

# 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.

#### Specification Features:

- Working Peak Reverse Voltage Range – 5 to 170 V
- Peak Power – 500 Watts @ 1 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 ns

#### 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:** 230°C,  
1/16" from the case for 10 seconds

**POLARITY:** Cathode indicated by polarity band.

**MOUNTING POSITION:** Any

#### MAXIMUM RATINGS

| Rating                                                                                                                         | Symbol          | Value        | Unit  |
|--------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------|-------|
| Peak Power Dissipation (Note 1)<br>@ $T_L \leq 25^\circ\text{C}$                                                               | $P_{PK}$        | 500          | Watts |
| Steady State Power Dissipation<br>@ $T_L \leq 75^\circ\text{C}$ , Lead Length = 3/8"<br>Derated above $T_L = 75^\circ\text{C}$ | $P_D$           | 3.0          | Watts |
|                                                                                                                                |                 | 30           | mW/°C |
| Thermal Resistance, Junction-to-Lead                                                                                           | $R_{\theta JL}$ | 33.3         | °C/W  |
| Forward Surge Current (Note 2)<br>@ $T_A = 25^\circ\text{C}$                                                                   | $I_{FSM}$       | 70           | Amps  |
| Operating and Storage Temperature Range                                                                                        | $T_J, T_{stg}$  | - 55 to +175 | °C    |

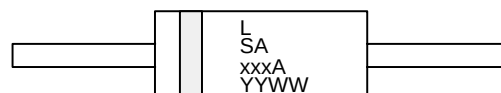
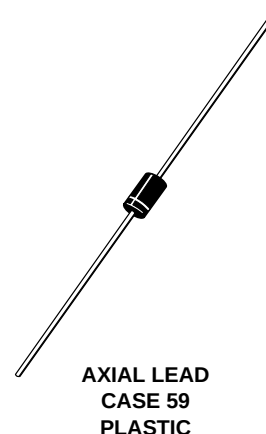
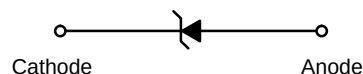
1. Nonrepetitive current pulse per Figure 4 and derated above  $T_A = 25^\circ\text{C}$  per Figure 2.
2. 1/2 sine wave (or equivalent square wave), PW = 8.3 ms, duty cycle = 4 pulses per minute

\*Please see SA5.0CA – SA170CA for Bidirectional devices.



ON Semiconductor®

<http://onsemi.com>



L = Assembly Location  
SAxxxA = ON Device Code  
YY = Year  
WW = Work Week

#### ORDERING INFORMATION

| Device    | Package    | Shipping         |
|-----------|------------|------------------|
| SAxxxA    | Axial Lead | 1000 Units/Box   |
| SAxxxARL* | Axial Lead | 5000/Tape & Reel |

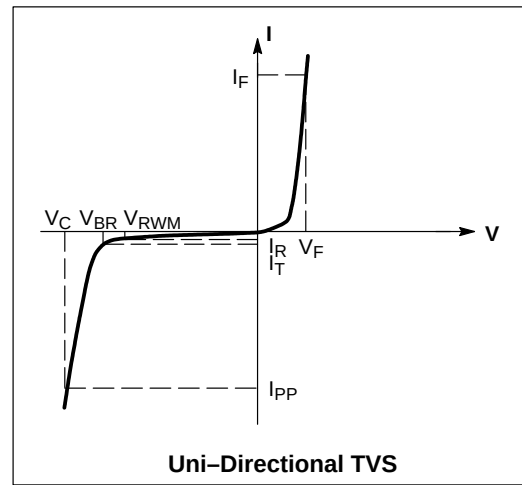
\*SA8.0A, SA130A, and SA160A Not Available in 5000/Tape & Reel.

Devices listed in **bold, italic** are ON Semiconductor **Preferred** devices. **Preferred** devices are recommended choices for future use and best overall value.

