



PROTEK DEVICES®

..... Engineered solutions for the transient environment

TVS

Transient Voltage Suppressors
SMCJ5.0
thru
SMCJ170CA

DESCRIPTION

This TVS family is a series of silicon transient voltage suppressors for use in applications where large voltage transients can permanently damage voltage sensitive components.

TVS diodes are characterized by their high surge capability, extremely fast response time, and low impedance, (R_{on}). Because of the unpredictable nature of transients, and the variation of the impedance with respect to these transients, impedance, per se, is not a specified parametric value. However, a minimum voltage (V_{BR}) at low current conditions and a maximum clamping voltage (V_C) at a maximum peak pulse current is specified. In addition, a maximum clamping ratio is indicated. In some instances, the thermal effect (see V_C Clamping Voltage) may be responsible for 50 to 70 percent of the observed voltage differential when subjected to high current pulses or severe duty cycles, thus making maximum impedance specification insignificant. Curves depicting clamping voltage vs. various current pulses are available from the factory. Extended power curves vs. pulse time are also available.

This TVS series has a peak pulse power rating of 1500 watts for one millisecond and therefore can be used in applications where induced lightning on rural or remote transmission lines present a hazard to electronic circuitry. The response time of TVS clamping action is theoretically instantaneous (1×10^{-12} sec); therefore, they can protect Integrated Circuits, MOS devices, Hybrids, and other voltage-sensitive semiconductors and components. TVSs can also be used in series or parallel to increase the peak power ratings (contact the factory for details). This is only one of many series of Transient Voltage Suppressors available from ProTek Devices.

FEATURES

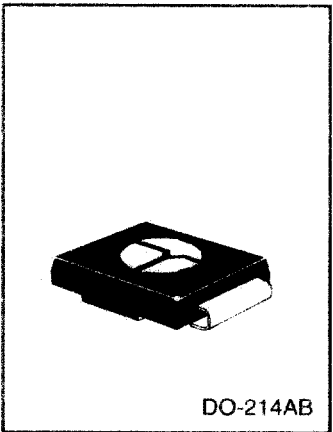
- 1500 watts peak power dissipation
- Available in ranges from 5.0 to 170 V_{WM}
- Unidirectional and Bidirectional Device Types
- Low Inductance
- UL 94V-0 Flammability Classification

MAXIMUM RATINGS

- 1500 Watts of Peak Pulse Power dissipation at 25°C (see Figure 1)
- Operating and Storage temperatures: -55° to +150°C
- Forward surge rating: 200 amps, 1/120 second at 25°C
- Steady State power dissipation: 5.0 watts $T_L = 75^\circ C$
- Repetition rate (duty cycle): .01%
- $t_{clamping}$ (0 volts V_{BR} min): Less than 1×10^{-12} seconds (10×10^{-9} for bidirectional)

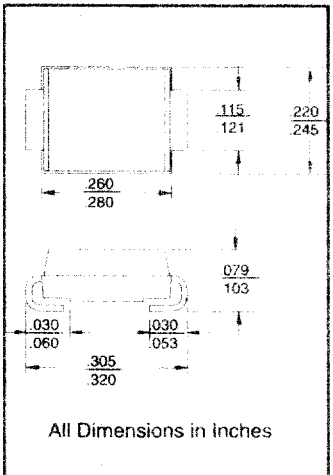
MECHANICAL CHARACTERISTICS

- Molded Surface Mountable case
- Standard Packaging: 16 mm tape (EIA Std. RS-481)
- Positive terminal marked with polarity band (except Bidirectional) or notch (Top Surface)
- Body marked with Logo and type code (see part list)



