temp. Coefficient of V _(BR) (% / °C) |
|-------------------|-----------------------------------|--|------|----------------------------------|---------------------------------------|---|--|---|---|
| | | Min | Max | | | | | | |
| 1N6267 | +1.5KE6.8 | 6.12 | 7.48 | 10 | 5.50 | 1000 | 139 | 10.8 | 0.057 |
| 1N6267A | +1.5KE6.8A | 6.45 | 7.14 | 10 | 5.80 | 1000 | 143 | 10.5 | 0.057 |
| 1N6268 | +1.5KE7.5 | 6.75 | 8.25 | 10 | 6.05 | 500 | 128 | 11.7 | 0.061 |
| 1N6268A | +1.5KE7.5A | 7.13 | 7.88 | 10 | 6.40 | 500 | 133 | 11.3 | 0.061 |
| 1N6269 | +1.5KE8.2 | 7.38 | 9.02 | 10 | 6.63 | 200 | 120 | 12.5 | 0.065 |
| 1N6269A | +1.5KE8.2A | 7.79 | 8.61 | 10 | 7.02 | 200 | 124 | 12.1 | 0.065 |
| 1N6270 | +1.5KE9.1 | 8.19 | 10.0 | 1.0 | 7.37 | 50 | 109 | 13.8 | 0.068 |
| 1N6270A | +1.5KE9.1A | 8.65 | 9.55 | 1.0 | 7.78 | 50 | 112 | 13.4 | 0.068 |
| 1N6271 | +1.5KE10 | 9.00 | 11.0 | 1.0 | 8.10 | 10 | 100 | 15.0 | 0.073 |
| 1N6271A | +1.5KE10A | 9.50 | 10.5 | 1.0 | 8.55 | 10 | 103 | 14.5 | 0.073 |
| 1N6272 | +1.5KE11 | 9.90 | 12.1 | 1.0 | 8.92 | 5.0 | 92.6 | 16.2 | 0.075 |
| 1N6272A | +1.5KE11A | 10.5 | 11.6 | 1.0 | 9.40 | 5.0 | 96.2 | 15.6 | 0.075 |
| 1N6273 | +1.5KE12 | 10.8 | 13.2 | 1.0 | 9.72 | 5.0 | 86.7 | 17.3 | 0.076 |
| 1N6273A | +1.5KE12A | 11.4 | 12.6 | 1.0 | 10.2 | 5.0 | 89.8 | 16.7 | 0.078 |
| 1N6274 | +1.5KE13 | 11.7 | 14.3 | 1.0 | 10.5 | 5.0 | 78.9 | 19.0 | 0.081 |
| 1N6274A | +1.5KE13A | 12.4 | 13.7 | 1.0 | 11.1 | 5.0 | 82.4 | 18.2 | 0.081 |
| 1N6275 | +1.5KE15 | 13.5 | 16.5 | 1.0 | 12.1 | 1.0 | 68.2 | 22.0 | 0.084 |
| 1N6275A | +1.5KE15A | 14.3 | 15.8 | 1.0 | 12.8 | 1.0 | 70.8 | 21.2 | 0.084 |
| 1N6276 | +1.5KE16 | 14.4 | 17.6 | 1.0 | 12.9 | 1.0 | 63.8 | 23.5 | 0.086 |
| 1N6276A | +1.5KE16A | 15.2 | 16.8 | 1.0 | 13.6 | 1.0 | 66.7 | 22.5 | 0.086 |
| 1N6277 | +1.5KE18 | 16.2 | 19.8 | 1.0 | 14.5 | 1.0 | 56.6 | 26.5 | 0.088 |
| 1N6277A | +1.5KE18A | 17.1 | 18.9 | 1.0 | 15.3 | 1.0 | 59.5 | 25.2 | 0.089 |
| 1N6278 | +1.5KE20 | 18.0 | 22.0 | 1.0 | 16.2 | 1.0 | 51.5 | 29.1 | 0.090 |
| 1N6278A | +1.5KE20A | 19.0 | 21.0 | 1.0 | 17.1 | 1.0 | 54.2 | 27.7 | 0.090 |
