

Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from, Europe, America and south Asia, supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of "Quality Parts, Customers Priority, Honest Operation, and Considerate Service", our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip, ALPS, ROHM, Xilinx, Pulse, ON, Everlight and Freescale. Main products comprise IC, Modules, Potentiometer, IC Socket, Relay, Connector. Our parts cover such applications as commercial, industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!



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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 5.8 V to 214 V
- Peak Power 1500 Watts @ 1 ms
- ESD Rating of Class 3 (>16 kV) per Human Body Model
- Maximum Clamp Voltage @ Peak Pulse Current
- Low Leakage < 5 µA Above 10 V
- UL 497B for Isolated Loop Circuit Protection
- Response Time is Typically < 1 ns
- These devices are manufactured with a Pb-Free external lead finish only*

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:

230°C, 1/16 in from the case for 10 seconds **POLARITY:** Cathode indicated by polarity band

MOUNTING POSITION: Any

ON Semiconductor® http://onsemi.com Cathode



Anode

AXIAL LEAD CASE 41A **PLASTIC**

MARKING DIAGRAM



 Assembly Location 1N6xxxA = JEDEC Device Code 1.5KExxxA = ON Device Code = Year ΥY ww Work Week

ORDERING INFORMATION

Device	Package	Shipping [†]	
1.5KExxxA	Axial Lead	500 Units/Box	
1.5KExxxARL4	Axial Lead	1500/Tape & Reel	
1N6xxxA	Axial Lead	500 Units/Box	
1N6xxxARL4*	Axial Lead	1500/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.

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

^{*1}N6302A Not Available in 1500/Tape & Reel

^{*}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

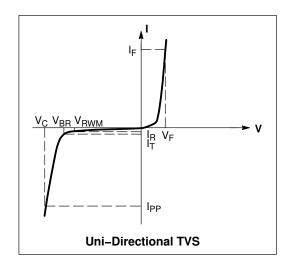
Rating	Symbol	Value	Unit
Peak Power Dissipation (Note 1) @ T _L ≤ 25°C	P _{PK}	1500	W
Steady State Power Dissipation @ $T_L \le 75^{\circ}$ C, Lead Length = 3/8 in Derated above $T_L = 75^{\circ}$ C	P _D	5.0 20	W mW/°C
Thermal Resistance, Junction-to-Lead	$R_{ heta JL}$	20	°C/W
Forward Surge Current (Note 2) @ T _A = 25°C	I _{FSM}	200	Α
Operating and Storage Temperature Range	T _J , T _{stg}	– 65 to +175	°C

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

- Nonrepetitive current pulse per Figure 5 and derated above T_A = 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 ($T_A = 25$ °C unless otherwise noted, $V_F = 3.5 \text{ V Max.}$, $I_F \text{ (Note 3)} = 100 \text{ A)}$

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
ΘV _{BR}	Maximum Temperature Coefficient of V _{BR}
I _F	Forward Current
V _F	Forward Voltage @ I _F



^{*}Please see 1.5KE6.8CA to 1.5KE250CA for Bidirectional Devices

ELECTRICAL CHARACTERISTICS ($T_A = 25$ °C unless otherwise noted, $V_F = 3.5$ V Max. @ I_F (Note 3) = 100 A)