## SA5.0A Series

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

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



## SA5.0A Series

### ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C unless otherwise noted, V<sub>F</sub> = 3.5 V Max. @ I<sub>F</sub> (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       | SA5.0A         | 5                            | 600                               | 6.4                              | 6.7          | 7           | 10               | 9.2                                       | 54.3            | 5                |
| SA6.0A       | SA6.0A         | 6                            | 600                               | 6.67                             | 7.02         | 7.37        | 10               | 10.3                                      | 48.5            | 5                |
| SA7.0A       | SA7.0A         | 7                            | 150                               | 7.78                             | 8.19         | 8.6         | 10               | 12                                        | 41.7            | 6                |
| SA7.5A       | SA7.5A         | 7.5                          | 50                                | 8.33                             | 8.77         | 9.21        | 1                | 12.9                                      | 38.8            | 7                |
| SA8.0A*      | SA8.0A*        | 8                            | 25                                | 8.89                             | 9.36         | 9.83        | 1                | 13.6                                      | 36.7            | 7                |
| SA8.5A       | SA8.5A         | 8.5                          | 5                                 | 9.44                             | 9.92         | 10.4        | 1                | 14.4                                      | 34.7            | 8                |
| SA9.0A       | SA9.0A         | 9                            | 1                                 | 10                               | 10.55        | 11.1        | 1                | 15.4                                      | 32.5            | 9                |
| SA10A        | SA10A          | 10                           | 1                                 | 11.1                             | 11.7         | 12.3        | 1                | 17                                        | 29.4            | 10               |
| <b>SA11A</b> | <b>SA11A</b>   | <b>11</b>                    | <b>1</b>                          | <b>12.2</b>                      | <b>12.85</b> | <b>13.5</b> | <b>1</b>         | <b>18.2</b>                               | <b>27.4</b>     | <b>11</b>        |
| SA12A        | SA12A          | 12                           | 1                                 | 13.3                             | 14           | 14.7        | 1                | 19.9                                      | 25.1            | 12               |
| SA13A        | SA13A          | 13                           | 1                                 | 14.4                             | 15.15        | 15.9        | 1                | 21.5                                      | 23.2            | 13               |
| SA14A        | SA14A          | 14                           | 1                                 | 15.6                             | 16.4         | 17.2        | 1                | 23.2                                      | 21.5            | 14               |
| SA15A        | SA15A          | 15                           | 1                                 | 16.7                             | 17.6         | 18.5        | 1                | 24.4                                      | 20.6            | 16               |
| SA16A        | SA16A          | 16                           | 1                                 | 17.8                             | 18.75        | 19.7        | 1                | 26                                        | 19.2            | 17               |
| SA17A        | SA17A          | 17                           | 1                                 | 18.9                             | 19.9         | 20.9        | 1                | 27.6                                      | 18.1            | 19               |
| SA18A        | SA18A          | 18                           | 1                                 | 20                               | 21.05        | 22.1        | 1                | 29.2                                      | 17.2            | 20               |
| SA20A        | SA20A          | 20                           | 1                                 | 22.2                             | 23.35        | 24.5        | 1                | 32.4                                      | 15.4            | 23               |
| SA22A        | SA22A          | 22                           | 1                                 | 24.4                             | 25.65        | 26.9        | 1                | 35.5                                      | 14.1            | 25               |
| SA24A        | SA24A          | 24                           | 1                                 | 26.7                             | 28.1         | 29.5        | 1                | 38.9                                      | 12.8            | 28               |
| SA26A        | SA26A          | 26                           | 1                                 | 28.9                             | 30.4         | 31.9        | 1                | 42.1                                      | 11.9            | 30               |
| SA28A        | SA28A          | 28                           | 1                                 | 31.1                             | 32.75        | 34.4        | 1                | 45.4                                      | 11              | 31               |
| SA30A        | SA30A          | 30                           | 1                                 | 33.3                             | 35.05        | 36.8        | 1                | 48.4                                      | 10.3            | 36               |
| SA33A        | SA33A          | 33                           | 1                                 | 36.7                             | 38.65        | 40.6        | 1                | 53.3                                      | 9.4             | 39               |
| SA36A        | SA36A          | 36                           | 1                                 | 40                               | 42.1         | 44.2        | 1                | 58.1                                      | 8.6             | 41               |
| SA40A        | SA40A          | 40                           | 1                                 | 44.4                             | 46.55        | 49.1        | 1                | 64.5                                      | 7.8             | 46               |
| SA43A        | SA43A          | 43                           | 1                                 | 47.8                             | 50.3         | 52.8        | 1                | 69.4                                      | 7.2             | 50               |
| SA45A        | SA45A          | 45                           | 1                                 | 50                               | 52.65        | 55.3        | 1                | 72.7                                      | 6.9             | 52               |
| SA48A        | SA48A          | 48                           | 1                                 | 53.3                             | 56.1         | 58.9        | 1                | 77.4                                      | 6.5             | 56               |
| SA51A        | SA51A          | 51                           | 1                                 | 56.7                             | 59.7         | 62.7        | 1                | 82.4                                      | 6.1             | 61               |
| SA58A        | SA58A          | 58                           | 1                                 | 64.4                             | 67.8         | 71.2        | 1                | 93.6                                      | 5.3             | 70               |
| SA60A        | SA60A          | 60                           | 1                                 | 66.7                             | 70.2         | 73.7        | 1                | 96.8                                      | 5.2             | 71               |
| SA64A        | SA64A          | 64                           | 1                                 | 71.1                             | 74.85        | 78.6        | 1                | 103                                       | 4.9             | 76               |
| SA70A        | SA70A          | 70                           | 1                                 | 77.8                             | 81.9         | 86          | 1                | 113                                       | 4.4             | 85               |
| SA78A        | SA78A          | 78                           | 1                                 | 86.7                             | 91.25        | 95.8        | 1                | 126                                       | 4.0             | 95               |
| <b>SA90A</b> | <b>SA90A</b>   | <b>90</b>                    | <b>1</b>                          | <b>100</b>                       | <b>105.5</b> | <b>111</b>  | <b>1</b>         | <b>146</b>                                | <b>3.4</b>      | <b>110</b>       |
| SA100A       | SA100A         | 100                          | 1                                 | 111                              | 117          | 123         | 1                | 162                                       | 3.1             | 123              |
| SA110A       | SA110A         | 110                          | 1                                 | 122                              | 128.5        | 135         | 1                | 177                                       | 2.8             | 133              |
| SA120A       | SA120A         | 120                          | 1                                 | 133                              | 140          | 147         | 1                | 193                                       | 2.5             | 146              |
| SA130A*      | SA130A*        | 130                          | 1                                 | 144                              | 151.5        | 159         | 1                | 209                                       | 2.4             | 158              |
| SA150A       | SA150A         | 150                          | 1                                 | 167                              | 176          | 185         | 1                | 243                                       | 2.1             | 184              |
| SA160A*      | SA160A*        | 160                          | 1                                 | 178                              | 187.5        | 197         | 1                | 259                                       | 1.9             | 196              |
| SA170A       | SA170A         | 170                          | 1                                 | 189                              | 199          | 209         | 1                | 275                                       | 1.8             | 208              |

