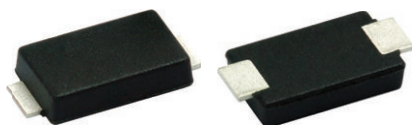


# Surface Mount TRANSZORB® Transient Voltage Suppressors

**SlimSMA™**


Top View

Bottom View

**DO-221AC**

## PRIMARY CHARACTERISTICS

|                                   |                      |
|-----------------------------------|----------------------|
| $V_{BR}$                          | 6.4 V to 24.5 V      |
| $V_{WM}$                          | 5.0 V to 20 V        |
| $P_{PPM}$ (10 x 1000 $\mu$ s)     | 600 W                |
| $P_{PPM}$ (8 x 20 $\mu$ s)        | 4000 W               |
| $P_D$ at $T_M = 55^\circ\text{C}$ | 6 W                  |
| $T_J$ max.                        | 175 $^\circ\text{C}$ |
| Polarity                          | Uni-directional      |
| Package                           | DO-221AC (SlimSMA)   |

## 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, and telecommunication.

## FEATURES

- Very low profile - typical height of 0.95 mm
- Ideal for automated placement
- Uni-directional only
- Excellent clamping capability
- Peak pulse power:
  - 600 W (10/1000  $\mu$ s)
  - 4 kW (8/20  $\mu$ s)
- ESD capability: IEC 61000-4-2 level 4
  - 15 kV (air)
  - 8 kV (contact)
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260  $^\circ\text{C}$
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

## MECHANICAL DATA

**Case:** DO-221AC (SlimSMA)

Molding compound meets UL 94 V-0 flammability rating  
Base P/N-M3 - halogen-free, RoHS-compliant, and commercial grade

**Terminals:** Matte tin plated leads, solderable per J-STD-002 and JESD22-B102

M3 suffix meets JESD 201 class 2 whisker test

**Polarity:** Color band denotes cathode end

## MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)

| PARAMETER                            |                                 | SYMBOL          | VALUE          | UNIT             |
|--------------------------------------|---------------------------------|-----------------|----------------|------------------|
| Peak pulse power dissipation         | with a 10/1000 $\mu$ s waveform | $P_{PPM}^{(1)}$ | 600            | W                |
|                                      | with a 8/20 $\mu$ s waveform    |                 | 4000           |                  |
| Peak pulse current                   | with a 10/1000 $\mu$ s waveform | $I_{PPM}^{(1)}$ | See next table | A                |
|                                      | with a 8/20 $\mu$ s waveform    |                 |                |                  |
| Power dissipation                    | $T_M = 55^\circ\text{C}$        | $P_D^{(2)}$     | 6              | W                |
|                                      | $T_A = 25^\circ\text{C}$        | $P_D^{(3)}$     | 1.0            |                  |
| Storage temperature range            |                                 | $T_{STG}$       | -65 to +175    | $^\circ\text{C}$ |
| Operating junction temperature range |                                 | $T_J$           | -55 to +175    |                  |

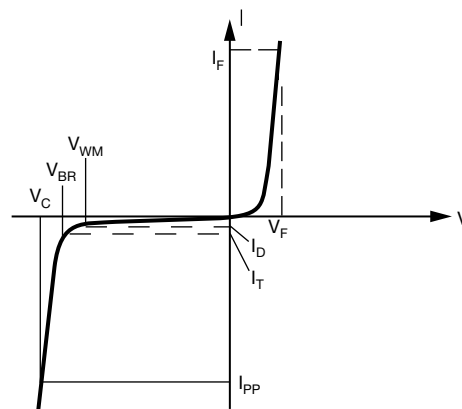
### Notes

- (1) Non-repetitive current pulse, per fig. 3 and derated above  $T_A = 25^\circ\text{C}$  per fig. 2.
- (2) Power dissipation mounted on infinite heatsink
- (3) Power dissipation mounted on minimum recommended pad layout



