

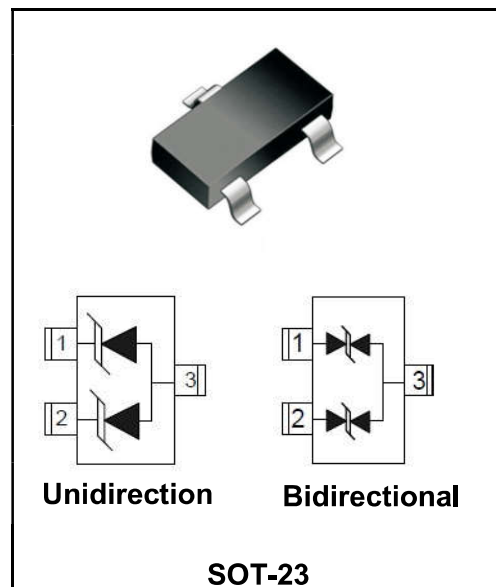
## Transient Voltage Suppressor

### Features

- ◆350 watts peak pulse power ( $t_p = 8/20\mu s$ )
- ◆Unidirectional & Bidirectional Configurations
- ◆Working Voltages: 3.3V, 5V, 8V, 12V, 15V, 24V and 36V
- ◆Low clamping voltages
- ◆Low Leakage Current
- ◆Response Time is Typically  $< 1\text{ ns}$
- ◆IEC 61000-4-2 ( ESD )  $\pm 30\text{KV}$  contact  $\pm 30\text{ KV}$  Air
- ◆IEC 61000-4-4 (EFT) 40A (5/50ns)

### Application

- ◆RS-232, RS-422 & RS-485
- ◆Cellular Handsets & Accessories
- ◆Control & Monitoring Systems
- ◆Portable Electronics
- ◆Set-Top Box
- ◆Servers, Notebook, and Desktop PC
- ◆Wireless Bus Protection

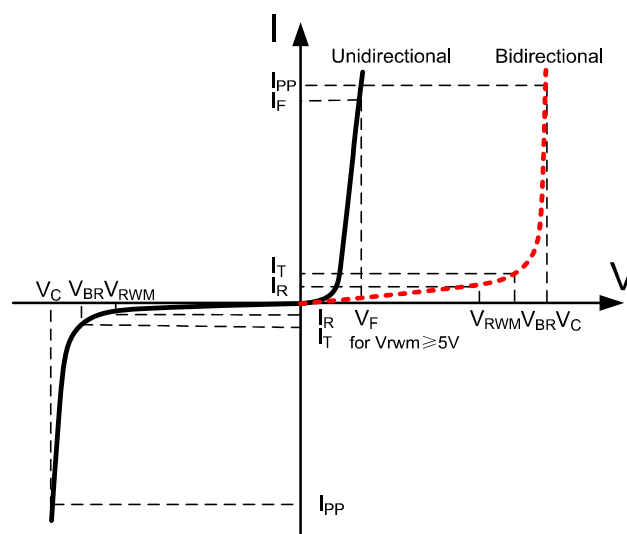


### Limiting Values(TA = 25 °C, unless otherwise specified)

| Symbol           | Parameter                              | Conditions | value       | Unit |
|------------------|----------------------------------------|------------|-------------|------|
| P <sub>PP</sub>  | Peak Pulse Power ( $t_p = 8/20\mu s$ ) | Contact    | 350         | W    |
| TL               | Lead Soldering Temperature             | -          | 260(10sec)  | °C   |
| T <sub>J</sub>   | Operating Temperature                  | -          | -55 to +125 | °C   |
| T <sub>stg</sub> | Storage Temperature                    | -          | -55 to +150 | °C   |

### Electrical Parameters (T=25°C)

| Symbol           | Parameter                                     |
|------------------|-----------------------------------------------|
| I <sub>PP</sub>  | Maximum Peak Pulse Current                    |
| V <sub>C</sub>   | Clamping Voltage @ I <sub>PP</sub>            |
| V <sub>RWM</sub> | Reverse Stand-Off Voltage                     |
| I <sub>R</sub>   | Reverse Leakage Current<br>@ V <sub>RWM</sub> |
| V <sub>BR</sub>  | Breakdown Voltage @ I <sub>T</sub>            |
| I <sub>T</sub>   | Test Current                                  |
| I <sub>F</sub>   | Forward Current                               |
| V <sub>F</sub>   | Forward Voltage @ I <sub>F</sub>              |