Device Device Device (Note 4) (Volts) I _R @ V _{RWM} V _{BR} (Note 6) (Volts) @ I _T V _C I _{PP} ΘV	(Volts) (A) (% 10.5 143 0.		@ I _T	olts)	(Note 6) (V	Von	1.04		JEDEC	
Device (Note 4) (Volts) (μA) Min Nom Max (mA) (Volts) (A) (%/% 1.5KE6.8A 1N6267A 5.8 1000 6.45 6.8 7.14 10 10.5 143 0.0 1.5KE7.5A 1N6268A 6.4 500 7.13 7.5 7.88 10 11.3 132 0.0 1.5KE8.2A 1N6269A 7.02 200 7.79 8.2 8.61 10 12.1 124 0.0 1.5KE9.1A 1N6270A 7.78 50 8.65 9.1 9.55 1 13.4 112 0.0 1.5KE10A 1N6271A 8.55 10 9.5 10 10.5 1 14.5 103 0.0 1.5KE11A 1N6272A 9.4 5 10.5 11 11.6 1 15.6 96 0.0 1.5KE12A 1N6273A 10.2 5 11.4 12 12.6 1 16.7	(Volts) (A) (% 10.5 143 0.	A) (Valla)		•	() (-	'BH	IR @ VRWM	(14016-3)	Dovice	
1.5KE7.5A 1N6268A 6.4 500 7.13 7.5 7.88 10 11.3 132 0.0 1.5KE8.2A 1N6269A 7.02 200 7.79 8.2 8.61 10 12.1 124 0.0 1.5KE9.1A 1N6270A 7.78 50 8.65 9.1 9.55 1 13.4 112 0.0 1.5KE10A 1N6271A 8.55 10 9.5 10 10.5 1 14.5 103 0.0 1.5KE11A 1N6272A 9.4 5 10.5 11 11.6 1 15.6 96 0.0 1.5KE12A 1N6273A 10.2 5 11.4 12 12.6 1 16.7 90 0.0 1.5KE13A 1N6274A 11.1 5 12.4 13 13.7 1 18.2 82 0.0 1.5KE15A 1N6275A 12.8 5 14.3 15 15.8 1 21.2 71 0.0 1.5KE18A 1N6276A 13.6 5 15.2 16 <t< th=""><th></th><th>ia) (voits)</th><th>(mA)</th><th>Max</th><th>Nom</th><th>Min</th><th>(μA)</th><th>(Volts)</th><th></th><th>Device</th></t<>		ia) (voits)	(mA)	Max	Nom	Min	(μ A)	(Volts)		Device
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1.5KE10A 1N6271A 8.55 10 9.5 10 10.5 1 14.5 103 0.0 1.5KE11A 1N6272A 9.4 5 10.5 11 11.6 1 15.6 96 0.0 1.5KE12A 1N6273A 10.2 5 11.4 12 12.6 1 16.7 90 0.0 1.5KE13A 1N6274A 11.1 5 12.4 13 13.7 1 18.2 82 0.0 1.5KE15A 1N6275A 12.8 5 14.3 15 15.8 1 21.2 71 0.0 1.5KE16A 1N6276A 13.6 5 15.2 16 16.8 1 22.5 67 0.0 1.5KE18A 1N6276A 15.3 5 17.1 18 18.9 1 25.2 59.5 0.0 1.5KE20A 1N6278A 17.1 5 19 20 21 1 27.7 54 0.0 1.5KE24A 1N6280A 20.5 5 22.8 24 25.2		0 12.1	10	8.61	8.2	7.79	200	7.02	1N6269A	1.5KE8.2A
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1.5KE27A	30.6 49 0.	1 30.6	1	23.1	22	20.9	5	18.8	1N6279A	1.5KE22A
	<i>33.2</i> 45 0.	1 33.2	1	25.2	24	22.8	5	20.5	1N6280A	1.5KE24A
15KE20A	<i>37.5</i> 40 0.	1 37.5	1	28.4	27	25.7	5	23.1	1N6281A	1.5KE27A