## INDEX OF SYMBOLS

| SYMBOL     | PARAMETER                       |
|------------|---------------------------------|
| $V_{WM}$   | Stand-off voltage               |
| $V_{BR}$   | Breakdown voltage               |
| $V_C$      | Clamping voltage                |
| $I_D$      | Leakage current at $V_{WM}$     |
| $I_{PP}$   | Peak pulse current              |
| $\alpha T$ | Voltage temperature coefficient |
| $V_F$      | Forward voltage drop            |
| $R_D$      | Dynamic resistance              |



Zener Voltage Regulator

ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

| DEVICE<br>TYPE | DEVICE<br>MARKING<br>CODE | BREAKDOWN<br>VOLTAGE<br>V <sub>BR</sub> AT I <sub>T</sub> <sup>(1)</sup> |      |    | STAND-OFF<br>VOLTAGE<br>V <sub>WM</sub> | MAXIMUM<br>REVERSE<br>LEAKAGE<br>I <sub>D</sub> AT V <sub>WM</sub> <sup>(3)</sup> |       |     | V <sub>C</sub> AT I <sub>PP</sub> |      | R <sub>D</sub> <sup>(2)</sup> | V <sub>C</sub> AT I <sub>PP</sub> |     | R <sub>D</sub> <sup>(2)</sup> | αT <sup>(3)</sup> |
|----------------|---------------------------|--------------------------------------------------------------------------|------|----|-----------------------------------------|-----------------------------------------------------------------------------------|-------|-----|-----------------------------------|------|-------------------------------|-----------------------------------|-----|-------------------------------|-------------------|
|                |                           | MIN.                                                                     | MAX. |    |                                         | 25 °C                                                                             | 85 °C |     | 10/1000 μs                        |      |                               | 8/20 μs                           |     |                               |                   |
|                |                           |                                                                          |      |    |                                         |                                                                                   |       |     | MAX.                              |      |                               | MAX.                              |     |                               |                   |
|                |                           |                                                                          |      |    |                                         |                                                                                   |       |     |                                   |      |                               |                                   |     |                               |                   |
| V              |                           | mA                                                                       | V    | μA | V                                       | V                                                                                 | A     | Ω   | V                                 | A    | Ω                             | 10 <sup>-4</sup> /°C              |     |                               |                   |
| SMA6F5.0A      | 6AE                       | 6.40                                                                     | 7.07 | 10 | 5                                       | 150                                                                               | 375   | 5.0 | 9.2                               | 68.0 | 0.031                         | 13.4                              | 298 | 0.021                         | 5.7               |
| SMA6F6.0A      | 6AG                       | 6.70                                                                     | 7.41 | 10 | 6                                       | 600                                                                               | 1500  | 6.0 | 9.5                               | 63.2 | 0.033                         | 13.7                              | 290 | 0.022                         | 5.9               |
| SMA6F6.5A      | 6AK                       | 7.20                                                                     | 7.96 | 10 | 6.5                                     | 100                                                                               | 250   | 6.5 | 10.2                              | 58.8 | 0.038                         | 14.5                              | 276 | 0.024                         | 6.1               |
| SMA6F7.5A      | 6AP                       | 8.33                                                                     | 9.21 | 1  | 7.5                                     | 50                                                                                | 125   | 7.5 | 11.8                              | 50.8 | 0.051                         | 17.0                              | 235 | 0.033                         | 6.5               |
| SMA6F8.0A      | 6AR                       | 8.89                                                                     | 9.83 | 1  | 8.0                                     | 20                                                                                | 50    | 8.0 | 12.8                              | 46.9 | 0.063                         | 18.2                              | 220 | 0.038                         | 7.0               |
| SMA6F8.5A      | 6AT                       | 9.4                                                                      | 10.4 | 1  | 8.5                                     | 20                                                                                | 50    | 8.5 | 13.3                              | 45.1 | 0.064                         | 18.7                              | 205 | 0.040                         | 7.3               |
| SMA6F10A       | 6AX                       | 11.1                                                                     | 12.3 | 1  | 10                                      | 1.0                                                                               | 5.0   | 10  | 15.7                              | 38.2 | 0.089                         | 19.6                              | 184 | 0.040                         | 7.8               |
| SMA6F11A       | 6AZ                       | 12.2                                                                     | 13.5 | 1  | 11                                      | 1.0                                                                               | 5.0   | 11  | 17.2                              | 34.8 | 0.107                         | 21.5                              | 172 | 0.047                         | 8.1               |
| SMA6F12A       | 6BE                       | 13.3                                                                     | 14.7 | 1  | 12                                      | 0.2                                                                               | 1.0   | 12  | 18.8                              | 31.9 | 0.128                         | 23.5                              | 157 | 0.056                         | 8.3               |
| SMA6F12AHD     | 6BF                       | 13.2                                                                     | 14.3 | 1  | 12                                      | 0.2                                                                               | 1.0   | 12  | 18.5                              | 32.4 | 0.130                         | 22.9                              | 157 | 0.055                         | 8.4               |
| SMA6F13A       | 6BG                       | 14.4                                                                     | 15.9 | 1  | 13                                      | 0.2                                                                               | 1.0   | 13  | 20.4                              | 29.4 | 0.153                         | 23.9                              | 147 | 0.064                         | 8.4               |
| SMA6F15A       | 6BM                       | 16.7                                                                     | 18.5 | 1  | 15                                      | 0.2                                                                               | 1.0   | 15  | 23.6                              | 25.4 | 0.201                         | 27.7                              | 123 | 0.075                         | 8.8               |
| SMA6F16A       | 6BP                       | 17.8                                                                     | 19.7 | 1  | 16                                      | 0.2                                                                               | 1.0   | 16  | 25.2                              | 23.8 | 0.229                         | 29.5                              | 119 | 0.082                         | 8.8               |
| SMA6F17A       | 6BR                       | 18.9                                                                     | 20.9 | 1  | 17                                      | 0.2                                                                               | 1.0   | 17  | 26.7                              | 22.5 | 0.259                         | 31.4                              | 111 | 0.095                         | 9.0               |
| SMA6F18A       | 6BT                       | 20.0                                                                     | 22.1 | 1  | 18                                      | 0.2                                                                               | 1.0   | 18  | 28.3                              | 21.2 | 0.292                         | 33.2                              | 102 | 0.109                         | 9.2               |
| SMA6F20A       | 6BV                       | 22.2                                                                     | 24.5 | 1  | 20                                      | 0.2                                                                               | 1.0   | 20  | 31.4                              | 19.1 | 0.361                         | 36.8                              | 93  | 0.132                         | 9.4               |

