**Preferred Device** 

# **1500 Watt Mosorb™ Zener Transient Voltage Suppressors**

# **Unidirectional\***

Mosorb devices are 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. These devices are ON Semiconductor's exclusive, cost-effective, highly reliable Surmetic™ axial leaded package and are ideally-suited for use in communication systems, numerical controls, process controls, medical equipment, business machines, power supplies and many other industrial/consumer applications, to protect CMOS, MOS and Bipolar integrated circuits.

#### **Features**

- Working Peak Reverse Voltage Range 5.0 V
- Peak Power 1500 Watts @ 1 ms
- Maximum Clamp Voltage @ Peak Pulse Current
- Low Leakage < 5 µA Above 10 V
- Response Time is Typically < 1 ns
- These are Pb-Free Devices\*

#### **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 PURPOSES:

260°C, 1/16" from the case for 10 seconds **POLARITY:** Cathode indicated by polarity band

**MOUNTING POSITION:** Any



# ON Semiconductor®

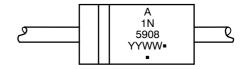
http://onsemi.com





AXIAL LEAD CASE 41A PLASTIC

#### MARKING DIAGRAM



A = Assembly Location 1N5908 = JEDEC Device Number

YY = Year WW = Work Week ■ Pb-Free Package

(Note: Microdot may be in either location)

#### **ORDERING INFORMATION**

Device	Package	Shipping <sup>†</sup> 500 Units/Box		
1N5908G	Axial Lead (Pb-Free)			
1N5908RL4G	Axial Lead (Pb-Free)	1500/Tape & Reel		

<sup>†</sup>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.

Preferred devices are recommended choices for future use and best overall value.

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

#### **MAXIMUM RATINGS**

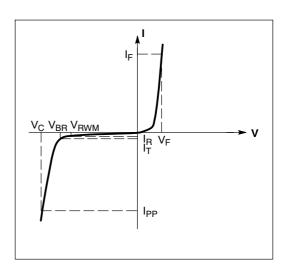
Rating	Symbol	Value	Unit
Peak Power Dissipation (Note 1) @ T <sub>L</sub> ≤ 25°C	P <sub>PK</sub>	1500	W
Steady State Power Dissipation @ T₁ ≤ 75°C, Lead Length = 3/8″	P <sub>D</sub>	5.0	W
Derated above T <sub>L</sub> = 75°C		50	mW/°C
Thermal Resistance, Junction-to-Lead	$R_{ heta JL}$	20	°C/W
Forward Surge Current (Note 2) @ T <sub>A</sub> = 25°C	I <sub>FSM</sub>	200	Α
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	- 65 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.

- Nonrepetitive current pulse per Figure 4 and derated above T<sub>A</sub> = 25°C per Figure 2.
   1/2 sine wave (or equivalent square wave), PW = 8.3 ms, duty cycle = 4 pulses per minute maximum.

## **ELECTRICAL CHARACTERISTICS** (T<sub>A</sub> = 25°C unless otherwise noted, V<sub>F</sub> = 3.5 V Max. @ I<sub>F</sub> (Note 3) = 100 A)

Symbol	Parameter					
I <sub>PP</sub>	Maximum Reverse Peak Pulse Current					
V <sub>C</sub> Clamping Voltage @ I <sub>PP</sub>						
V <sub>RWM</sub> Working Peak Reverse Voltage						
I <sub>R</sub> Maximum Reverse Leakage Current @ V <sub>R</sub>						
V <sub>BR</sub> Breakdown Voltage @ I <sub>T</sub>						
I <sub>T</sub>	Test Current					
IF	Forward Current					
V <sub>F</sub>	Forward Voltage @ I <sub>F</sub>					



**Uni-Directional TVS** 

# **ELECTRICAL CHARACTERISTICS** ( $T_A = 25^{\circ}C$ unless otherwise noted, $V_F = 3.5$ V Max. @ $I_F$ (Note $3^{\circ} = 53$ A)

	V <sub>RWM</sub>			Breakdown Voltage			1	V <sub>C</sub> (Volts) (Note 7)		
	Device	(Note 5)	I <sub>R</sub> @ V <sub>RWM</sub>	V <sub>BR</sub> (Note 6) (Volts)		@ I <sub>T</sub>				
	(Note 4)	(Volts)	<b>(μΑ)</b>	Min	Nom	Max	(mA)	@ l <sub>PP</sub> = 120 A	@ I <sub>PP</sub> = 60 A	@ I <sub>PP</sub> = 30 A
I	1N5908	5.0	300	6.0	-	-	1.0	8.5	8.0	7.6

- 3. Square waveform, PW = 8.3 ms, Non-repetitive duty cycle.
- 4. 1N5908 is JEDEC registered as a unidirectional device only (no bidirectional option)
- 5. A transient 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.

