# 1SMA5.0AT3G Series, SZ1SMA5.0AT3G Series

# 400 Watt Peak Power Zener Transient Voltage Suppressors

## Unidirectional

The SMA series is designed to protect voltage sensitive components from high voltage, high energy transients. They have excellent clamping capability, high surge capability, low zener impedance and fast response time. The SMA series is supplied in ON Semiconductor's exclusive, cost-effective, highly reliable SURMETIC® package and is ideally suited for use in communication systems, automotive, numerical controls, process controls, medical equipment, business machines, power supplies and many other industrial/consumer applications.

### Features

- Working Peak Reverse Voltage Range – 5.0 V to 78 V
- Standard Zener Breakdown Voltage Range – 6.7 V to 91.25 V
- Peak Power – 400 W @ 1 ms
- ESD Rating of Class 3 (> 16 kV) per Human Body Model
- Response Time is Typically < 1 ns
- Flat Handling Surface for Accurate Placement
- Package Design for Top Slide or Bottom Circuit Board Mounting
- Low Profile Package
- SZ Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q101 Qualified and PPAP Capable
- Pb−Free Packages are Available*

**Mechanical Characteristics:**

**CASE:** Void-free, transfer-molded plastic

**FINISH:** All external surfaces are corrosion resistant and leads are readily solderable

**MAXIMUM CASE TEMPERATURE FOR SOLDERING PURPOSES:** 260°C for 10 Seconds

**POLARITY:** Cathode indicated by molded polarity notch or polarity band

**MOUNTING POSITION:** Any

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

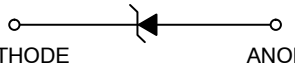
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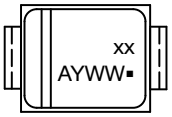
**PLASTIC SURFACE MOUNT ZENER OVERVOLTAGE TRANSIENT SUPPRESSORS 5.0 – 78 V, 400 W PEAK POWER**



**SMA**
**CASE 403D**
**STYLE 1**




**MARKING DIAGRAM**




xx = Device Code (Refer to page 3)
A = Assembly Location
Y = Year
WW = Work Week
▪ = Pb−Free Package

**ORDERING INFORMATION**

| Device | Package | Shipping† |
|---|---|---|
| 1SMAxxAT3G | SMA (Pb−Free) | 5,000 / Tape & Reel |
| SZ1SMAxxAT3G | SMA (Pb−Free) | 5,000 / Tape & Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

**DEVICE MARKING INFORMATION**

See specific marking information in the device marking column of the Electrical Characteristics table on page 3 of this data sheet.

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**MAXIMUM RATINGS**

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Peak Power Dissipation (Note 1) @ $T_L$ = 25°C, Pulse Width = 1 ms | $P_{PK}$ | 400 | W |
| DC Power Dissipation @ $T_L$ = 75°C Measured Zero Lead Length (Note 2)<br>Derate Above 75°C<br>Thermal Resistance from Junction to Lead | $P_D$<br><br>$R_{\theta JL}$ | 1.5<br>20<br>50 | W<br>mW/°C<br>°C/W |
| DC Power Dissipation (Note 3) @ $T_A$ = 25°C<br>Derate Above 25°C<br>Thermal Resistance from Junction to Ambient | $P_D$<br><br>$R_{\theta JA}$ | 0.5<br>4.0<br>250 | W<br>mW/°C<br>°C/W |
| Forward Surge Current (Note 4) @ $T_A$ = 25°C | $I_{FSM}$ | 40 | A |
| Operating and Storage Temperature Range | $T_J$, $T_{stg}$ | −65 to +150 | °C |

