1N6267A Series

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.

Specification 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

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″ from the case for 10 seconds

POLARITY: Cathode indicated by polarity band

MOUNTING POSITION: Any

MAXIMUM RATINGS

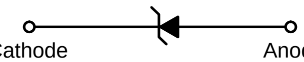
Rating	Symbol	Value	Unit
Peak Power Dissipation (Note 1) @ $T_L \le 25°C$	P_{PK}	1500	Watts
Steady State Power Dissipation @ $T_L \le 75°C$, Lead Length = 3/8″ Derated above $T_L = 75°C$	P_D	5.0 20	Watts mW/°C
Thermal Resistance, Junction–to–Lead	$R_{\theta JL}$	20	°C/W
Forward Surge Current (Note 2) @ $T_A = 25°C$	I_{FSM}	200	Amps
Operating and Storage Temperature Range	T_J, T_{stg}	– 65 to +175	°C

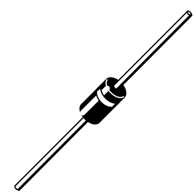
1. Nonrepetitive current pulse per Figure 5 and derated above $T_A = 25°C$ per Figure 2.
2. 1/2 sine wave (or equivalent square wave), PW = 8.3 ms, duty cycle = 4 pulses per minute maximum.

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

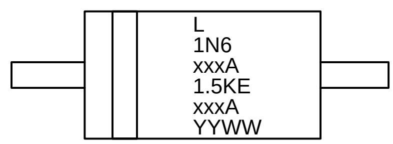
ON Semiconductor®

http://onsemi.com





AXIAL LEAD
CASE 41A
PLASTIC



L = Assembly Location
1N6xxxA = JEDEC Device Code
1.5KExxxA = ON Device Code
YY = Year
WW = Work Week

ORDERING INFORMATION

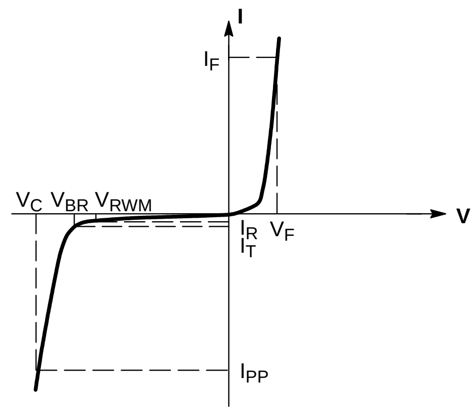
Device	Package	Shipping
1.5KExxxA	Axial Lead	500 Units/Box
1.5KExxxARL4	Axial Lead	1500/Tape & Reel
1N6xxxA	Axial Lead	500 Units/Box
1N6xxxARL4*	Axial Lead	1500/Tape & Reel