| 1N6279 | +1.5KE22 | 19.8 | 24.2 | 1.0 | 17.8 | 1.0 | 47.0 | 31.9 | 0.092 |
| 1N6279A | +1.5KE22A | 20.9 | 23.1 | 1.0 | 18.8 | 1.0 | 49.0 | 30.6 | 0.092 |
| 1N6280 | +1.5KE24 | 21.6 | 26.4 | 1.0 | 19.4 | 1.0 | 43.2 | 34.7 | 0.094 |
| 1N6280A | +1.5KE24A | 22.8 | 25.2 | 1.0 | 20.5 | 1.0 | 45.2 | 33.2 | 0.094 |
| 1N6281 | +1.5KE27 | 24.3 | 29.7 | 1.0 | 21.8 | 1.0 | 38.4 | 39.1 | 0.096 |
| 1N6281A | +1.5KE27A | 25.7 | 28.4 | 1.0 | 23.1 | 1.0 | 40.0 | 37.5 | 0.096 |
| 1N6282 | +1.5KE30 | 27.0 | 33.0 | 1.0 | 24.3 | 1.0 | 34.5 | 43.5 | 0.097 |
| 1N6282A | +1.5KE30A | 28.5 | 31.5 | 1.0 | 25.6 | 1.0 | 36.2 | 41.4 | 0.097 |
| 1N6283 | +1.5KE33 | 29.7 | 36.3 | 1.0 | 26.8 | 1.0 | 31.4 | 47.7 | 0.098 |
| 1N6283A | +1.5KE33A | 31.4 | 34.7 | 1.0 | 28.2 | 1.0 | 32.8 | 45.7 | 0.098 |
| 1N6284 | +1.5KE36 | 32.4 | 39.6 | 1.0 | 29.1 | 1.0 | 28.8 | 52.0 | 0.099 |
| 1N6284A | +1.5KE36A | 34.2 | 37.8 | 1.0 | 30.8 | 1.0 | 30.1 | 49.9 | 0.099 |
| 1N6285 | +1.5KE39 | 35.1 | 42.9 | 1.0 | 31.6 | 1.0 | 26.6 | 56.4 | 0.100 |
| 1N6285A | +1.5KE39A | 37.1 | 41.0 | 1.0 | 33.3 | 1.0 | 27.8 | 53.9 | 0.100 |
| 1N6286 | +1.5KE43 | 38.7 | 47.3 | 1.0 | 34.8 | 1.0 | 24.2 | 61.9 | 0.101 |
| 1N6286A | +1.5KE43A | 40.9 | 45.2 | 1.0 | 36.8 | 1.0 | 25.3 | 59.3 | 0.101 |
| 1N6287 | +1.5KE47 | 42.3 | 51.7 | 1.0 | 38.1 | 1.0 | 22.1 | 67.8 | 0.101 |
| 1N6287A | +1.5KE47A | 44.7 | 49.4 | 1.0 | 40.2 | 1.0 | 23.1 | 64.8 | 0.101 |
| 1N6288 | +1.5KE51 | 45.9 | 56.1 | 1.0 | 41.3 | 1.0 | 20.4 | 73.5 | 0.102 |
| 1N6288A | +1.5KE51A | 48.5 | 53.6 | 1.0 | 43.6 | 1.0 | 21.4 | 70.1 | 0.102 |
| 1N6289 | +1.5KE56 | 50.4 | 61.8 | 1.0 | 45.4 | 1.0 | 18.6 | 80.5 | 0.103 |
| 1N6289A | +1.5KE56A | 53.2 | 58.8 | 1.0 | 47.8 | 1.0 | 19.5 | 77.0 | 0.103 |
| 1N6290 | +1.5KE62 | 55.8 | 68.2 | 1.0 | 50.2 | 1.0 | 16.9 | 89.0 | 0.104 |
| 1N6290A | +1.5KE62A | 58.9 | 65.1 | 1.0 | 53.0 | 1.0 | 17.6 | 85.0 | 0.104 |
| 1N6291 | +1.5KE68 | 61.2 | 74.8 | 1.0 | 55.1 | 1.0 | 15.3 | 98.0 | 0.104 |
| 1N6291A | +1.5KE68A | 64.6 | 71.4 | 1.0 | 58.1 | 1.0 | 16.3 | 92.0 | 0.104 |
| 1N6292 | +1.5KE75 | 67.5 | 82.5 | 1.0 | 60.7 | 1.0 | 13.9 | 109 | 0.105 |



