

# SA5.0A Series

## 500 Watt Peak Power MiniMOSORB™ Zener Transient Voltage Suppressors

### Unidirectional

The SA5.0A 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 SA5.0A series is supplied in ON Semiconductor's exclusive, cost-effective, highly reliable Surmetic™ axial leaded package and is ideally-suited for use in communication systems, numerical controls, process controls, medical equipment, business machines, power supplies and many other industrial/consumer applications.

#### Features

- Working Peak Reverse Voltage Range – 5.0 to 170 V
- Peak Power – 500 Watts @ 1.0 ms
- ESD Rating of Class 3 (>16 kV) per Human Body Model
- Maximum Clamp Voltage @ Peak Pulse Current
- Low Leakage < 1  $\mu$ A above 8.5 V
- UL 497B for Isolated Loop Circuit Protection
- Maximum Temperature Coefficient Specified
- Response Time is typically < 1.0 ns
- Pb-Free Packages are Available\*

#### Mechanical Characteristics:

**CASE:** Void-free, Transfer-molded, Thermosetting Plastic

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

#### MAXIMUM LEAD TEMPERATURE FOR SOLDERING:

260°C, 1/16 in. from the case for 10 seconds

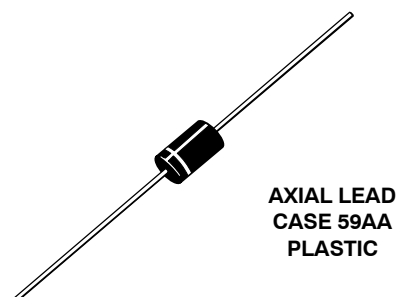
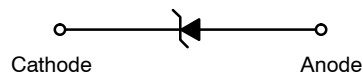
**POLARITY:** Cathode indicated by polarity band

**MOUNTING POSITION:** Any

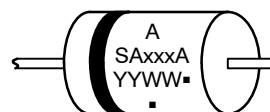


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#### MARKING DIAGRAM



A = Assembly Location  
SAxxxA = Device Number  
(Refer to Table on Page 3)  
YY = Year  
WW = Work Week  
■ = Pb-Free Package  
(Note: Microdot may be in either location)

#### ORDERING INFORMATION

| Device      | Package              | Shipping†          |
|-------------|----------------------|--------------------|
| SAxxxAG     | Axial Lead (Pb-Free) | 1000 Units / Box   |
| SAxxxARLG   | Axial Lead (Pb-Free) | 5000 / Tape & Reel |
| SAxxxALFG** | Axial Lead (Pb-Free) | 2000 Units / Box   |

†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.

\*\*Lead formed device.

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

## SA5.0A Series

### MAXIMUM RATINGS

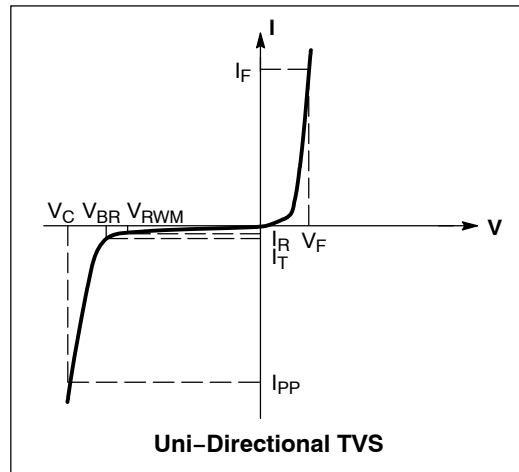
| Rating                                                                                                                        | Symbol          | Value        | Unit                      |
|-------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------|---------------------------|
| Peak Power Dissipation (Note 1) @ $T_L \leq 25^\circ\text{C}$                                                                 | $P_{PK}$        | 500          | W                         |
| Steady State Power Dissipation @ $T_L \leq 25^\circ\text{C}$ , Lead Length = 3/8 in<br>Derated above $T_L = 50^\circ\text{C}$ | $P_D$           | 3.0<br>30    | W<br>mW/ $^\circ\text{C}$ |
| Thermal Resistance, Junction-to-Lead                                                                                          | $R_{\theta JL}$ | 33.3         | $^\circ\text{C/W}$        |
| Forward Surge Current (Note 2) @ $T_A = 25^\circ\text{C}$                                                                     | $I_{FSM}$       | 70           | A                         |
| Operating and Storage Temperature Range                                                                                       | $T_J, T_{stg}$  | - 55 to +150 | $^\circ\text{C}$          |

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. Nonrepetitive current pulse per Figure 4 and derated above  $T_A = 25^\circ\text{C}$  per Figure 5.
2. 1/2 sine wave (or equivalent square wave),  $PW = 8.3$  ms, duty cycle = 4 pulses per minute.

### ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted, $V_F = 3.5$ V Max. @ $I_F$ (Note 6) = 35 A)

| 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                                |
| $\Delta V_{BR}$ | Maximum Temperature Variation of $V_{BR}$   |
| $I_F$           | Forward Current                             |
| $V_F$           | Forward Voltage @ $I_F$                     |



## SA5.0A Series

### ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted, $V_F = 3.5\text{ V Max. @ } I_F$ (Note 6) = 35 A)

| Device*   | Device Marking | V <sub>RWM</sub><br>(Note 3) | I <sub>R</sub> @ V <sub>RWM</sub> | Breakdown Voltage                |       |      |                  | V <sub>C</sub> @ I <sub>PP</sub> (Note 5) |                 | ΘV <sub>BR</sub> |
|-----------|----------------|------------------------------|-----------------------------------|----------------------------------|-------|------|------------------|-------------------------------------------|-----------------|------------------|
|           |                |                              |                                   | V <sub>BR</sub> (Note 4) (Volts) |       |      | @ I <sub>T</sub> | V <sub>C</sub>                            | I <sub>PP</sub> |                  |
|           |                | Volts                        | μA                                | Min                              | Nom   | Max  | mA               | Volts                                     | A               | mV/°C            |
| SA5.0A, G | SA5.0A         | 5                            | 600                               | 6.4                              | 6.7   | 7    | 10               | 9.2                                       | 54.3            | 5                |
| SA6.0AG   | SA6.0A         | 6                            | 600                               | 6.67                             | 7.02  | 7.37 | 10               | 10.3                                      | 48.5            | 5                |
| SA7.0ARLG | SA7.0A         | 7                            | 150                               | 7.78                             | 8.19  | 8.6  | 10               | 12                                        | 41.7            | 6                |
| SA10AG    | SA10A          | 10                           | 1                                 | 11.1                             | 11.7  | 12.3 | 1                | 17                                        | 29.4            | 10               |
| SA12AG    | SA12A          | 12                           | 1                                 | 13.3                             | 14    | 14.7 | 1                | 19.9                                      | 25.1            | 12               |
| SA13AG    | SA13A          | 13                           | 1                                 | 14.4                             | 15.15 | 15.9 | 1                | 21.5                                      | 23.2            | 13               |
| SA15AG    | SA15A          | 15                           | 1                                 | 16.7                             | 17.6  | 18.5 | 1                | 24.4                                      | 20.6            | 16               |
| SA16AG    | SA16A          | 16                           | 1                                 | 17.8                             | 18.75 | 19.7 | 1                | 26                                        | 19.2            | 17               |
| SA17ARLG  | SA17A          | 17                           | 1                                 | 18.9                             | 19.9  | 20.9 | 1                | 27.6                                      | 18.1            | 19               |
| SA18ARLG  | SA18A          | 18                           | 1                                 | 20                               | 21.05 | 22.1 | 1                | 29.2                                      | 17.2            | 20               |
| SA20ARLG  | SA20A          | 20                           | 1                                 | 22.2                             | 23.35 | 24.5 | 1                | 32.4                                      | 15.4            | 23               |
| SA24AG    | SA24A          | 24                           | 1                                 | 26.7                             | 28.1  | 29.5 | 1                | 38.9                                      | 12.8            | 28               |
| SA26ARLG  | SA26A          | 26                           | 1                                 | 28.9                             | 30.4  | 31.9 | 1                | 42.1                                      | 11.9            | 30               |
| SA28ARLG  | SA28A          | 28                           | 1                                 | 31.1                             | 32.75 | 34.4 | 1                | 45.4                                      | 11              | 31               |
| SA30ARLG  | SA30A          | 30                           | 1                                 | 33.3                             | 35.05 | 36.8 | 1                | 48.4                                      | 10.3            | 36               |
| SA33ARLG  | SA33A          | 33                           | 1                                 | 36.7                             | 38.65 | 40.6 | 1                | 53.3                                      | 9.4             | 39               |
| SA36AG    | SA36A          | 36                           | 1                                 | 40                               | 42.1  | 44.2 | 1                | 58.1                                      | 8.6             | 41               |
| SA51AG    | SA51A          | 51                           | 1                                 | 56.7                             | 59.7  | 62.7 | 1                | 82.4                                      | 6.1             | 61               |
| SA64ALFG  | SA64A          | 64                           | 1                                 | 71.1                             | 74.85 | 78.6 | 1                | 103                                       | 4.9             | 76               |
| SA100AG   | SA100A         | 100                          | 1                                 | 111                              | 117   | 123  | 1                | 162                                       | 3.1             | 123              |
| SA170ARLG | SA170A         | 170                          | 1                                 | 189                              | 199   | 209  | 1                | 275                                       | 1.8             | 208              |