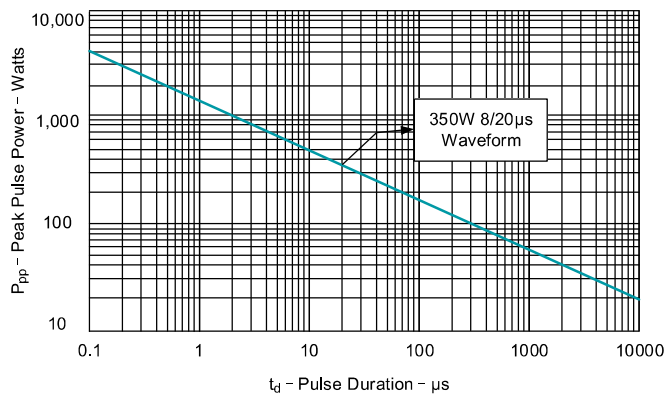


## Electrical Characteristics

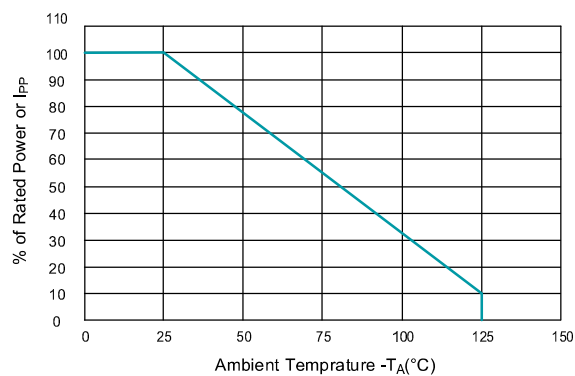
| Part Number  | Reverse Stand off Voltage $V_{RWM}$ (Volts) | Minimum Breakdown Voltage $V_{BR@1mA}$ (Volts) | Maximum Peak Pulse Current $I_{pp}$ (Amps) | Maximum Clamping Voltage $V_C@I_{PP}$ (Volts) | Maximum Reverse Leakage $I_R@V_{RWM}$ ( $\mu A$ ) | Typical Capacitance DC=0V $C_J@1\text{ MHz}$ (pF) | Maximum Capacitance DC=0V $C_J@1\text{ MHz}$ (pF) | Marking Code |
|--------------|---------------------------------------------|------------------------------------------------|--------------------------------------------|-----------------------------------------------|---------------------------------------------------|---------------------------------------------------|---------------------------------------------------|--------------|
| ESD3V3FT233  | 3.3                                         | 4.0                                            | 25                                         | 15                                            | 1                                                 | 200                                               | 240                                               | 3M2          |
| ESD3V3FBT233 | 3.3                                         | 4.0                                            | 25                                         | 15                                            | 1                                                 | 100                                               | 120                                               | 3B2          |
| ESD5VFT233   | 5                                           | 6.0                                            | 25                                         | 16                                            | 1                                                 | 150                                               | 180                                               | 5M2          |
| ESD5VFBT233  | 5                                           | 6.0                                            | 25                                         | 16                                            | 1                                                 | 75                                                | 90                                                | 5B2          |
| ESD8VFT233   | 8                                           | 9.0                                            | 20                                         | 20                                            | 1                                                 | 70                                                | 80                                                | 8M2          |
| ESD8VFBT233  | 8                                           | 9.0                                            | 20                                         | 20                                            | 1                                                 | 40                                                | 45                                                | 8B2          |
| ESD12VFT233  | 12                                          | 13.3                                           | 15                                         | 24                                            | 1                                                 | 75                                                | 90                                                | AM2          |
| ESD12VFBT233 | 12                                          | 13.3                                           | 15                                         | 24                                            | 1                                                 | 40                                                | 90                                                | AB2          |
| ESD15VFT233  | 15                                          | 16.7                                           | 12                                         | 32                                            | 1                                                 | 45                                                | 80                                                | BM2          |
| ESD15VFBT233 | 15                                          | 16.7                                           | 12                                         | 32                                            | 1                                                 | 25                                                | 80                                                | BB2          |
| ESD18VFT233  | 18                                          | 19.0                                           | 10                                         | 34                                            | 1                                                 | 30                                                | 70                                                | EM2          |
| ESD18VFBT233 | 18                                          | 19.0                                           | 10                                         | 34                                            | 1                                                 | 30                                                | 70                                                | EB2          |
| ESD20VFT233  | 20                                          | 23.5                                           | 8                                          | 33                                            | 1                                                 | 30                                                | 60                                                | FM2          |
| ESD20VFBT233 | 20                                          | 23.5                                           | 8                                          | 33                                            | 1                                                 | 30                                                | 60                                                | FB2          |
| ESD24VFT233  | 24                                          | 26.7                                           | 7                                          | 42                                            | 1                                                 | 25                                                | 50                                                | CM2          |
| ESD24VFBT233 | 24                                          | 26.7                                           | 7                                          | 42                                            | 1                                                 | 25                                                | 50                                                | CB2          |
| ESD36VFT233  | 36                                          | 40                                             | 6                                          | 60                                            | 1                                                 | 15                                                | 30                                                | DM2          |
| ESD36VFBT233 | 36                                          | 40                                             | 6                                          | 60                                            | 1                                                 | 15                                                | 30                                                | DB2          |