Electrical Characteristics (Cont'd) (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 Temp. Coefficient of V _(BR) (% / °C) |
|-------------------|-----------------------------------|--|-------|----------------------------------|---------------------------------------|---|--|---|---|
| | | Min | Max | | | | | | |
| 1N6292A | +1.5KE75A | 71.3 | 78.8 | 1.0 | 64.1 | 1.0 | 14.6 | 104 | 0.105 |
| 1N6293 | +1.5KE82 | 73.8 | 90.2 | 1.0 | 66.4 | 1.0 | 12.7 | 118 | 0.105 |
| 1N6293A | +1.5KE82A | 77.9 | 86.1 | 1.0 | 70.1 | 1.0 | 13.3 | 113 | 0.105 |
| 1N6294 | +1.5KE91 | 81.9 | 100.0 | 1.0 | 73.7 | 1.0 | 11.5 | 131 | 0.106 |
| 1N6294A | +1.5KE91A | 86.5 | 95.5 | 1.0 | 77.8 | 1.0 | 12.0 | 125 | 0.106 |
| 1N6295 | +1.5KE100 | 90.0 | 110 | 1.0 | 81.0 | 1.0 | 10.4 | 144 | 0.106 |
| 1N6295A | +1.5KE100A | 95.0 | 105 | 1.0 | 85.5 | 1.0 | 10.9 | 137 | 0.106 |
| 1N6296 | +1.5KE110 | 99.0 | 121 | 1.0 | 89.2 | 1.0 | 9.5 | 158 | 0.107 |
| 1N6296A | +1.5KE 110A | 105 | 116 | 1.0 | 94.0 | 1.0 | 9.9 | 152 | 0.107 |
| 1N6297 | +1.5KE120 | 108 | 132 | 1.0 | 97.2 | 1.0 | 8.7 | 173 | 0.107 |
| 1N6297A | +1.5KE120A | 114 | 126 | 1.0 | 102 | 1.0 | 9.1 | 165 | 0.107 |
| 1N6298 | +1.5KE130 | 117 | 143 | 1.0 | 105 | 1.0 | 8.0 | 187 | 0.107 |
| 1N6298A | +1.5KE130A | 124 | 137 | 1.0 | 111 | 1.0 | 8.4 | 179 | 0.107 |
| 1N6299 | +1.5KE150 | 136 | 165 | 1.0 | 121 | 1.0 | 7.0 | 215 | 0.108 |
| 1N6299A | +1.5KE150A | 143 | 158 | 1.0 | 128 | 1.0 | 7.2 | 207 | 0.106 |
| 1N6300 | +1.5KE160 | 144 | 176 | 1.0 | 130 | 1.0 | 6.5 | 230 | 0.106 |
| 1N6300A | +1.5KE160A | 152 | 168 | 1.0 | 136 | 1.0 | 6.8 | 219 | 0.108 |
| 1N6301 | +1.5KE170 | 153 | 187 | 1.0 | 138 | 1.0 | 6.1 | 244 | 0.108 |
| 1N6301A | +1.5KE170A | 162 | 179 | 1.0 | 145 | 1.0 | 6.4 | 234 | 0.108 |
| 1N6302 | 1.5KE180 | 162 | 198 | 1.0 | 146 | 1.0 | 5.8 | 258 | 0.108 |
| 1N6302A | 1.5KE180A | 171 | 189 | 1.0 | 154 | 1.0 | 6.1 | 246 | 0.108 |
| 1N6303 | 1.5KE200 | 180 | 220 | 1.0 | 162 | 1.0 | 5.2 | 287 | 0.108 |
| 1N6303A | 1.5KE200A* | 190 | 210 | 1.0 | 171 | 1.0 | 5.5 | 274 | 0.108 |
| | 1.5KE220 | 198 | 242 | 1.0 | 175 | 1.0 | 4.4 | 344 | 0.108 |
| | 1.5KE220A* | 209 | 231 | 1.0 | 185 | 1.0 | 4.6 | 328 | 0.108 |
| | 1.5KE250 | 225 | 275 | 1.0 | 202 | 1.0 | 4.2 | 360 | 0.110 |
| | 1.5KE250A | 237 | 263 | 1.0 | 214 | 1.0 | 4.4 | 344 | 0.110 |
| | 1.5KE300 | 270 | 330 | 1.0 | 243 | 1.0 | 3.5 | 430 | 0.110 |
| | 1.5KE300A | 285 | 315 | 1.0 | 256 | 1.0 | 3.6 | 414 | 0.110 |
| | 1.5KE350 | 315 | 385 | 1.0 | 284 | 1.0 | 3.0 | 504 | 0.110 |
| | 1.5KE350A | 333 | 368 | 1.0 | 300 | 1.0 | 3.1 | 482 | 0.110 |
| | 1.5KE400 | 360 | 440 | 1.0 | 324 | 1.0 | 2.6 | 574 | 0.110 |
| | 1.5KE400A | 380 | 420 | 1.0 | 342 | 1.0 | 2.7 | 548 | 0.110 |
| | 1.5KE440 | 396 | 484 | 1.0 | 356 | 1.0 | 2.4 | 631 | 0.110 |
| | 1.5KE440A | 418 | 462 | 1.0 | 376 | 1.0 | 2.5 | 602 | 0.110 |
| | 1.5KE480 | 432 | 528 | 1.0 | 389 | 1.0 | 2.19 | 686 | 0.110 |
| | 1.5KE480A | 456 | 504 | 1.0 | 408 | 1.0 | 2.28 | 658 | 0.110 |
| | 1.5KE510 | 459 | 561 | 1.0 | 413 | 1.0 | 2.06 | 729 | 0.110 |
| | 1.5KE510A | 485 | 535 | 1.0 | 434 | 1.0 | 2.15 | 698 | 0.110 |
| | 1.5KE540 | 486 | 594 | 1.0 | 437 | 1.0 | 1.94 | 772 | 0.110 |
| | 1.5KE540A | 513 | 567 | 1.0 | 459 | 1.0 | 2.03 | 740 | 0.110 |