3. MiniMOSORB™ transients suppressor is normally selected according to the maximum working peak reverse voltage ( $V_{RWM}$ ), which should be equal to or greater than the dc or continuous peak operating voltage level.

4.  $V_{BR}$  measured at pulse test current  $I_T$  at an ambient temperature of  $25^\circ\text{C}$ .

5. Surge current waveform per Figure 4 and derate per Figures 1 and 2.

6. 1/2 sine wave (or equivalent square wave),  $PW = 8.3\text{ ms}$ , duty cycle = 4 pulses per minute

\*The "G" suffix indicates Pb-Free package or Pb-Free Packages available.

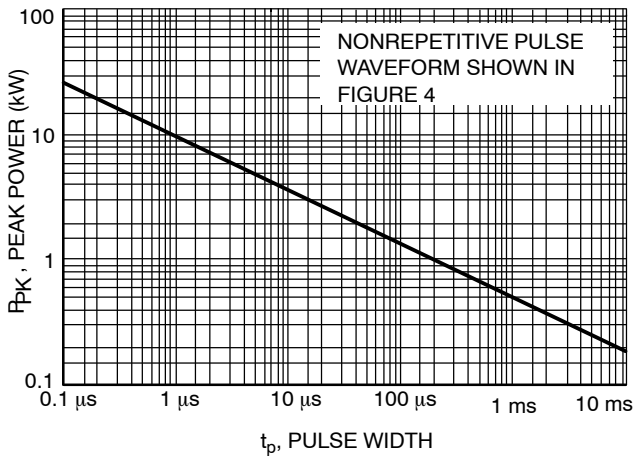


Figure 1. Pulse Rating Curve

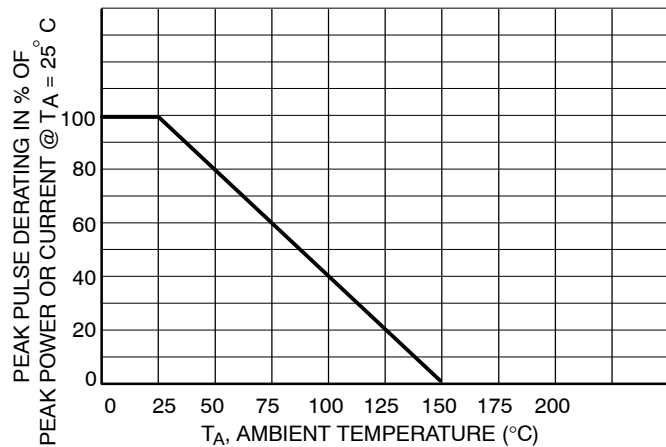


Figure 2. Pulse Derating Curve

## SA5.0A Series

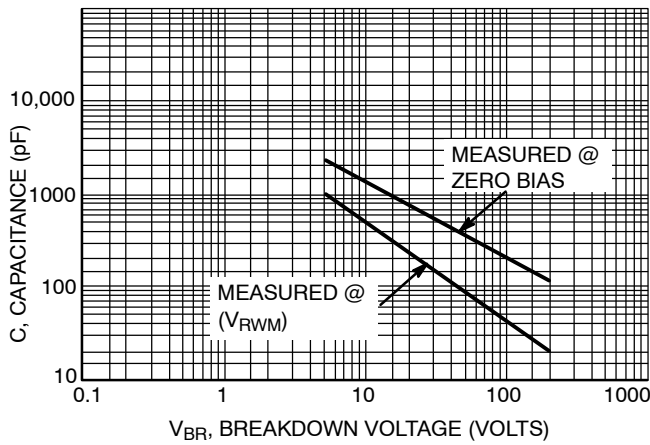


Figure 3. Capacitance versus Breakdown Voltage

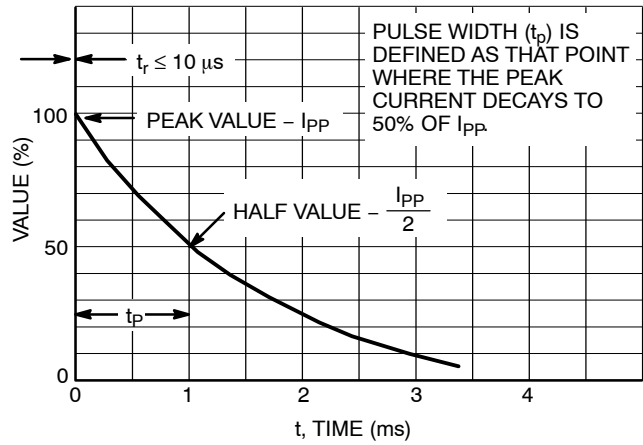


Figure 4. Pulse Waveform

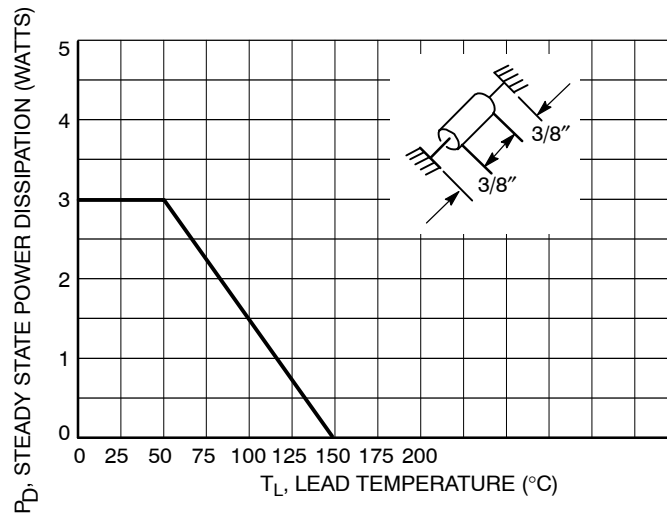


Figure 5. Steady State Power Derating

## UL RECOGNITION\*

The entire series including the bidirectional CA suffix has *Underwriters Laboratory Recognition* for the classification of protectors (QVGQ2) under the UL standard for safety 497B and File #E210057. Many competitors only have one or two devices recognized