**Typical Characteristics**

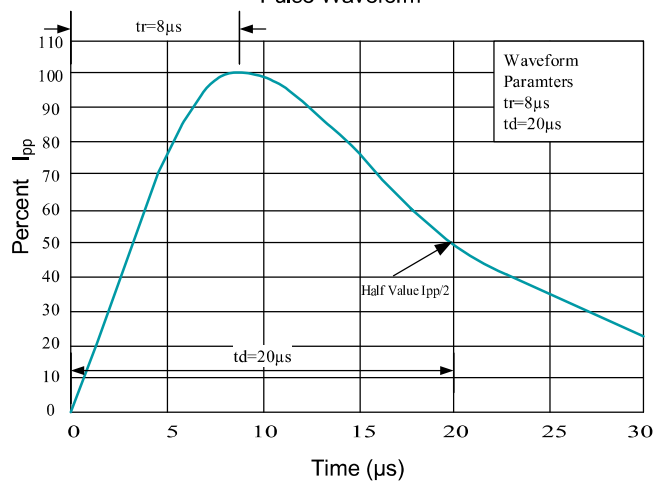
Peak Pulse Power vs. Pulse Time



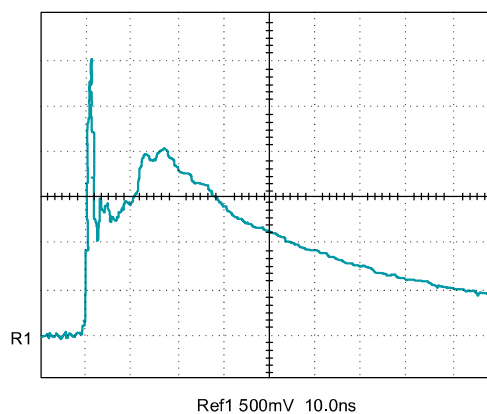
Power Derating Curve

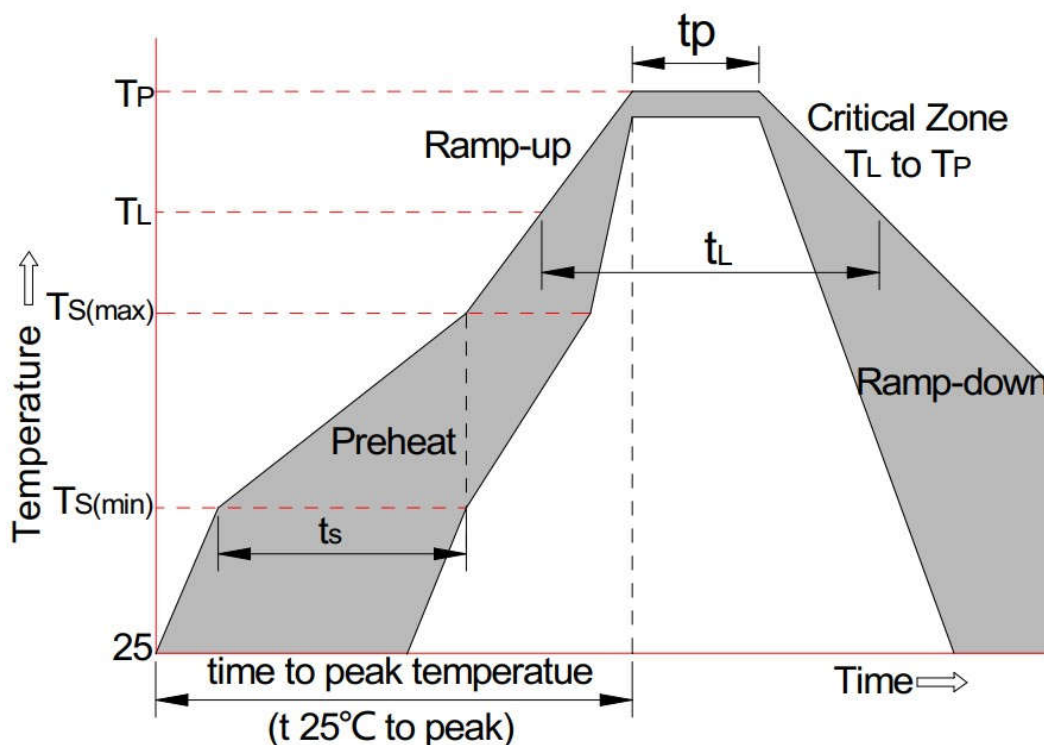


Pulse Waveform



ESD Pulse Waveform (Per IEC 61000-4-2)





| Reflow Condition                                   |                             | Pb-Free Assembly |
|----------------------------------------------------|-----------------------------|------------------|
| Pre-heat                                           | -Temperature Min (Ts(min))  | +150°C           |
|                                                    | -Temperature Max(Ts(max))   | +200°C           |
|                                                    | -Time (Min to Max) (ts)     | 60-190 secs.     |
| Average ramp up rate (Liquid us Temp (TL) to peak) |                             | 5°C/sec. Max     |
| Ts(max) to TL - Ramp-up Rate                       |                             | 5°C/sec. Max     |
| Reflow                                             | -Temperature(TL)(Liquid us) | +217°C           |
|                                                    | -Temperature(tL)            | 60-150 secs.     |
| Peak Temp (Tp)                                     |                             | +260(+0/-5)°C    |
| Time within 5°C of actual Peak Temp (tp)           |                             | 20-40 secs. Max  |
| Ramp-down Rate                                     |                             | 5°C/sec. Max     |
| Time 25°C to Peak Temp (TP)                        |                             | 8 min. Max       |
| Do not exceed                                      |                             | +280°C           |

Package Dimension

PACKAGE OUTLINE

Top view: A rectangular package with a central pin labeled '3' and two side pins labeled '1' and '2'. Dimensions include overall width D, overall height E, height from top surface to pin center E1, pin width b, pin spacing e, and pin-to-pin distance e1.