1.5NESUM	41.4 36 0.	1 41.4	1	31.5	30	28.5	5	25.6	1N6282A	1.5KE30A
1.5KE33A 1N6283A 28.2 5 31.4 33 34.7 1 45.7 33 0.0	45.7 33 0 .	1 45.7	1	34.7	33	31.4	5	28.2	1N6283A	1.5KE33A
1.5KE36A	49.9 30 0.	1 49.9	1	37.8	36	34.2		30.8	1N6284A	1.5KE36A
1.5KE39A	53.9 28	1 53.9	1	41	39	37.1	5	33.3	1N6285A	1.5KE39A
1.5KE43A 1N6286A 36.8 5 40.9 43 45.2 1 59.3 25.3 0.1	59.3 25.3 0.	1 59.3	1	45.2	43	40.9	5	36.8	1N6286A	1.5KE43A
1.5KE47A 1N6287A 40.2 5 44.7 47 49.4 1 64.8 23.2 0.1	64.8 23.2 0.	1 64.8	1	49.4	47	44.7	5	40.2	1N6287A	1.5KE47A
1.5KE51A		1 70.1	1	53.6	51	48.5		43.6	1N6288A	1.5KE51A
1.5KE56A	<i>77</i> 19.5 0.	1 77	1	58.8	56	53.2		47.8	1N6289	1.5KE56A
1.5KE62A 1N6290A 53 5 58.9 62 65.1 1 85 17.7 0.1	85 17.7 0.	1 85	1	65.1	62	58.9	5	53	1N6290A	1.5KE62A
1.5KE68A 1N6291A 58.1 5 64.6 68 71.4 1 92 16.3 0.10	92 16.3 0.	1 92	1			64.6		58.1	1N6291A	1.5KE68A
1.5KE75A 1N6292A 64.1 5 71.3 75 78.8 1 103 14.6 0.16	103 14.6 0.	1 103	1	78.8	75	71.3		64.1	1N6292A	1.5KE75A
1.5KE82A 1N6293A 70.1 5 77.9 82 86.1 1 113 13.3 0.1		1 113	1	86.1		77.9		70.1		
1.5KE91A 1N6294A 77.8 5 86.5 91 95.5 1 125 12 0.1	125 12 0.	1 125	1	95.5	91	86.5	5	77.8	1N6294A	1.5KE91A
1.5KE100A 1N6295A 85.5 5 95 100 105 1 137 11 0.10	137 11 0.	1 137	1	105	100	95			1N6295A	1.5KE100A
1.5KE110A 1N6296A 94 5 105 110 116 1 152 9.9 0.16	152 9.9 0.	1 152	1	116	110	105	5	94	1N6296A	1.5KE110A
1.5KE120A	165 9.1 0.	1 165	1	126	120	114		102		1.5KE120A
1.5KE130A 1N6298A 111 5 124 130 137 1 179 8.4 0.1	179 8.4 0.	1 179	1	137	130	124	5	111	1N6298A	1.5KE130A
1.5KE150A 1N6299A 128 5 143 150 158 1 207 7.2 0.10		1 207	1	158	150	143		128		1.5KE150A
1.5KE160A 1N6300A 136 5 152 160 168 1 219 6.8 0.16	219 6.8 0.	1 219	1	168	160	152		136	1N6300A	1.5KE160A
1.5KE170A 1N6301A 145 5 162 170 179 1 234 6.4 0.16	234 6.4 0.	1 234	1	179	170	162		145	1N6301A	1.5KE170A
1.5KE180A 1N6302A* 154 5 171 180 189 1 246 6.1 0.1	246 6.1 0.	1 246	1	189	180	171	5	154	1N6302A*	1.5KE180A
1.5KE200A 1N6303A 171 5 190 200 210 1 274 5.5 0.10		1 274	1	210	200	190	5	171	1N6303A	1.5KE200A
1.5KE220A 185 5 209 220 231 1 328 4.6 0.10	274 5.5 0.	2/4					-			
1.5KE250A 214 5 237 250 263 1 344 5 0.16			1	_				185		1.5KE220A