*1N6302A Not Available in 1500/Tape & Reel

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

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



Uni–Directional TVS

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

				Breakdown Voltage				V_C @ I_{PP} (Note 7)		
	JEDEC Device	V_{RWM} (Note 5)	I_R @ V_{RWM}	V_{BR} (Note 6) **(Volts)**			@ I_T	V_C	I_{PP}	ΘV_{BR}
Device	(Note 4)	**(Volts)**	**(μA)**	**Min**	**Nom**	**Max**	**(mA)**	**(Volts)**	**(A)**	**(%/°C)**
1.5KE6.8A	***1N6267A***	***5.8***	***1000***	***6.45***	***6.8***	***7.14***	***10***	***10.5***	***143***	***0.057***
1.5KE7.5A	1N6268A	6.4	500	7.13	7.5	7.88	10	11.3	132	0.061
1.5KE8.2A	1N6269A	7.02	200	7.79	8.2	8.61	10	12.1	124	0.065
1.5KE9.1A	1N6270A	7.78	50	8.65	9.1	9.55	1	13.4	112	0.068
1.5KE10A	1N6271A	8.55	10	9.5	10	10.5	1	14.5	103	0.073
1.5KE11A	1N6272A	9.4	5	10.5	11	11.6	1	15.6	96	0.075
1.5KE12A	1N6273A	10.2	5	11.4	12	12.6	1	16.7	90	0.078
1.5KE13A	1N6274A	11.1	5	12.4	13	13.7	1	18.2	82	0.081
1.5KE15A	***1N6275A***	***12.8***	***5***	***14.3***	***15***	***15.8***	***1***	***21.2***	***71***	***0.084***
1.5KE16A	1N6276A	13.6	5	15.2	16	16.8	1	22.5	67	0.086
1.5KE18A	1N6277A	15.3	5	17.1	18	18.9	1	25.2	59.5	0.088
1.5KE20A	1N6278A	17.1	5	19	20	21	1	27.7	54	0.09
1.5KE22A	1N6279A	***18.8***	***5***	***20.9***	***22***	***23.1***	***1***	***30.6***	***49***	***0.092***
1.5KE24A	***1N6280A***	***20.5***	***5***	***22.8***	***24***	***25.2***	***1***	***33.2***	***45***	***0.094***
1.5KE27A	***1N6281A***	***23.1***	***5***	***25.7***	***27***	***28.4***	***1***	***37.5***	***40***	***0.096***
1.5KE30A	***1N6282A***	***25.6***	***5***	***28.5***	***30***	***31.5***	***1***	***41.4***	***36***	***0.097***
1.5KE33A	***1N6283A***	***28.2***	***5***	***31.4***	***33***	***34.7***	***1***	***45.7***	***33***	***0.098***
1.5KE36A	1N6284A	30.8	5	34.2	36	37.8	1	49.9	30	0.099
1.5KE39A	***1N6285A***	***33.3***	***5***	***37.1***	***39***	***41***	***1***	***53.9***	***28***	***0.1***
1.5KE43A	1N6286A	36.8	5	40.9	43	45.2	1	59.3	25.3	0.101
1.5KE47A	1N6287A	40.2	5	44.7	47	49.4	1	64.8	23.2	0.101
1.5KE51A	***1N6288A***	***43.6***	***5***	***48.5***	***51***	***53.6***	***1***	***70.1***	***21.4***	***0.102***
1.5KE56A	1N6289	***47.8***	***5***	***53.2***	***56***	***58.8***	***1***	***77***	***19.5***	***0.103***
1.5KE62A	1N6290A	53	5	58.9	62	65.1	1	85	17.7	0.104
1.5KE68A	1N6291A	58.1	5	64.6	68	71.4	1	92	16.3	0.104
1.5KE75A	1N6292A	64.1	5	71.3	75	78.8	1	103	14.6	0.105
1.5KE82A	1N6293A	70.1	5	77.9	82	86.1	1	113	13.3	0.105
1.5KE91A	1N6294A	77.8	5	86.5	91	95.5	1	125	12	0.106
1.5KE100A	1N6295A	85.5	5	95	100	105	1	137	11	0.106
1.5KE110A	1N6296A	94	5	105	110	116	1	152	9.9	0.107
1.5KE120A	1N6297A	102	5	114	120	126	1	165	9.1	0.107
1.5KE130A	1N6298A	111	5	124	130	137	1	179	8.4	0.107
1.5KE150A	1N6299A	128	5	143	150	158	1	207	7.2	0.108
1.5KE160A	1N6300A	136	5	152	160	168	1	219	6.8	0.108
1.5KE170A	1N6301A	145	5	162	170	179	1	234	6.4	0.108
1.5KE180A	1N6302A*	154	5	171	180	189	1	246	6.1	0.108
1.5KE200A	1N6303A	171	5	190	200	210	1	274	5.5	0.108
1.5KE220A		185	5	209	220	231	1	328	4.6	0.109
1.5KE250A		214	5	237	250	263	1	344	5	0.109