or have recognition in a non-protective category. Some competitors have no recognition at all. With the UL497B recognition, our parts successfully passed several tests including Strike Voltage

Breakdown test, Endurance Conditioning, Temperature test, Dielectric Voltage-Withstand test, Discharge test and several more.

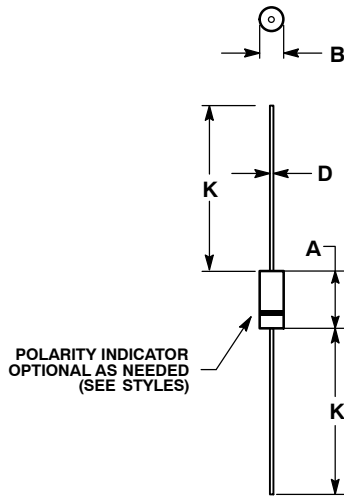
Whereas, some competitors have only passed a flammability test for the package material, we have been recognized for much more to be included in their protector category.

\*Applies to SA5.0A – SA170A.

# SA5.0A Series

## PACKAGE DIMENSIONS

### AXIAL LEAD CASE 59AA-01 ISSUE A



#### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. ALL RULES AND NOTES ASSOCIATED WITH JEDEC DO-41 OUTLINE SHALL APPLY.
4. POLARITY DENOTED BY CATHODE BAND.
5. LEAD DIAMETER NOT CONTROLLED WITHIN F DIMENSION.
6. REPLACES CASE 59-09.

| DIM | INCHES |       | MILLIMETERS |      |
|-----|--------|-------|-------------|------|
|     | MIN    | MAX   | MIN         | MAX  |
| A   | 0.228  | 0.299 | 5.80        | 7.60 |
| B   | 0.102  | 0.142 | 2.60        | 3.60 |
| D   | 0.028  | 0.034 | 0.71        | 0.86 |
| K   | 1.000  | ---   | 25.44       | ---  |

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