## Notes

(1) Pulse test:  $t_p \leq 50$  ms(2) To calculate maximum clamping voltage at other surge currents, use following formula:  $V_{CL} \text{ max.} = R_D \times I_{PP} + V_{BR} \text{ max.}$ (3) To calculate  $V_{BR}$  vs. junction temperature, use following formula:  $V_{BR} \text{ at } T_J = V_{BR} \text{ at } 25^\circ\text{C} \times (1 + \alpha T \times (T_J - 25))$ THERMAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

| PARAMETER                                       | SYMBOL              | VALUE | UNIT                      |
|-------------------------------------------------|---------------------|-------|---------------------------|
| Typical thermal resistance, junction to ambient | $R_{\theta JA}$ (1) | 150   | $^\circ\text{C}/\text{W}$ |
| Typical thermal resistance, junction to mount   | $R_{\theta JM}$ (2) | 20    | $^\circ\text{C}/\text{W}$ |

## Notes

(1) Mounted on minimum recommended pad layout

(2) Mounted on infinite heatsink

**IMMUNITY TO STATIC ELECTRICAL DISCHARGE TO THE FOLLOWING STANDARDS**

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

| STANDARD      | TEST TYPE                             | TEST CONDITIONS                               | SYMBOL | CLASS | VALUE   |
|---------------|---------------------------------------|-----------------------------------------------|--------|-------|---------|
| IEC 61000-4-2 | Human body model (contact mode)       | $C = 150\text{ pF}$ , $R = 330\text{ }\Omega$ | $V_C$  | 4     | > 8 kV  |
|               | Human body model (air discharge mode) |                                               |        |       | > 15 kV |

