

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

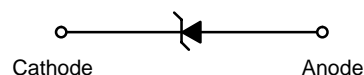
**POLARITY:** Cathode indicated by polarity band

**MOUNTING POSITION:** Any

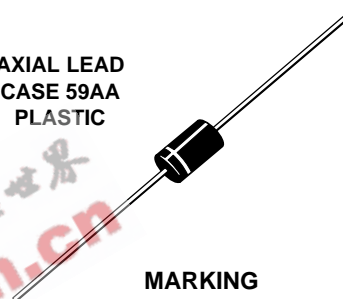


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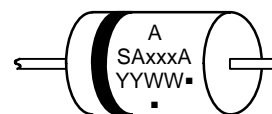
<http://onsemi.com>



AXIAL LEAD  
CASE 59AA  
PLASTIC



MARKING  
DIAGRAM



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

#### ORDERING INFORMATION

Device	Package	Shipping†
SAxxxA	Axial Lead	1000 Units / Box
SAxxxAG	Axial Lead (Pb-Free)	1000 Units / Box
SAxxxARL*	Axial Lead	5000 / Tape & Reel
SAxxxARLG*	Axial Lead (Pb-Free)	5000 / Tape & Reel
SAxxxALF**	Axial Lead	2000 Units / Box
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.

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

\*\* 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

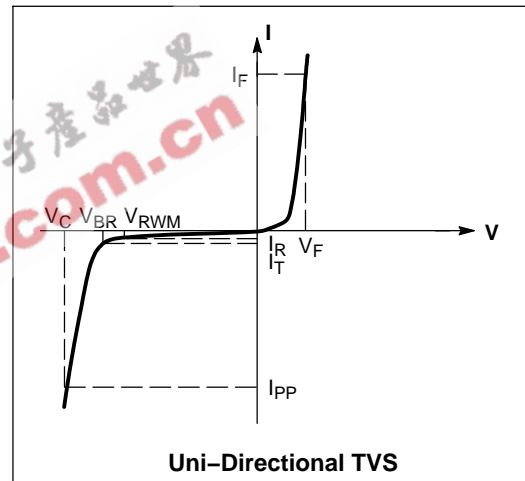
Rating	Symbol	Value	Unit
Peak Power Dissipation (Note 1) @ $T_L \leq 25^\circ\text{C}$	$P_{PK}$	500	W
Steady State Power Dissipation @ $T_L \leq 75^\circ\text{C}$ , Lead Length = 3/8 in Derated above $T_L = 75^\circ\text{C}$	$P_D$	3.0 30	W mW/°C
Thermal Resistance, Junction-to-Lead	$R_{\theta JL}$	33.3	°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 +175	°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 2.
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
$\Theta V_{BR}$	Maximum Temperature Variation of $V_{BR}$
$I_F$	Forward Current
$V_F$	Forward Voltage @ $I_F$