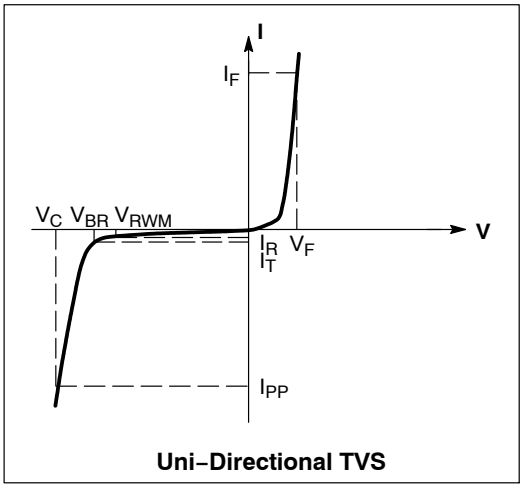
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. 10 X 1000 μs, non−repetitive.
2. 1″ square copper pad, FR−4 board.
3. FR−4 board, using ON Semiconductor minimum recommended footprint, as shown in 403B case outline dimensions spec.
4. 1/2 sine wave (or equivalent square wave), PW = 8.3 ms, duty cycle = 4 pulses per minute maximum.

**ELECTRICAL CHARACTERISTICS** ($T_A$ = 25°C unless otherwise noted, $V_F$ = 3.5 V Max. @ $I_F$ = 30 A for all types) (Note 5)

| Symbol | Parameter |
|---|---|
| $I_{PP}$ | Maximum Reverse Peak Pulse Current |
| $V_C$ | Clamping Voltage @ $I_{PP}$ |
| $V_{RWM}$ | Working Peak Reverse Voltage |
| $I_R$ | Maximum Reverse Leakage Current @ $V_{RWM}$ |
| $V_{BR}$ | Breakdown Voltage @ $I_T$ |
| $I_T$ | Test Current |
| $I_F$ | Forward Current |
| $V_F$ | Forward Voltage @ $I_F$ |

5. 1/2 sine wave or equivalent, PW = 8.3 ms, non−repetitive duty cycle.