**ORDERING INFORMATION (Example)**

| PREFERRED P/N   | UNIT WEIGHT (g) | PREFERRED PACKAGE CODE | BASE QUANTITY | DELIVERY MODE                      |
|-----------------|-----------------|------------------------|---------------|------------------------------------|
| SMA6F5.0A-M3/6A | 0.032           | 6A                     | 3500          | 7" diameter plastic tape and reel  |
| SMA6F5.0A-M3/6B | 0.032           | 6B                     | 14 000        | 13" diameter plastic tape and reel |

**RATINGS AND CHARACTERISTICS CURVES**

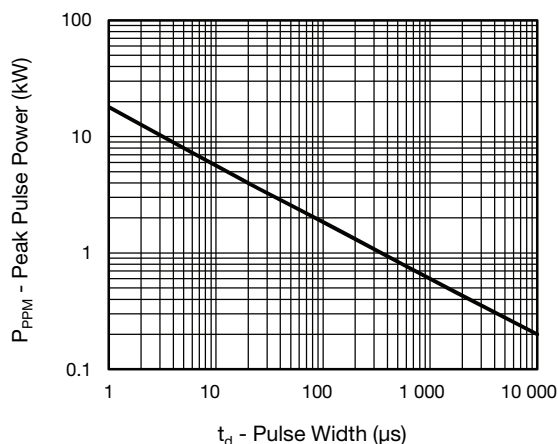
( $T_A = 25\text{ }^{\circ}\text{C}$  unless otherwise noted)