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

^{3. 1/2} sine wave (or equivalent square wave), PW = 8.3 ms, duty cycle = 4 pulses per minute maximum.
4. Indicates JEDEC registered data

^{5.} A transient 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.

 ^{6.} V_{BR} measured at pulse test current I_T at an ambient temperature of 25°C
 7. Surge current waveform per Figure 5 and derate per Figures 1 and 2.
 *Not Available in the 1500/Tape & Reel

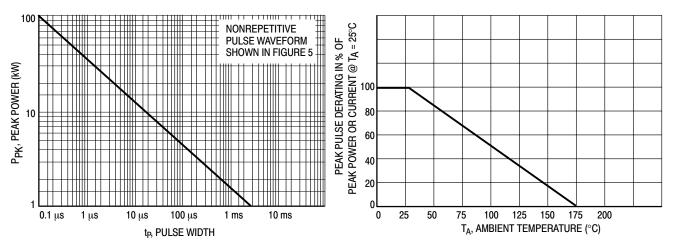


Figure 1. Pulse Rating Curve

Figure 2. Pulse Derating Curve

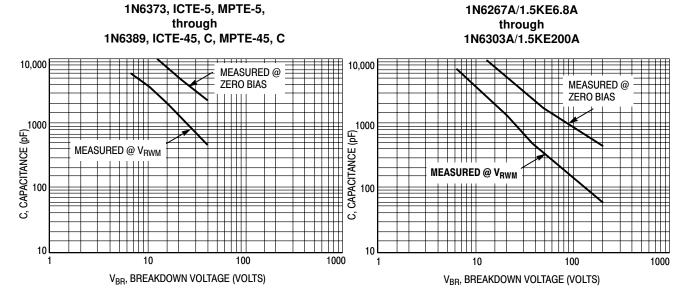


Figure 3. Capacitance versus Breakdown Voltage

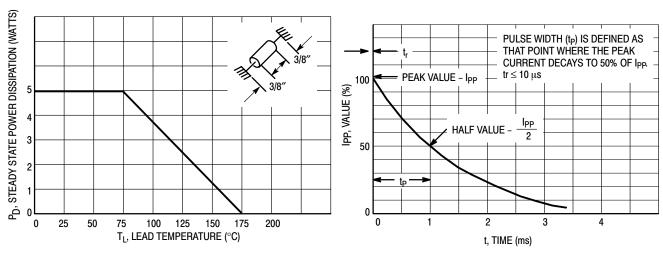


Figure 4. Steady State Power Derating

Figure 5. Pulse Waveform

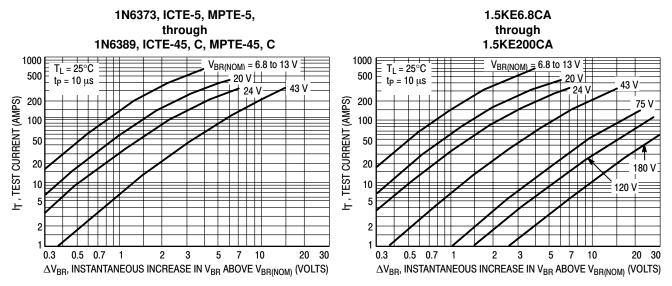


Figure 6. Dynamic Impedance

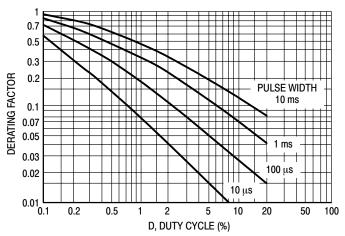


Figure 7. Typical Derating Factor for Duty Cycle

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 8.

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 9. 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 7. 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 7 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 7 is multiplied by the peak power value of Figure 1 for the same pulse, the results follow the expected trend.

TYPICAL PROTECTION CIRCUIT

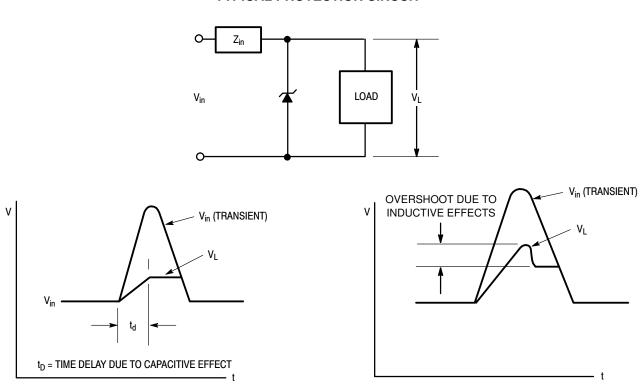


Figure 8. Figure 9.

UL RECOGNITION*

The entire series has *Underwriters Laboratory Recognition* for the classification of protectors (QVGV2) under the UL standard for safety 497B and File #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.

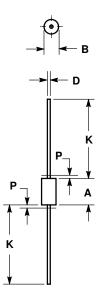
*Applies to 1.5KE6.8A, CA thru 1.5KE250A, CA

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_F which does not apply).
- 3. 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.

OUTLINE DIMENSIONS

MOSORB CASE 41A-04 ISSUE D



- NOTES:
 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. LEAD FINISH AND DIAMETER UNCONTROLLED IN DIMENSION P.
 4. 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		
Р		0.050		1.27	

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