**Uni−Directional TVS**

**ELECTRICAL CHARACTERISTICS**

| Device* | Device Marking | $V_{RWM}$ (Note 6) | $I_R$ @ $V_{RWM}$ | Breakdown Voltage | | | | $V_C$ @ $I_{PP}$ (Note 8) | | C Typ. (Note 9) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | $V_{BR}$ (Volts) (Note 7) | | | @ $I_T$ | $V_C$ | $I_{PP}$ | |
| | | Volts | μA | Min | Nom | Max | mA | Volts | Amps | pF |
| 1SMA5.0AT3G | QE | 5.0 | 400 | 6.4 | 6.7 | 7.0 | 10 | 9.2 | 43.5 | 2035 |
| 1SMA6.0AT3G | QG | 6.0 | 400 | 6.67 | 7.02 | 7.37 | 10 | 10.3 | 38.8 | 1730 |
| 1SMA6.5AT3G | QK | 6.5 | 250 | 7.22 | 7.6 | 7.98 | 10 | 11.2 | 35.7 | 1605 |
| 1SMA8.0AT3G | QR | 8.0 | 25 | 8.89 | 9.36 | 9.83 | 1 | 13.6 | 29.4 | 1035 |
| 1SMA8.5AT3G | QT | 8.5 | 5.0 | 9.44 | 9.92 | 10.4 | 1 | 14.4 | 27.8 | 1265 |
| 1SMA9.0AT3G | QV | 9.0 | 2.5 | 10 | 10.55 | 11.1 | 1 | 15.4 | 26.0 | 1200 |
| 1SMA10AT3G | QX | 10 | 2.5 | 11.1 | 11.7 | 12.3 | 1 | 17.0 | 23.5 | 1090 |
| 1SMA11AT3G | QZ | 11 | 2.5 | 12.2 | 12.85 | 13.5 | 1 | 18.2 | 22.0 | 1000 |
| 1SMA12AT3G | RE | 12 | 2.5 | 13.3 | 14.0 | 14.7 | 1 | 19.9 | 20.1 | 925 |
| 1SMA13AT3G | RG | 13 | 2.5 | 14.4 | 15.15 | 15.9 | 1 | 21.5 | 18.6 | 860 |
| 1SMA14AT3G | RH | 14 | 2.5 | 15.6 | 16.4 | 17.2 | 1 | 23.2 | 17.2 | 800 |
| 1SMA15AT3G | RM | 15 | 2.5 | 16.7 | 17.6 | 18.5 | 1 | 24.4 | 16.4 | 758 |
| 1SMA16AT3G | RP | 16 | 2.5 | 17.8 | 18.75 | 19.7 | 1 | 26.0 | 15.4 | 715 |
| 1SMA17AT3G | RR | 17 | 2.5 | 18.9 | 19.9 | 20.9 | 1 | 27.6 | 14.5 | 680 |
| 1SMA18AT3G | RT | 18 | 2.5 | 20 | 21.05 | 22.1 | 1 | 29.2 | 13.7 | 645 |
| 1SMA20AT3G | RV | 20 | 2.5 | 22.2 | 23.35 | 24.5 | 1 | 32.4 | 12.3 | 585 |
| 1SMA22AT3G | RX | 22 | 2.5 | 24.4 | 25.65 | 26.9 | 1 | 35.5 | 11.3 | 540 |
| 1SMA24AT3G | RZ | 24 | 2.5 | 26.7 | 28.1 | 29.5 | 1 | 38.9 | 10.3 | 500 |
| 1SMA26AT3G | SE | 26 | 2.5 | 28.9 | 30.4 | 31.9 | 1 | 42.1 | 9.5 | 460 |
| 1SMA28AT3G | SG | 28 | 2.5 | 31.1 | 32.75 | 34.4 | 1 | 45.4 | 8.8 | 430 |
| 1SMA30AT3G | SK | 30 | 2.5 | 33.3 | 35.05 | 36.8 | 1 | 48.4 | 8.3 | 405 |
| 1SMA33AT3G | SM | 33 | 2.5 | 36.7 | 38.65 | 40.6 | 1 | 53.3 | 7.5 | 375 |
| 1SMA36AT3G | SP | 36 | 2.5 | 40 | 42.1 | 44.2 | 1 | 58.1 | 6.9 | 345 |
| 1SMA40AT3G | SR | 40 | 2.5 | 44.4 | 46.75 | 49.1 | 1 | 64.5 | 6.2 | 315 |
| 1SMA43AT3G | ST | 43 | 2.5 | 47.8 | 50.3 | 52.8 | 1 | 69.4 | 5.8 | 295 |
| 1SMA45AT3G | SV | 45 | 2.5 | 50 | 52.65 | 55.3 | 1 | 72.2 | 5.5 | 280 |
| 1SMA48AT3G | SX | 48 | 2.5 | 53.3 | 56.1 | 58.9 | 1 | 77.4 | 5.2 | 265 |
| 1SMA54AT3G | TE | 54 | 2.5 | 60 | 63.15 | 66.3 | 1 | 87.1 | 4.6 | 240 |
| 1SMA58AT3G | TG | 58 | 2.5 | 64.4 | 67.8 | 71.5 | 1 | 93.6 | 4.3 | 225 |
| 1SMA70AT3G | TP | 70 | 2.5 | 77.8 | 81.9 | 86.0 | 1 | 113 | 3.5 | 190 |
| 1SMA75AT3G | TR | 75 | 2.5 | 83.3 | 87.7 | 92.1 | 1 | 121 | 3.3 | 180 |

6. A transient suppressor is normally selected according to the working peak reverse voltage ($V_{RWM}$), which should be equal to or greater than the DC or continuous peak operating voltage level.
7. $V_{BR}$ measured at pulse test current $I_T$ at an ambient temperature of 25°C.
8. Surge current waveform per Figure 2 and derate per Figure 3.
9. Bias voltage = 0 V, F = 1.0 MHz, $T_J$ = 25°C.

†Please see 1SMA10CAT3 to 1SMA75CAT3 for Bidirectional devices.