Fig. 1 - Peak Pulse Power Rating Curve

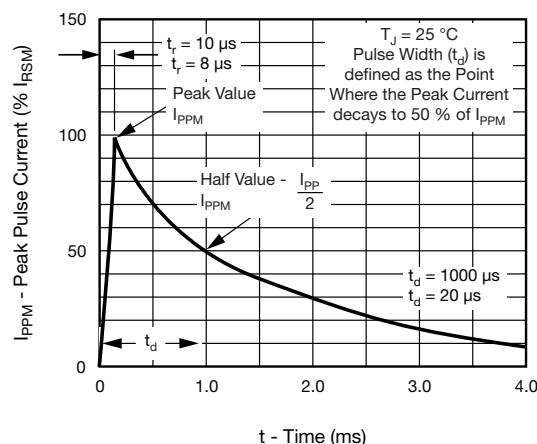


Fig. 3 - Pulse Waveform

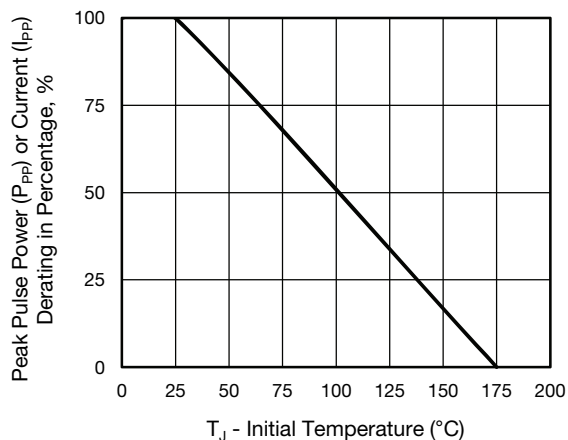


Fig. 2 - Pulse Power or Current vs. Initial Junction Temperature

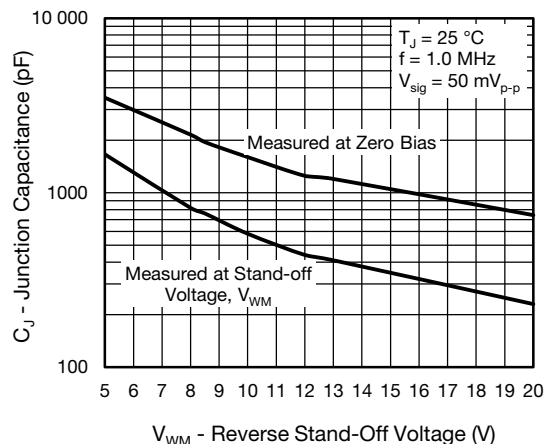


Fig. 4 - Typical Junction Capacitance

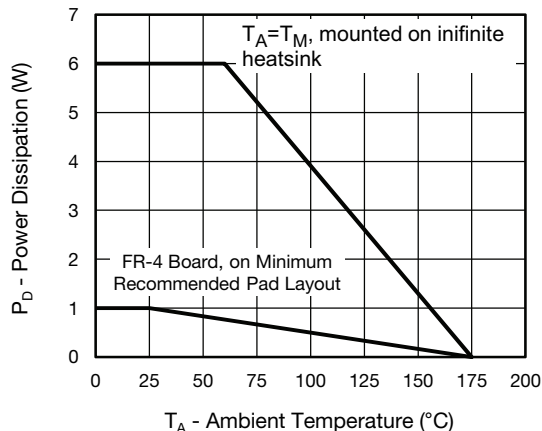


Fig. 5 - Power Dissipation Derating Curve

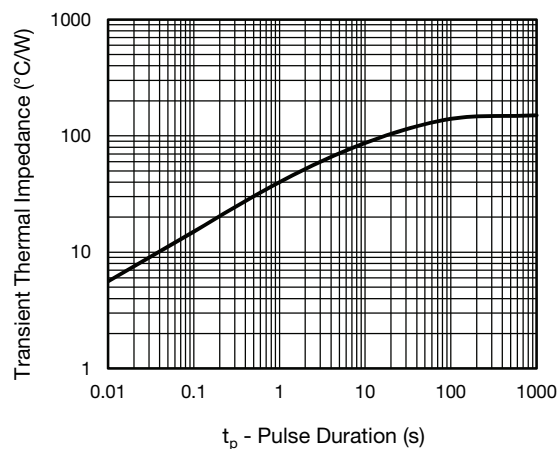
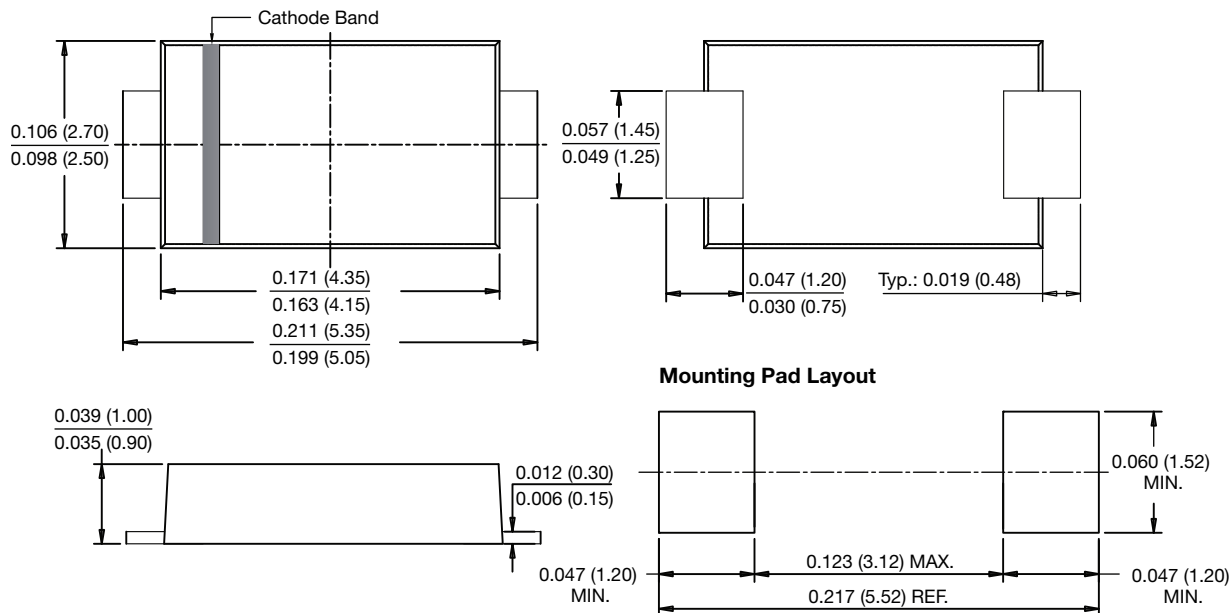


Fig. 6 - Typical Transient Thermal Impedance

**PACKAGE OUTLINE DIMENSIONS** in inches (millimeters)

**DO-221AC (SlimSMA)**




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