DO-214AB

Discrete TVS Diodes



All Dimensions in Inches

FIGURE 1 Peak Pulse Power Vs Pulse Time

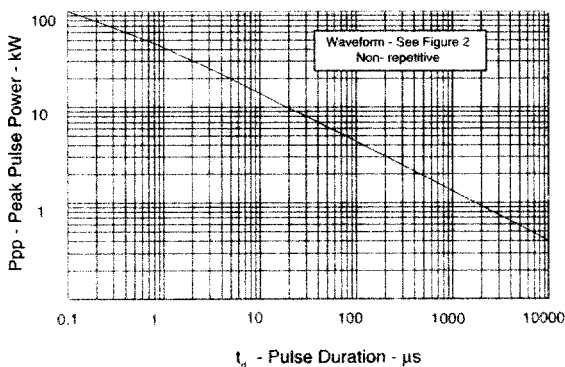


FIGURE 2 Pulse Wave Form

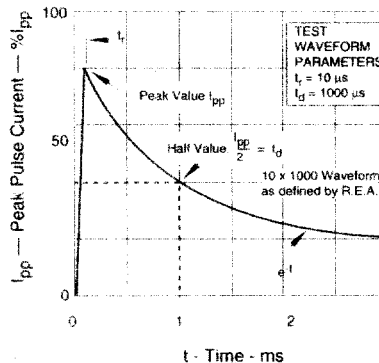
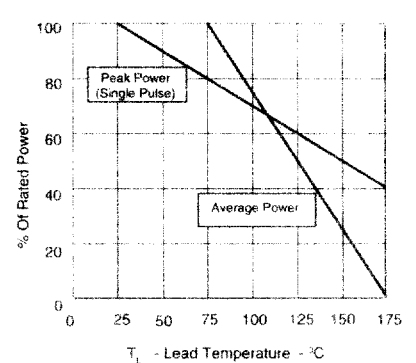


FIGURE 3 Power Derating Curve



PROTEK DEVICES

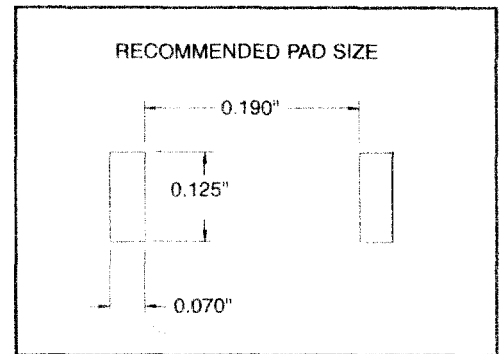
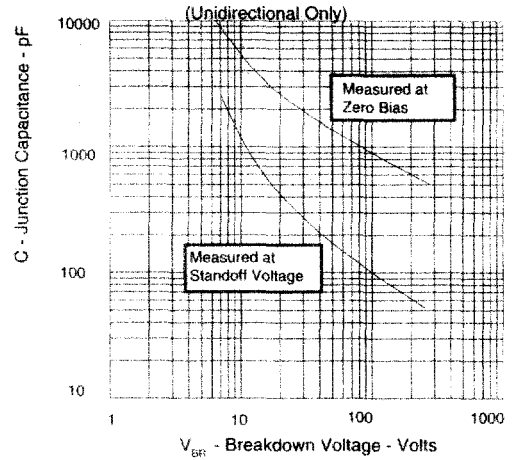
5929 S Fair Lane • Tempe, Arizona 85282 • USA
Tel: 602-431-8701 • Fax: 602-431-2288