#### NOTES:

- MiniMOSORB™ transients suppressor is normally selected according to the maximum working peak reverse voltage (V<sub>RWM</sub>), which should be equal to or greater than the dc or continuous peak operating voltage level.
- V<sub>BR</sub> measured at pulse test current I<sub>T</sub> at an ambient temperature of 25°C.
- Surge current waveform per Figure 4 and derate per Figures 1 and 2.
- 1/2 sine wave (or equivalent square wave), PW = 8.3 ms, duty cycle = 4 pulses per minute
- \*Not Available in the 5000/Tape & Reel.

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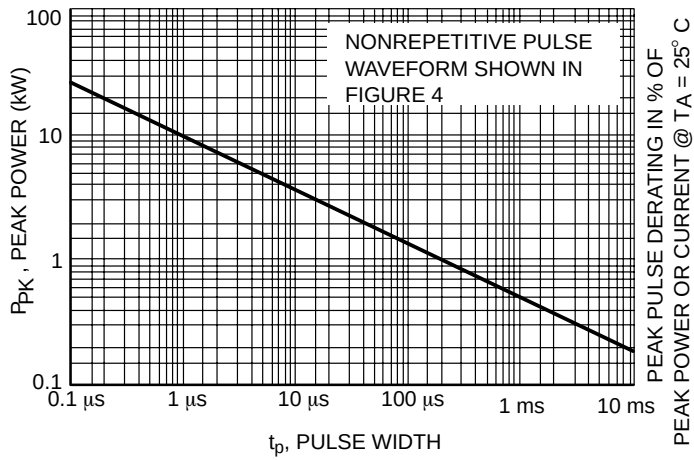