Side view: Shows the package profile with dimensions A1 (height from bottom surface to pin center) and A2 (height from bottom surface to top surface).

Side view showing the package profile with a lead angle theta, a lead length L, and a lead width c. A dimension of 0.25 is indicated for the lead thickness.

DIMENSIONS

| SYMBOL | MILLIMETER |      | INCHES     |        |
|--------|------------|------|------------|--------|
|        | MIN        | MAX  | MIN        | MAX    |
| A      | 0.90       | 1.15 | 0.035      | 0.045  |
| A1     | 0.00       | 0.10 | 0.000      | 0.004  |
| A2     | 0.60       | 0.70 | 0.0236     | 0.0275 |
| b      | 0.30       | 0.50 | 0.012      | 0.020  |
| c      | 0.08       | 0.15 | 0.003      | 0.006  |
| D      | 2.80       | 3.00 | 0.110      | 0.118  |
| E      | 2.25       | 2.55 | 0.089      | 0.100  |
| E1     | 1.20       | 1.40 | 0.047      | 0.055  |
| e      | 0.95 BSC   |      | 0.0374 BSC |        |
| e1     | 1.80       | 2.00 | 0.071      | 0.079  |
| L      | 0.30       | 0.50 | 0.012      | 0.020  |
| θ      | 0          | 8°   | 0          | 8°     |

Notes

1. Dimensioning and tolerances per ANSI Y14.5M, 1985.
2. Controlling Dimension: Inches
3. Pin 3 is the cathode (Unidirectional Only).
4. Dimensions are exclusive of mold flash and metal burrs.

Top view of a package with three pins. The central pin is labeled 'C' and the two side pins are labeled 'M'. Dimensions include pin width b, pin-to-pin distance Z, pin-to-pin distance C, pin-to-pin distance M, pin spacing e, and pin-to-pin distance e1.

| DIMENSIONS |           |             |
|------------|-----------|-------------|
| DIM        | INCHES    | MILLIMETERS |
| M          | 0.0795    | 2.02        |
| C          | 0.0315    | 0.80        |
| Z          | 0.111     | 2.82        |
| e          | 0.037 BSC | 0.95 BSC    |
| e1         | 0.075 BSC | 1.9 BSC     |
| b          | 0.0315    | 0.80        |