E-mail: sales@protek-tvs.com

ELECTRICAL CHARACTERISTICS @ 25°C

| PROTEK TYPE NUMBER | DEVICE MARKING CODE (Note 4) | DEVICE MARKING CODE (Note 5) | RATED STAND-OFF VOLTAGE (See Note 1) V _{WM} VOLTS | BREAKDOWN VOLTAGE | | MAXIMUM STANDBY CURRENT @ V _{WM} I _D µA | MAXIMUM CLAMPING VOLTAGE @ I _{PP} (See Fig 2) V _C VOLTS | MAXIMUM PEAK PULSE CURRENT (See Fig. 2) I _{PP} A | MAXIMUM TEMPERATURE COEFFICIENT OF V _{BR} mV/°C |
|--------------------|---------------------------------|---------------------------------|---|--------------------------|------------------------|--|---|--|---|
| | | | | V _{BR} VOLTS | @ I _T mA | | | | |
| P SMCJ5.0 | GDD | | 5.0 | 6.40 | 10 | 1000 | 9.6 | 156.2 | 5.0 |
| P SMCJ5.0A | GDE | | 5.0 | 6.40 | 10 | 1000 | 9.2 | 163.0 | 5.0 |
| P SMCJ6.0 | GDF | BDF | 6.0 | 6.67 | 10 | 1000 | 11.4 | 131.6 | 5.0 |
| P SMCJ6.0A | GDG | BDG | 6.0 | 6.67 | 10 | 1000 | 10.3 | 145.6 | 5.0 |
| SMCJ6.5 | GDH | BDH | 6.5 | 7.22 | 10 | 500 | 12.3 | 122.0 | 5.0 |
| SMCJ6.5A | GDK | BDK | 6.5 | 7.22 | 10 | 500 | 11.2 | 133.9 | 5.0 |
| SMCJ7.0 | GDL | BDL | 7.0 | 7.78 | 10 | 200 | 13.3 | 112.8 | 6.0 |
| SMCJ7.0A | GDM | BDM | 7.0 | 7.78 | 10 | 200 | 12.0 | 125.0 | 6.0 |
| SMCJ7.5 | GDN | BDN | 7.5 | 8.33 | 1 | 100 | 14.3 | 104.9 | 7.0 |
| SMCJ7.5A | GDP | BDP | 7.5 | 8.33 | 1 | 100 | 12.9 | 116.3 | 7.0 |
| P SMCJ8.0 | GDO | BDO | 8.0 | 8.89 | 1 | 50 | 15.0 | 100.0 | 7.0 |
| P SMCJ8.0A | GDR | BDR | 8.0 | 8.89 | 1 | 50 | 13.6 | 110.3 | 7.0 |
| SMCJ8.5 | GDS | BDS | 8.5 | 9.44 | 1 | 25 | 15.9 | 94.3 | 8.0 |
| SMCJ8.5A | GDT | BDT | 8.5 | 9.44 | 1 | 25 | 14.4 | 104.2 | 8.0 |
| SMCJ9.0 | GDU | BDU | 9.0 | 10.0 | 1 | 10 | 16.9 | 88.7 | 9.0 |
| SMCJ9.0A | GDV | BDV | 9.0 | 10.0 | 1 | 10 | 15.4 | 97.4 | 9.0 |
| P SMCJ10 | GDW | BDW | 10 | 11.1 | 1 | 5 | 18.8 | 79.8 | 10 |
| P SMCJ10A | GDX | BDX | 10 | 11.1 | 1 | 5 | 17.0 | 88.2 | 10 |
| P SMCJ11 | GDY | BDY | 11 | 12.2 | 1 | 5 | 20.1 | 74.6 | 11 |
| P SMCJ11A | GDZ | BDZ | 11 | 12.2 | 1 | 5 | 18.2 | 82.4 | 11 |
| P SMCJ12 | GED | BED | 12 | 13.3 | 1 | 5 | 22.0 | 68.2 | 12 |
| P SMCJ12A | GEE | BEE | 12 | 13.3 | 1 | 5 | 19.9 | 75.3 | 12 |
| P SMCJ13 | GEF | BEF | 13 | 14.4 | 1 | 5 | 23.8 | 63.0 | 13 |
| P SMCJ13A | GEG | BEG | 13 | 14.4 | 1 | 5 | 21.5 | 69.7 | 13 |
| SMCJ14 | GEH | BEH | 14 | 15.6 | 1 | 5 | 25.8 | 58.1 | 14 |
| SMCJ14A | GEK | BEK | 14 | 15.6 | 1 | 5 | 23.2 | 64.7 | 14 |
| P SMCJ15 | GEL | BEL | 15 | 16.7 | 1 | 5 | 26.9 | 55.8 | 16 |
| P SMCJ15A | GEM | BEM | 15 | 16.7 | 1 | 5 | 24.4 | 61.5 | 16 |
| SMCJ16 | GEN | BEN | 16 | 17.8 | 1 | 5 | 28.8 | 52.1 | 19 |
| SMCJ16A | GEP | BEP | 16 | 17.8 | 1 | 5 | 26.0 | 57.7 | 17 |
| SMCJ18 | GES | BES | 18 | 18.9 | 1 | 5 | 32.2 | 46.6 | 21 |
| SMCJ18A | GET | BET | 18 | 18.9 | 1 | 5 | 29.9 | 51.4 | 20 |
| P SMCJ20 | GEU | BEU | 20 | 22.2 | 1 | 5 | 35.8 | 41.9 | 25 |
| P SMCJ20A | GEV | BEV | 20 | 22.2 | 1 | 5 | 32.4 | 46.3 | 23 |
| P SMCJ24 | GEY | BEY | 24 | 26.7 | 1 | 5 | 43.0 | 34.9 | 31 |
| P SMCJ24A | GEZ | BEZ | 24 | 26.7 | 1 | 5 | 38.9 | 36.6 | 28 |