Figure 1. Pulse Rating Curve

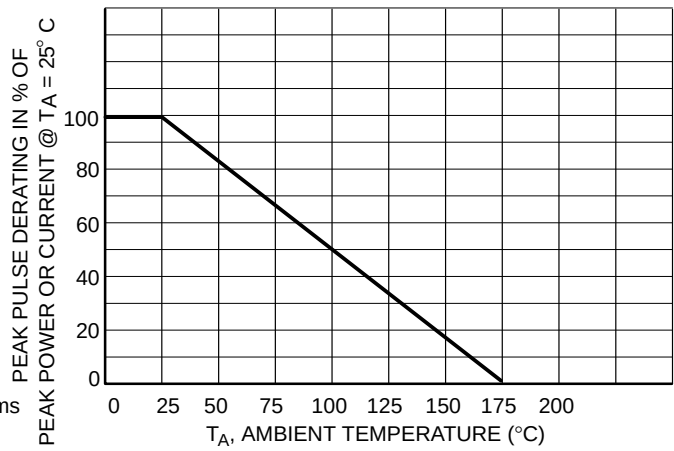


Figure 2. Pulse Derating Curve

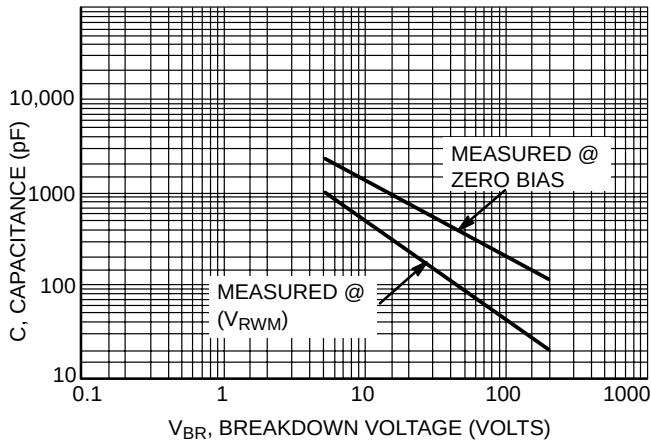


Figure 3. Capacitance versus Breakdown Voltage

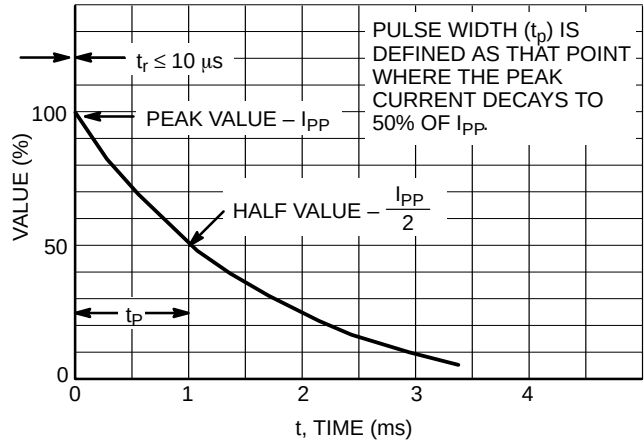


Figure 4. Pulse Waveform

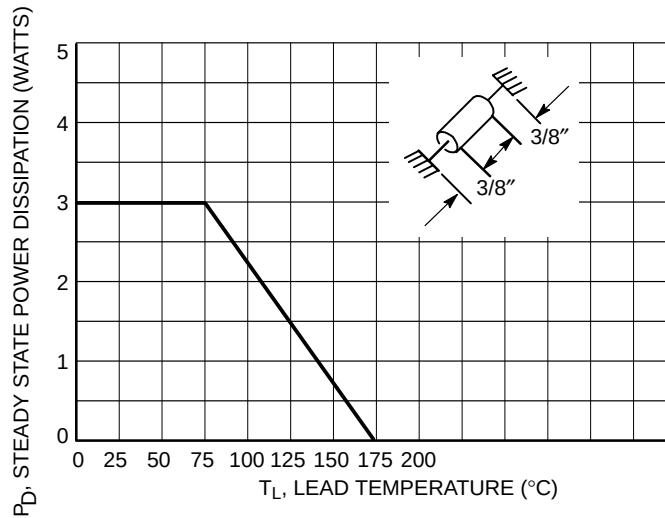


Figure 5. Steady State Power Derating

## SA5.0A Series

### UL RECOGNITION\*

The entire series including the bidirectional CA suffix has *Underwriters Laboratory Recognition* for the classification of protectors (QGV2) under the UL standard for safety 497B and File #E 116110. 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.

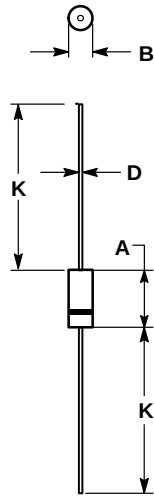
Whereas, some competitors have only passed a flammability test for the package material, we have been recognized for much more to be included in their protector category.

\*Applies to SA5.0A, CA – SA170A, CA.

# Transient Voltage Suppressors – Axial Leaded

## 500 Watt Peak Power MiniMOSORB™

MINI MOSORB  
CASE 59-09  
ISSUE S



### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 59-04 OBSOLETE, NEW STANDARD 59-09.
4. 59-03 OBSOLETE, NEW STANDARD 59-10.
5. ALL RULES AND NOTES ASSOCIATED WITH JEDEC DO-41 OUTLINE SHALL APPLY.
6. POLARITY DENOTED BY CATHODE BAND.
7. LEAD DIAMETER NOT CONTROLLED WITHIN F DIMENSION.

| 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       | ---  |

## **Notes**

## SA5.0A Series

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