## SA5.0A Series

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

Device*	Device Marking	$V_{RWM}$ (Note 3) Volts	$I_R$ @ $V_{RWM}$ $\mu\text{A}$	Breakdown Voltage				$V_C$ @ $I_{PP}$ (Note 5)		$\theta_{VBR}$ mV/ $^\circ\text{C}$
				$V_{BR}$ (Note 4) (Volts)			@ $I_T$	$V_C$	$I_{PP}$	
				Min	Nom	Max	mA	Volts	A	
SA5.0A, G	SA5.0A	5	600	6.4	6.7	7	10	9.2	54.3	5
SA6.0A, G	SA6.0A	6	600	6.67	7.02	7.37	10	10.3	48.5	5
SA7.0A, G	SA7.0A	7	150	7.78	8.19	8.6	10	12	41.7	6
SA7.5A, G	SA7.5A	7.5	50	8.33	8.77	9.21	1	12.9	38.8	7
SA8.0A, G†	SA8.0A	8	25	8.89	9.36	9.83	1	13.6	36.7	7
SA8.5A, G	SA8.5A	8.5	5	9.44	9.92	10.4	1	14.4	34.7	8
SA9.0A, G	SA9.0A	9	1	10	10.55	11.1	1	15.4	32.5	9
SA10A, G	SA10A	10	1	11.1	11.7	12.3	1	17	29.4	10
<b>SA11A, G</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, G	SA12A	12	1	13.3	14	14.7	1	19.9	25.1	12
SA13A, G	SA13A	13	1	14.4	15.15	15.9	1	21.5	23.2	13
SA14A, G	SA14A	14	1	15.6	16.4	17.2	1	23.2	21.5	14
SA15A, G	SA15A	15	1	16.7	17.6	18.5	1	24.4	20.6	16
SA16A, G	SA16A	16	1	17.8	18.75	19.7	1	26	19.2	17
SA17A, G	SA17A	17	1	18.9	19.9	20.9	1	27.6	18.1	19
SA18A, G	SA18A	18	1	20	21.05	22.1	1	29.2	17.2	20
SA20A, G	SA20A	20	1	22.2	23.35	24.5	1	32.4	15.4	23
SA22A, G	SA22A	22	1	24.4	25.65	26.9	1	35.5	14.1	25
SA24A, G	SA24A	24	1	26.7	28.1	29.5	1	38.9	12.8	28
SA26A, G	SA26A	26	1	28.9	30.4	31.9	1	42.1	11.9	30
SA28A, G	SA28A	28	1	31.1	32.75	34.4	1	45.4	11	31
SA30A, G	SA30A	30	1	33.3	35.05	36.8	1	48.4	10.3	36
SA33A, G	SA33A	33	1	36.7	38.65	40.6	1	53.3	9.4	39
SA36A, G	SA36A	36	1	40	42.1	44.2	1	58.1	8.6	41
SA40A, G	SA40A	40	1	44.4	46.55	49.1	1	64.5	7.8	46
SA43A, G	SA43A	43	1	47.8	50.3	52.8	1	69.4	7.2	50
SA45A, G	SA45A	45	1	50	52.65	55.3	1	72.7	6.9	52
SA48A, G	SA48A	48	1	53.3	56.1	58.9	1	77.4	6.5	56
SA51A, G	SA51A	51	1	56.7	59.7	62.7	1	82.4	6.1	61
SA58A, G	SA58A	58	1	64.4	67.8	71.2	1	93.6	5.3	70
SA60A, G	SA60A	60	1	66.7	70.2	73.7	1	96.8	5.2	71
SA64A, G	SA64A	64	1	71.1	74.85	78.6	1	103	4.9	76
SA64ALF, G	SA64A	64	1	71.1	74.85	78.6	1	103	4.9	76
SA70A, G	SA70A	70	1	77.8	81.9	86	1	113	4.4	85
SA78A, G	SA78A	78	1	86.7	91.25	95.8	1	126	4.0	95
<b>SA90A, G</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, G	SA100A	100	1	111	117	123	1	162	3.1	123
SA110A, G	SA110A	110	1	122	128.5	135	1	177	2.8	133
SA120A, G	SA120A	120	1	133	140	147	1	193	2.5	146
SA130A, G†	SA130A	130	1	144	151.5	159	1	209	2.4	158
SA150A, G	SA150A	150	1	167	176	185	1	243	2.1	184
SA160A, G†	SA160A	160	1	178	187.5	197	1	259	1.9	196
SA170A, G	SA170A	170	1	189	199	209	1	275	1.8	208

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

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 available.

†Not Available in the 5000/Tape & Reel.

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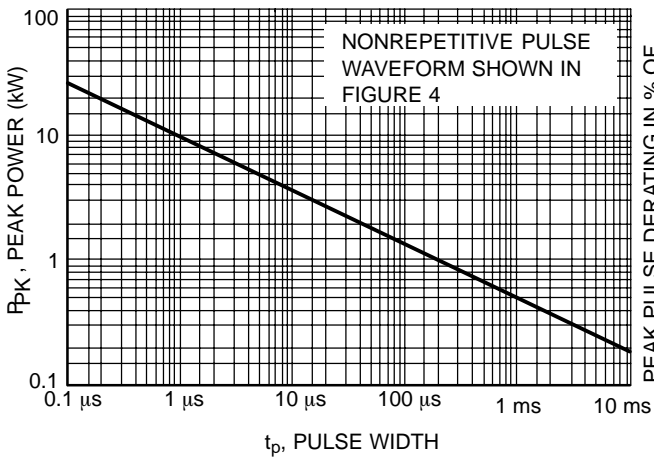