| P SMCJ26 | GFD | BFD | 26 | 28.9 | 1 | 5 | 46.6 | 32.2 | 31 |
| P SMCJ26A | GFE | BFE | 26 | 28.9 | 1 | 5 | 42.1 | 35.6 | 30 |
| P SMCJ28 | GFF | BFF | 28 | 31.1 | 1 | 5 | 50.0 | 30.0 | 35 |
| P SMCJ28A | GFG | BFG | 28 | 31.1 | 1 | 5 | 45.4 | 33.0 | 31 |
| SMCJ30 | GFH | BFH | 30 | 33.3 | 1 | 5 | 53.5 | 28.0 | 39 |
| SMCJ30A | GFK | BFK | 30 | 33.3 | 1 | 5 | 48.4 | 31.0 | 36 |
| SMCJ33 | GFL | BFL | 33 | 36.7 | 1 | 5 | 59.0 | 25.2 | 42 |
| SMCJ33A | GFM | BFM | 33 | 36.7 | 1 | 5 | 53.3 | 28.1 | 39 |
| P SMCJ36 | GFN | BFN | 36 | 40.0 | 1 | 5 | 64.3 | 23.3 | 46 |
| P SMCJ36A | GFP | BFP | 36 | 40.0 | 1 | 5 | 58.1 | 25.8 | 41 |
| SMCJ40 | GFQ | BFQ | 40 | 44.4 | 1 | 5 | 71.4 | 21.0 | 51 |
| SMCJ40A | GFR | BFR | 40 | 44.4 | 1 | 5 | 64.5 | 23.2 | 46 |
| SMCJ43 | GFS | BFS | 43 | 47.8 | 1 | 5 | 76.7 | 19.6 | 55 |
| SMCJ43A | GFT | BFT | 43 | 47.8 | 1 | 5 | 69.4 | 21.6 | 50 |
| SMCJ45 | GFU | BFU | 45 | 50.0 | 1 | 5 | 80.3 | 18.7 | 58 |
| SMCJ45A | GFV | BFV | 45 | 50.0 | 1 | 5 | 72.7 | 20.6 | 52 |
| SMCJ48 | GFW | BFW | 48 | 53.3 | 1 | 5 | 85.5 | 17.5 | 63 |
| SMCJ48A | GFY | BFY | 48 | 53.3 | 1 | 5 | 77.4 | 19.4 | 56 |
| SMCJ54 | GGD | BGD | 54 | 60.0 | 1 | 5 | 96.3 | 15.6 | 71 |
| SMCJ54A | GGE | BGE | 54 | 60.0 | 1 | 5 | 87.1 | 17.2 | 65 |
| P SMCJ58 | GGF | BGF | 58 | 64.4 | 1 | 5 | 103.0 | 14.6 | 78 |
| P SMCJ58A | GGG | BGG | 58 | 64.4 | 1 | 5 | 93.6 | 16.0 | 70 |
| SMCJ60 | GGH | BGH | 60 | 66.7 | 1 | 5 | 107.0 | 14.0 | 80 |
| SMCJ60A | G GK | BGK | 60 | 66.7 | 1 | 5 | 96.8 | 15.5 | 71 |
| SMCJ64 | GGL | BGL | 64 | 71.1 | 1 | 5 | 114.0 | 13.2 | 86 |
| SMCJ64A | GGM | BGM | 64 | 71.1 | 1 | 5 | 103.0 | 14.6 | 76 |
| SMCJ70 | GGN | BGN | 70 | 77.8 | 1 | 5 | 125.0 | 12.0 | 94 |
| SMCJ70A | G GP | BGP | 70 | 77.8 | 1 | 5 | 113.0 | 13.3 | 85 |
| SMCJ78 | GGS | BGS | 78 | 86.7 | 1 | 5 | 139 | 10.6 | 105 |
| SMCJ78A | GGT | BGT | 78 | 86.7 | 1 | 5 | 126 | 11.4 | 95 |
| SMCJ85 | GGU | BGU | 85 | 94.4 | 1 | 5 | 151 | 9.9 | 114 |
| SMCJ85A | GGV | BGV | 85 | 94.4 | 1 | 5 | 137 | 10.4 | 103 |
| P SMCJ90 | GGW | BGW | 90 | 100 | 1 | 5 | 160 | 9.4 | 121 |
| P SMCJ90A | GGX | BGX | 90 | 100 | 1 | 5 | 146 | 10.3 | 110 |
| SMCJ100 | GGY | BGY | 100 | 111 | 1 | 5 | 179 | 8.4 | 135 |
| SMCJ100A | GGZ | BGZ | 100 | 111 | 1 | 5 | 162 | 9.3 | 123 |
| SMCJ110 | GHD | BHD | 110 | 122 | 1 | 5 | 196 | 7.7 | 148 |
| SMCJ110A | GHE | BHE | 110 | 122 | 1 | 5 | 177 | 8.4 | 133 |
| SMCJ120 | GHF | BHF | 120 | 133 | 1 | 5 | 214 | 7.0 | 162 |
| SMC120A | GHG | BHG | 120 | 133 | 1 | 5 | 193 | 7.9 | 146 |
| P SMCJ130 | GHH | BHH | 130 | 144 | 1 | 5 | 231 | 6.5 | 175 |
| P SMCJ130A | GHK | BHK | 130 | 144 | 1 | 5 | 209 | 7.2 | 158 |
| SMCJ150 | GHL | BHL | 150 | 167 | 1 | 5 | 268 | 5.6 | 203 |
| SMCJ150A | GHM | BHM | 150 | 167 | 1 | 5 | 243 | 6.2 | 184 |
| P SMCJ160 | GHN | BHN | 160 | 178 | 1 | 5 | 287 | 5.2 | 217 |
| P SMCJ160A | GHP | BHP | 160 | 178 | 1 | 5 | 259 | 5.8 | 196 |
| P SMCJ170 | GHQ | BHQ | 170 | 189 | 1 | 5 | 304 | 4.8 | 230 |
| P SMCJ170A | GHR | BHR | 170 | 189 | 1 | 5 | 275 | 5.5 | 208 |