Notes: (1) Pulse test: t_p ≤ 50ms

(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 volts and less the I_D limit is doubled

* Bidirectional versions are UL approved under component across the line protection, ULV1414 file number E108274 (1.5KE200CA, 1.5KE220CA)

+ Underwriters Laboratory Recognition for the classification of protectors (QVQG2) under the UL standard for safety 497B and file number E136766 for both uni-directional and bi-directional devices

Application

- 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 watts for one millisecond. The response time of TVS diode clamping action is effectively instantaneous (1 x 10⁻⁹ seconds bidirectional); 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.

1.5KE Series and 1N6267 thru 1N6303A



Vishay Semiconductors
formerly General Semiconductor

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

Fig. 1 – Peak Pulse Power Rating Curve

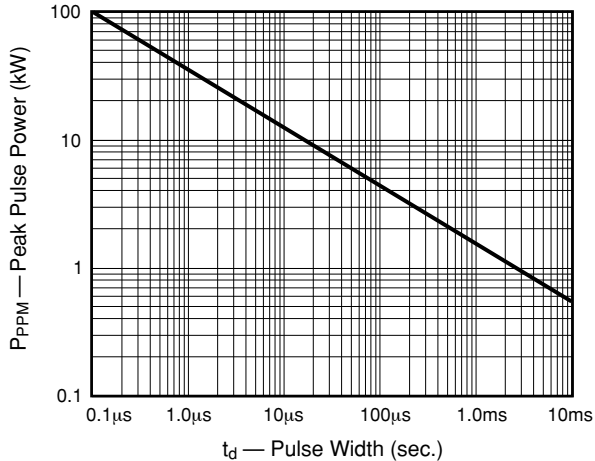


Fig. 2 – Pulse Derating Curve

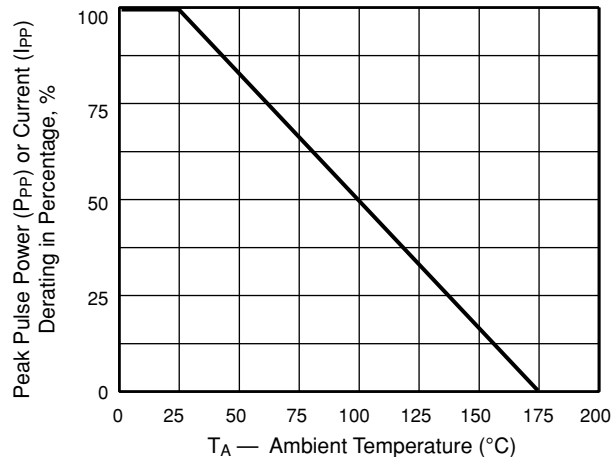


Fig. 3 – Pulse Waveform

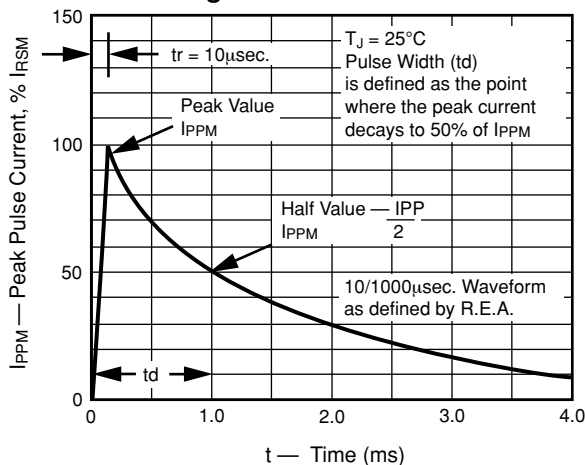


Fig. 4 - Typical Junction Capacitance

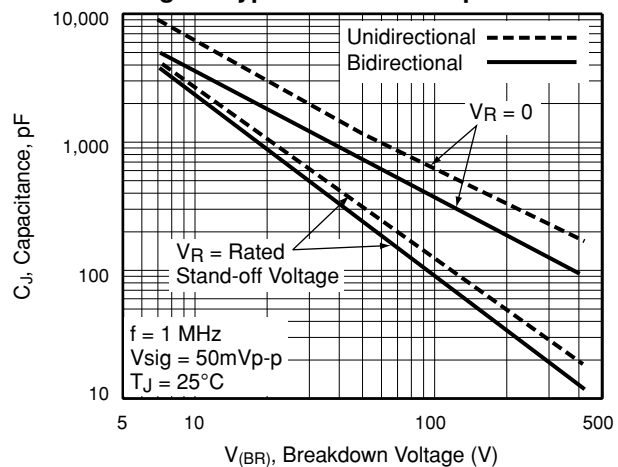


Fig. 5 – Steady State Power Derating Curve

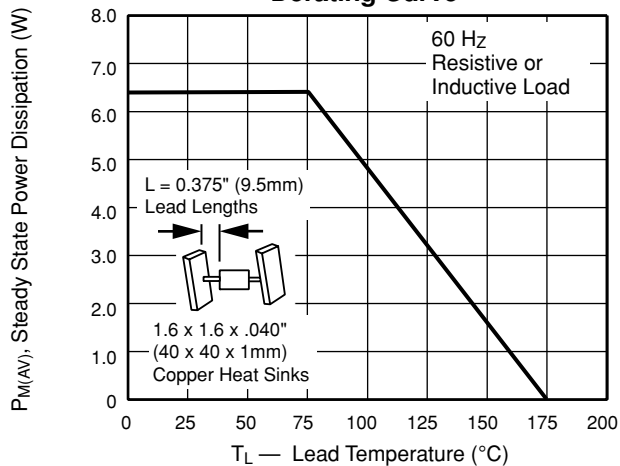
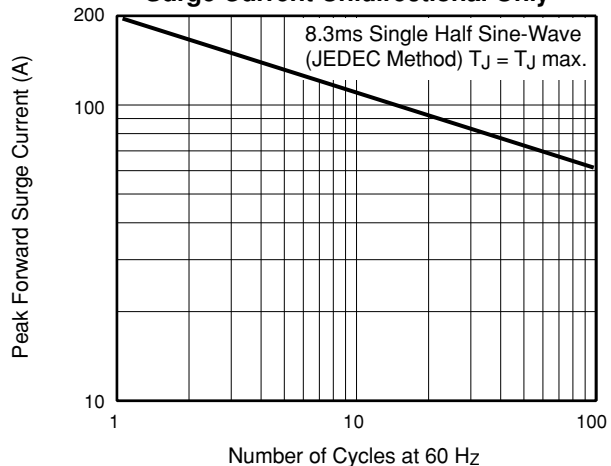