  6. V<sub>BR</sub> measured at pulse test current I<sub>T</sub> at an ambient temperature of 25°C and minimum voltages in V<sub>BR</sub> are to be controlled.
- 7. Surge current waveform per Figure 4 and derate per Figure 2 of the General Data 1500 W at the beginning of this group

<sup>\*</sup>Bidirectional device will not be available in this device

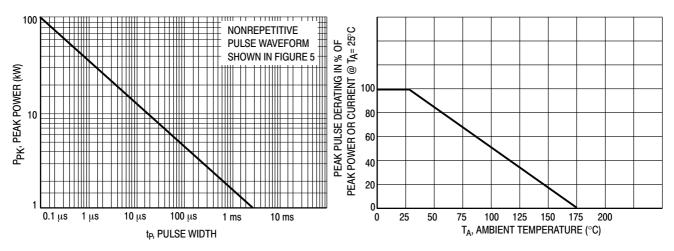


Figure 1. Pulse Rating Curve

Figure 2. Pulse Derating Curve

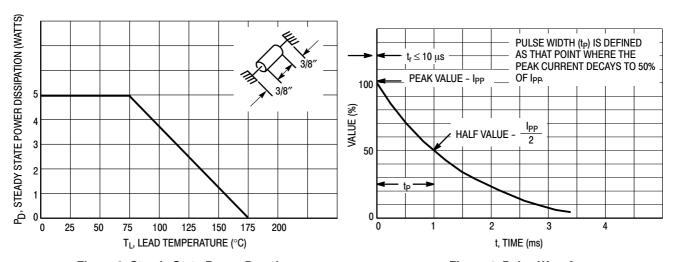


Figure 3. Steady State Power Derating

Figure 4. Pulse Waveform

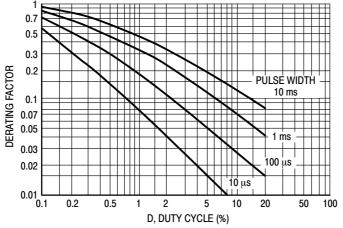


Figure 5. Typical Derating Factor for Duty Cycle

#### **APPLICATION NOTES**

#### **RESPONSE TIME**

In most applications, the transient suppressor device is placed in parallel with the equipment or component to be protected. In this situation, there is a time delay associated with the capacitance of the device and an overshoot condition associated with the inductance of the device and the inductance of the connection method. The capacitance effect is of minor importance in the parallel protection scheme because it only produces a time delay in the transition from the operating voltage to the clamp voltage as shown in Figure 6.

The inductive effects in the device are due to actual turn-on time (time required for the device to go from zero current to full current) and lead inductance. This inductive effect produces an overshoot in the voltage across the equipment or component being protected as shown in Figure 7. Minimizing this overshoot is very important in the application, since the main purpose for adding a transient suppressor is to clamp voltage spikes. These devices have excellent response time, typically in the picosecond range and negligible inductance. However, external inductive effects could produce unacceptable overshoot. Proper circuit layout, minimum lead lengths and

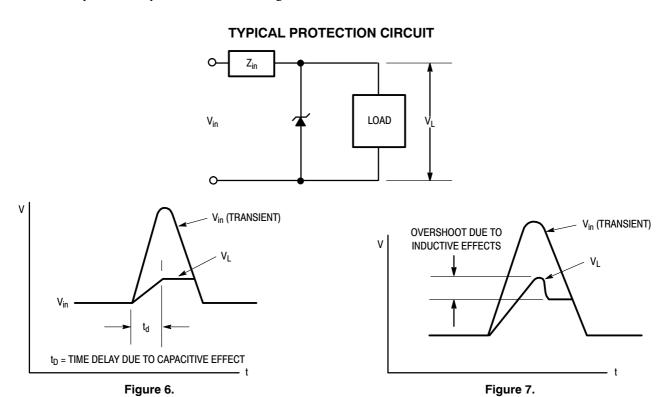
placing the suppressor device as close as possible to the equipment or components to be protected will minimize this overshoot.

Some input impedance represented by  $Z_{in}$  is essential to prevent overstress of the protection device. This impedance should be as high as possible, without restricting the circuit operation.

## **DUTY CYCLE DERATING**

The data of Figure 1 applies for non-repetitive conditions and at a lead temperature of 25°C. If the duty cycle increases, the peak power must be reduced as indicated by the curves of Figure 5. Average power must be derated as the lead or ambient temperature rises above 25°C. The average power derating curve normally given on data sheets may be normalized and used for this purpose.

At first glance the derating curves of Figure 5 appear to be in error as the 10 ms pulse has a higher derating factor than the  $10~\mu s$  pulse. However, when the derating factor for a given pulse of Figure 5 is multiplied by the peak power value of Figure 1 for the same pulse, the results follow the expected trend.



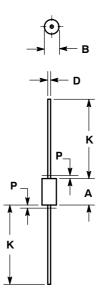
#### **CLIPPER BIDIRECTIONAL DEVICES**

- Clipper-bidirectional devices are available in the 1.5KEXXA series and are designated with a "CA" suffix; for example, 1.5KE18CA. Contact your nearest ON Semiconductor representative.
- Clipper-bidirectional part numbers are tested in both directions to electrical parameters in preceding table (except for V<sub>F</sub> which does not apply).
- The 1N6267A through 1N6303A series are JEDEC registered devices and the registration does not include a "CA" suffix. To order clipper-bidirectional devices one must add CA to the 1.5KE device title.

#### 1N5908

#### PACKAGE DIMENSIONS

**MOSORB** CASE 41A-04 ISSUE D



#### NOTES:

- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
- CONTROLLING DIMENSION: INCH.
  LEAD FINISH AND DIAMETER UNCONTROLLED 3. IN DIMENSION P. 041A-01 THRU 041A-03 OBSOLETE, NEW
- STANDARD 041A-04

	INC	HES	MILLIMETERS		
DIM	MIN	MAX	MIN	MAX	
Α	0.335	0.374	8.50	9.50	
В	0.189	0.209	4.80	5.30	
D	0.038	0.042	0.96	1.06	
K	1.000		25.40		
P		0.050		1.27	

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