FIGURE 4
TYPICAL CAPACITANCE vs BREAKDOWN VOLTAGE



NOTES

1. A TVS is normally selected according to the reverse "Stand Off Voltage" (V_a) which should be equal to or greater than the DC or continuous peak operating voltage level.
2. For Bidirectional types, 10 volts and under, the I_D limit is doubled.
3. Part numbers shown are for unidirectional devices. Add C or CA suffix to specify bidirectional devices, such as SMCJ7.5C or SMCJ7.5CA.
4. Unidirectional Marking Code
5. Bidirectional Marking Code

ABBREVIATIONS & SYMBOLS

- V_{WM}** Rated Stand-Off Voltage: Maximum working (continuous) DC or peak voltage which may be applied over the standard operating temperature range. (Note: V_{WM} is a selected device parameter and must be equal to or greater than the maximum operating voltage of the line to be protected.)
- V_{BR} (min)** Minimum Breakdown Voltage: This is the minimum voltage the device will exhibit and is used to assure that conduction does not occur prior to that voltage at 25°C.
- V_C** Maximum Clamping Voltage: The maximum peak voltage that appears across the TVS when subjected to the peak pulse current in a 1 ms time interval. The peak pulse voltages are the combination of voltage rise due to both the series resistance and the thermal rise.
- I_{PP}** Peak Pulse Current - See Figure 2
- P_p** Peak Pulse Power - See Figure 1
- I_D** Standby-Current
- I_T** Test Current

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V_p at 100 amps peak, 8.3 ms sine wave = 3.5 volts maximum (Unidirectional only) For Bidirectional Device Types: See Notes 2 and 3.

Note: P = Standard Part, for non-designated parts, contact the factory for minimum order quantity and delivery.