Fig. 6 - Maximum Non-repetitive Peak Forward Surge Current Unidirectional Only





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

Fig. 7 – Incremental Clamping Voltage Curve (Unidirectional)

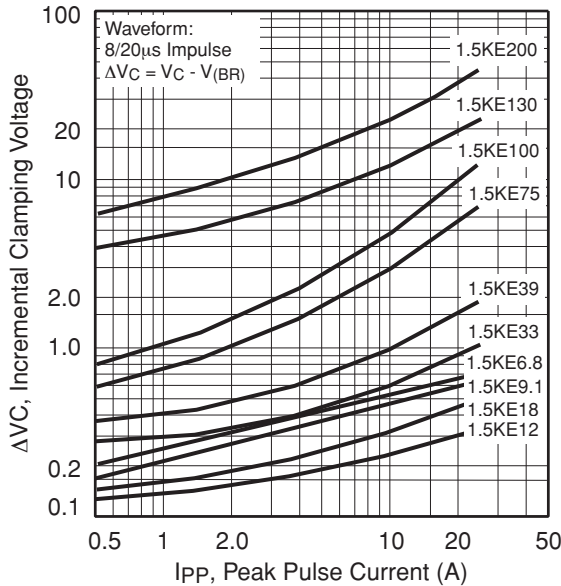


Fig. 8 – Incremental Clamping Voltage Curve (Unidirectional)

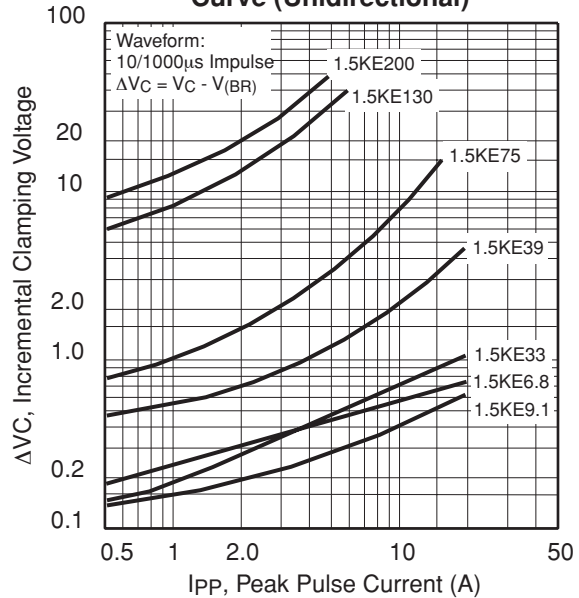


Fig. 7 – Incremental Clamping Voltage Curve (Bidirectional)