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

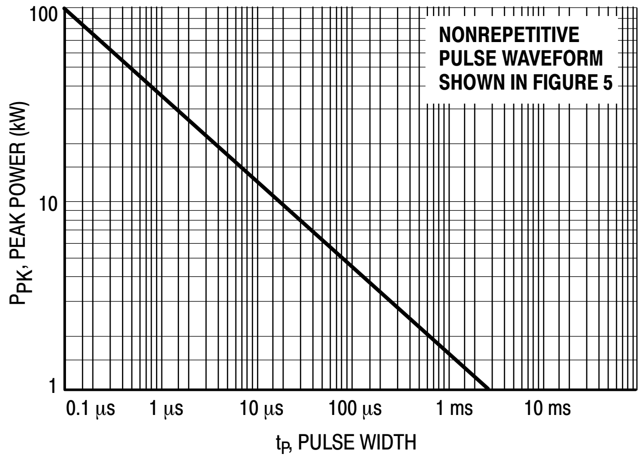


Figure 1. Pulse Rating Curve

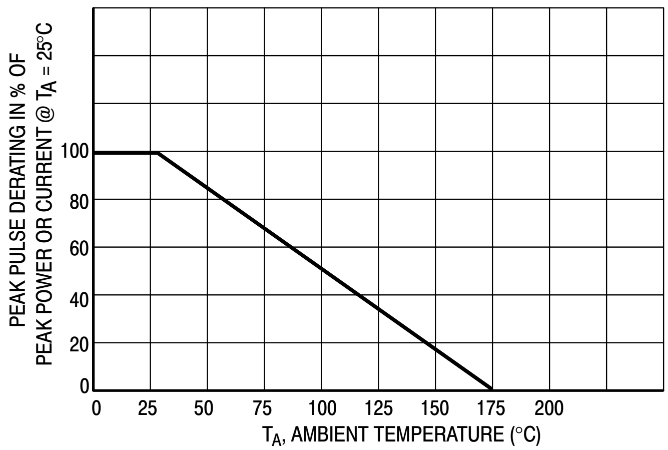
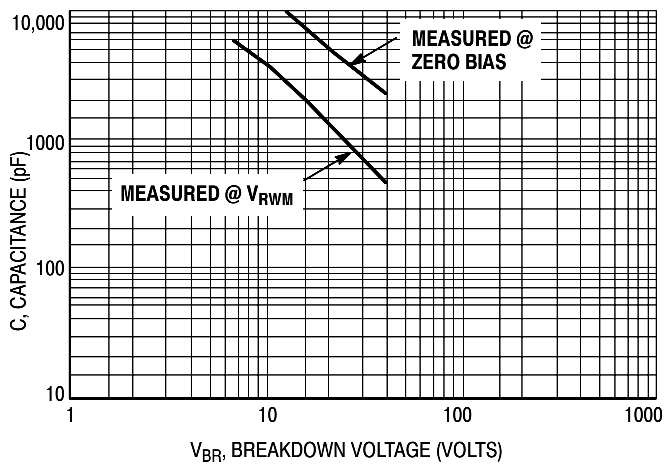