Figure 1. Pulse Rating Curve

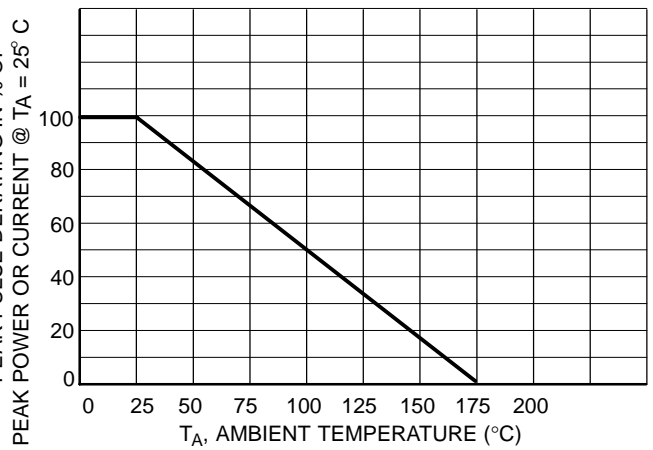


Figure 2. Pulse Derating Curve

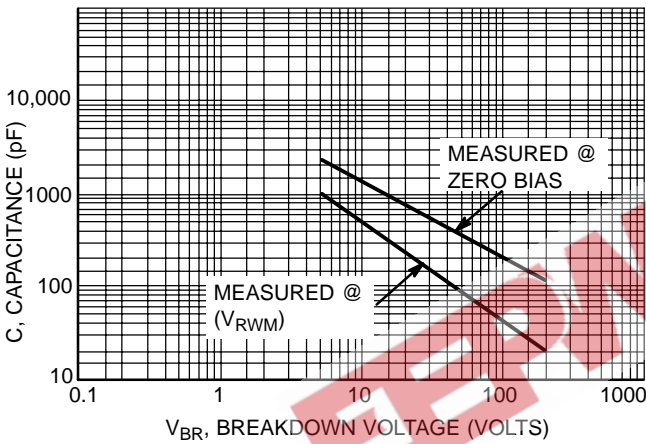


Figure 3. Capacitance versus Breakdown Voltage

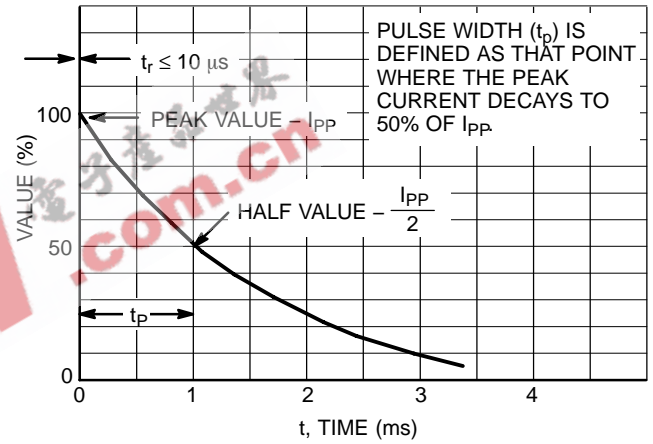


Figure 4. Pulse Waveform

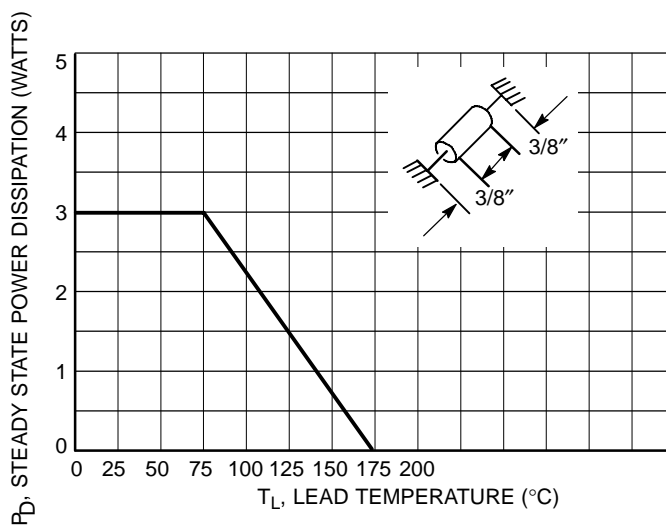


Figure 5. Steady State Power Derating

## SA5.0A Series

### UL RECOGNITION\*

The entire series including the bidirectional CA suffix has *Underwriters Laboratory Recognition* for the classification of protectors (QVGV2) 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.

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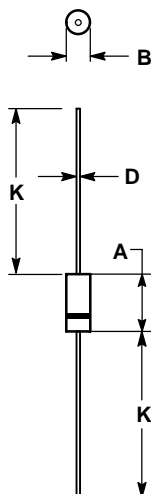
## PACKAGE DIMENSIONS

### AXIAL LEAD

CASE 59AA-01

ISSUE O

(Similar to DO-204AC or DO-15)




#### 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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