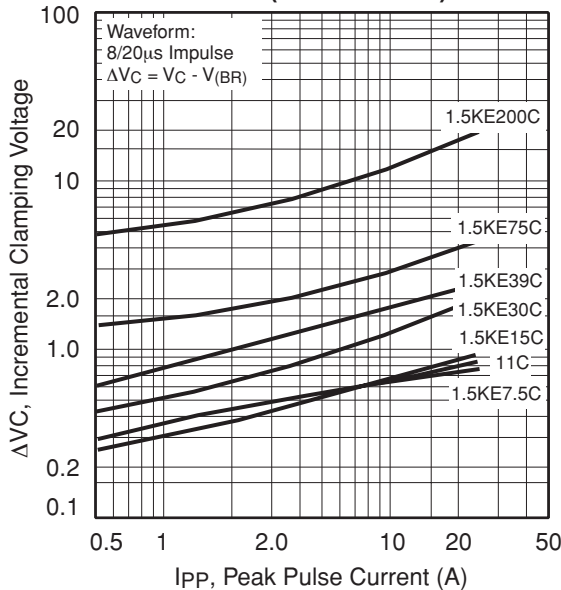
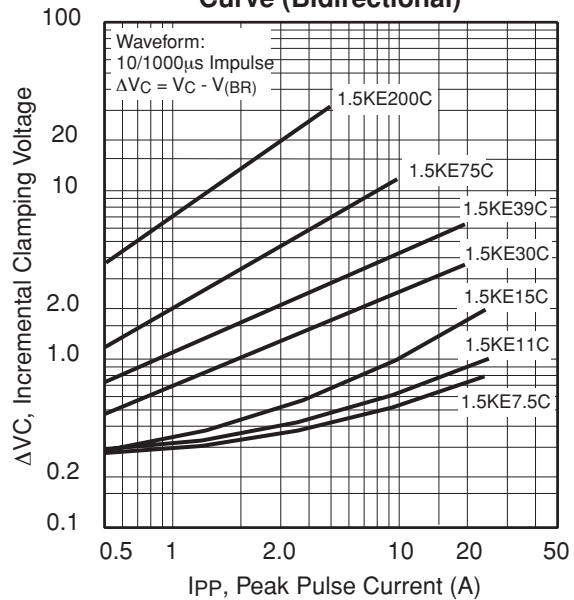


Fig. 10 – Incremental Clamping Voltage Curve (Bidirectional)



1.5KE Series and 1N6267 thru 1N6303A



Vishay Semiconductors
formerly General Semiconductor

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

Fig. 11 – Instantaneous Forward Voltage Characteristics Curve

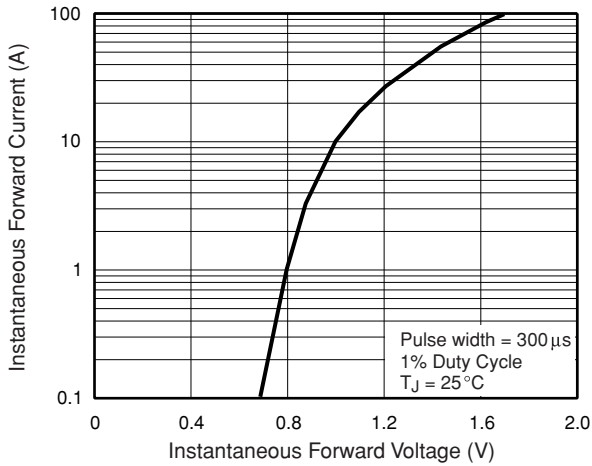


Fig. 12 – Typical Transient Thermal Impedance

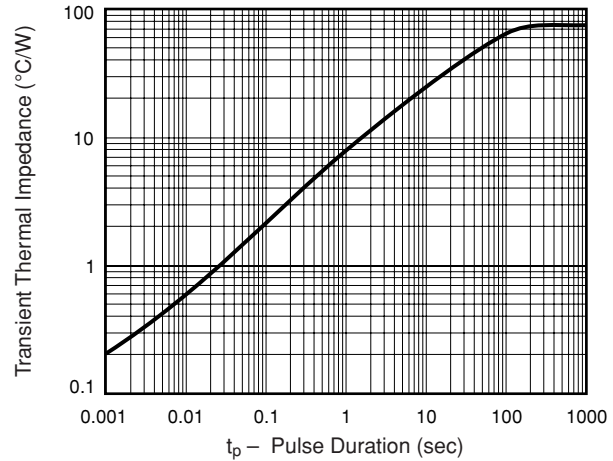


Fig. 13 – Typical Reverse Leakage Characteristics