***** Include SZ-prefix devices where applicable.

## RATING AND TYPICAL CHARACTERISTIC CURVES

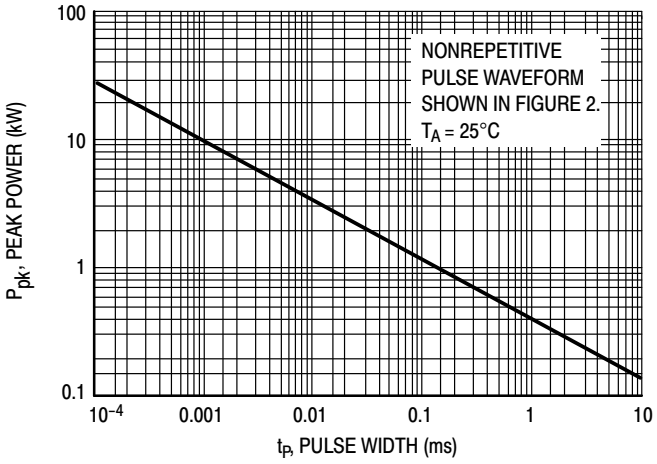



**Figure 1. Pulse Rating Curve**

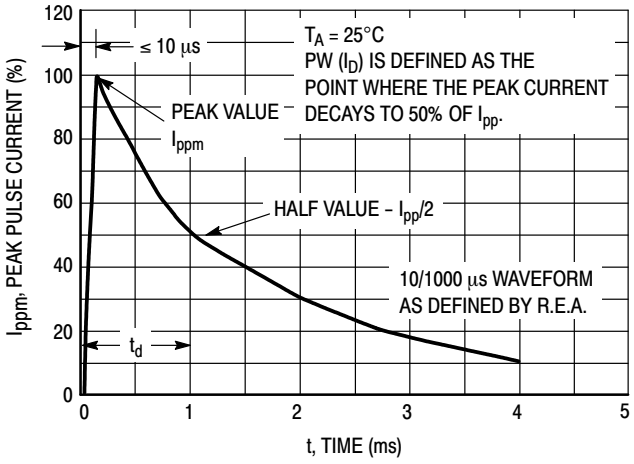



**Figure 2. Pulse Waveform**

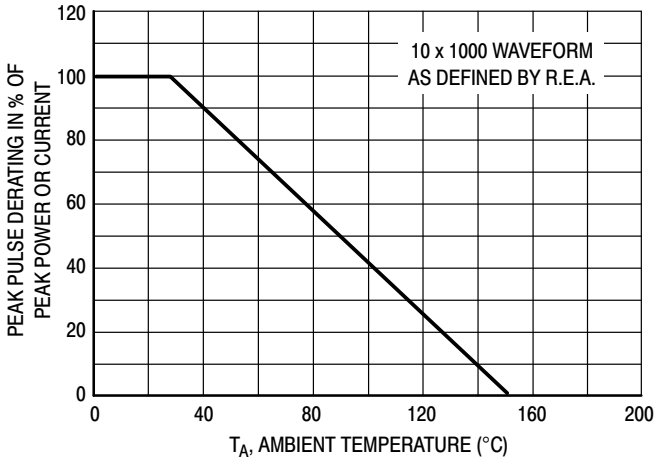



**Figure 3. Pulse Derating Curve**

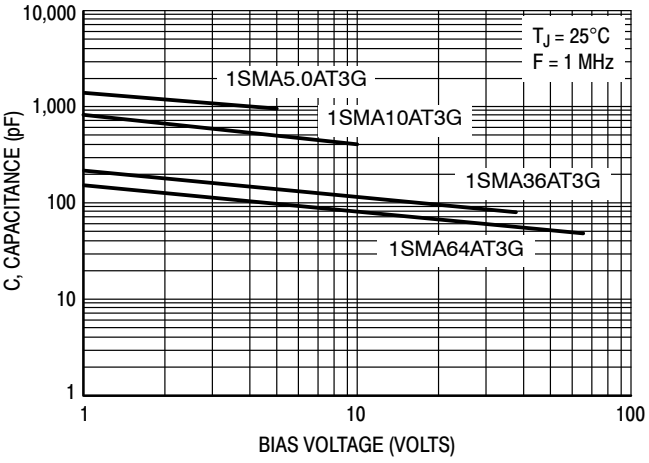



**Figure 4. Typical Junction Capacitance vs. Bias Voltage**

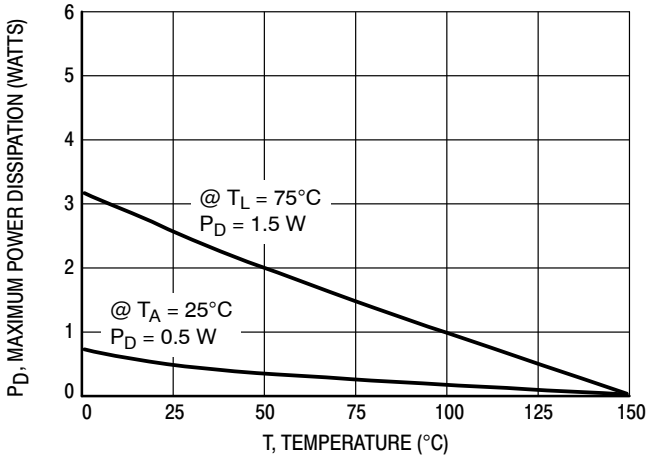
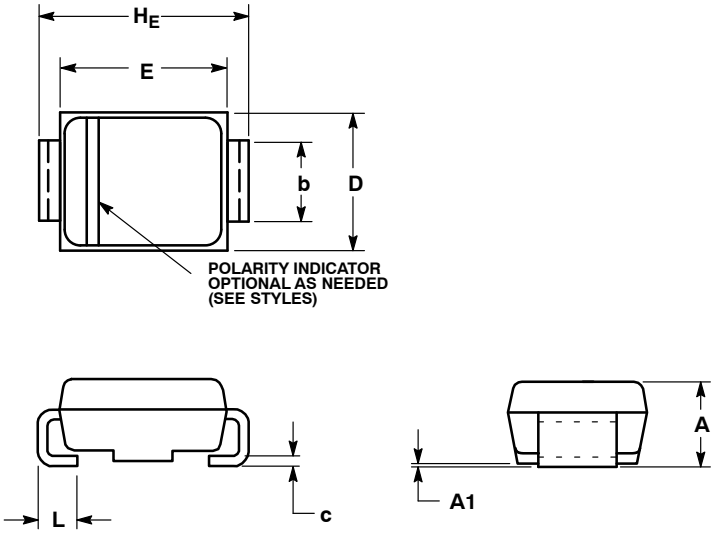



**Figure 5. Steady State Power Derating**

## PACKAGE DIMENSIONS

**SMA**
CASE 403D−02
ISSUE F

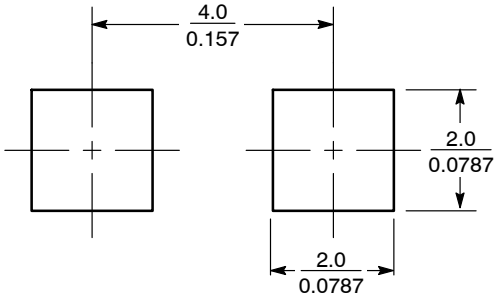



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 403D−01 OBSOLETE, NEW STANDARD IS 403D−02.

| | MILLIMETERS | | | INCHES | | |
|---|---|---|---|---|---|---|
| DIM | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 1.97 | 2.10 | 2.20 | 0.078 | 0.083 | 0.087 |
| A1 | 0.05 | 0.10 | 0.15 | 0.002 | 0.004 | 0.006 |
| b | 1.27 | 1.45 | 1.63 | 0.050 | 0.057 | 0.064 |
| c | 0.15 | 0.28 | 0.41 | 0.006 | 0.011 | 0.016 |
| D | 2.29 | 2.60 | 2.92 | 0.090 | 0.103 | 0.115 |
| E | 4.06 | 4.32 | 4.57 | 0.160 | 0.170 | 0.180 |
| $H_E$ | 4.83 | 5.21 | 5.59 | 0.190 | 0.205 | 0.220 |
| L | 0.76 | 1.14 | 1.52 | 0.030 | 0.045 | 0.060 |

STYLE 1:
PIN 1. CATHODE (POLARITY BAND)
2. ANODE

## SOLDERING FOOTPRINT*




SCALE 8:1 $\left(\frac{\text{mm}}{\text{inches}}\right)$

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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