Figure 2. Pulse Derating Curve

1N6373, ICTE-5, MPTE-5,
through
1N6389, ICTE-45, C, MPTE-45, C



1N6267A/1.5KE6.8A
through
1N6303A/1.5KE200A

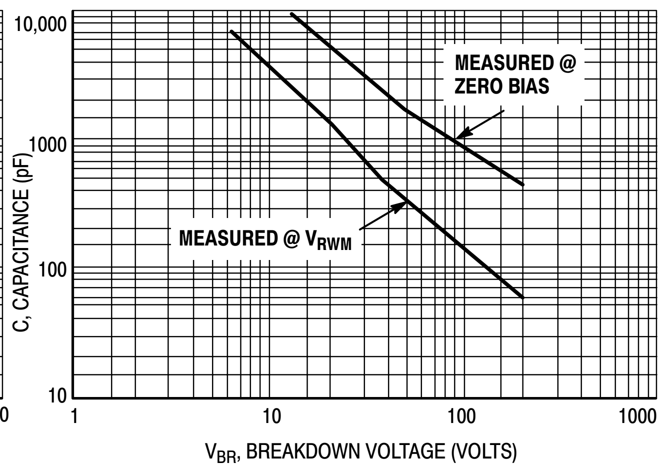


Figure 3. Capacitance versus Breakdown Voltage

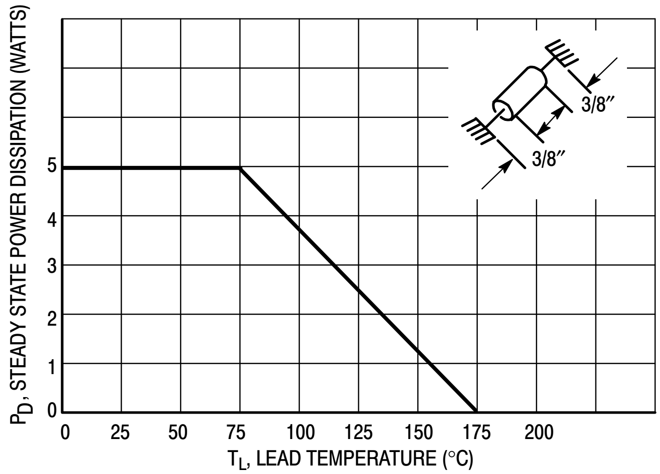


Figure 4. Steady State Power Derating

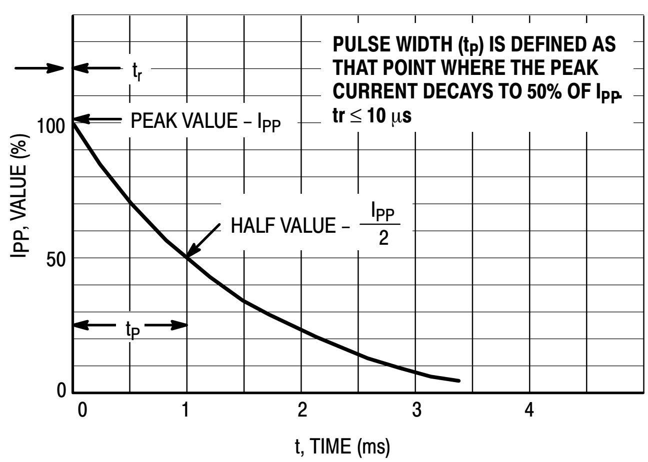


Figure 5. Pulse Waveform

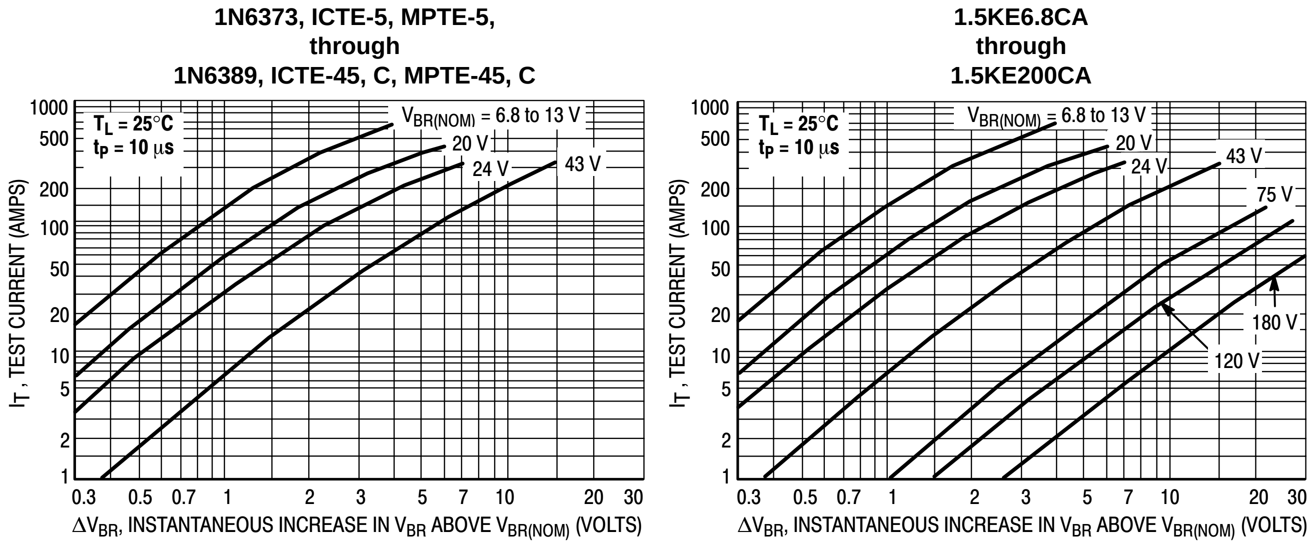


Figure 6. Dynamic Impedance

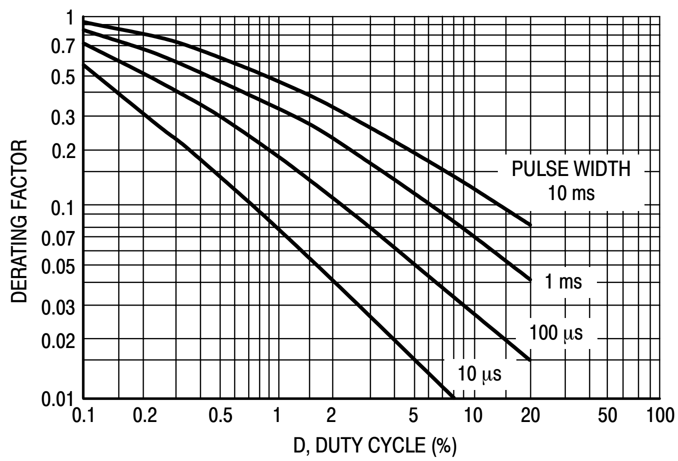


Figure 7. Typical Derating Factor for Duty Cycle

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.

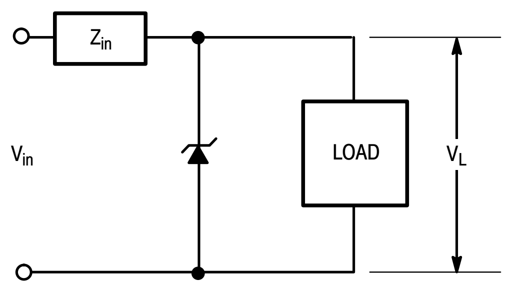
Some input impedance represented by Z_{in} is essential to prevent overstress of the protection device. This impedance should be as high as possible, without restricting the circuit operation.

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 μs 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



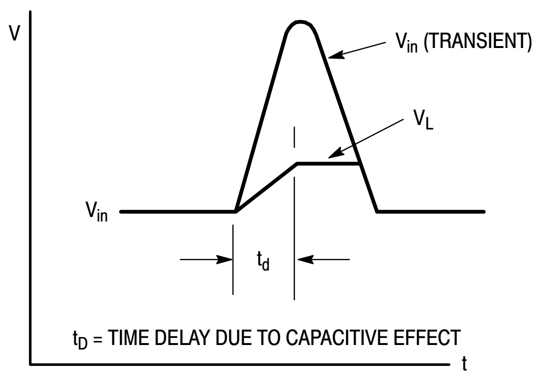


Figure 8.

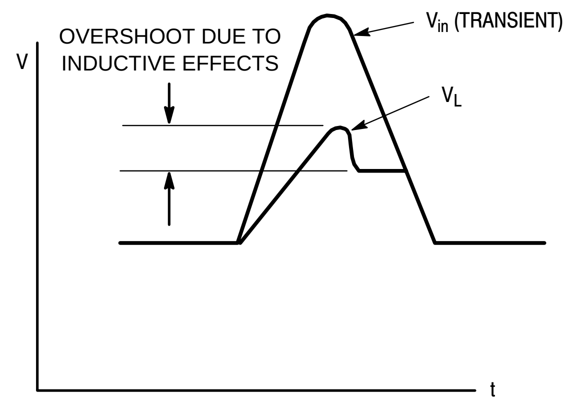


Figure 9.

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

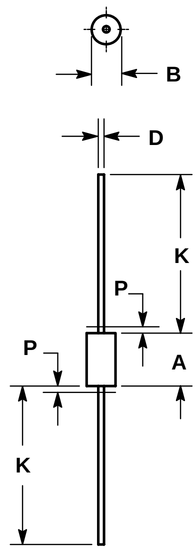
1. Clipper-bidirectional devices are available in the 1.5KEXXA series and are designated with a “CA” suffix; for example, 1.5KE18CA. Contact your nearest ON Semiconductor representative.
2. Clipper-bidirectional part numbers are tested in both directions to electrical parameters in preceding table (except 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

Transient Voltage Suppressors – Axial Leaded

1500 Watt Mosorb

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.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.335	0.374	8.50	9.50
B	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

PUBLICATION ORDERING INFORMATION

Literature Fulfillment:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
Phone: 303–675–2175 or 800–344–3860 Toll Free USA/Canada
Fax: 303–675–2176 or 800–344–3867 Toll Free USA/Canada
Email: ONlit@hibbertco.com

N. American Technical Support: 800–282–9855 Toll Free USA/Canada

JAPAN: ON Semiconductor, Japan Customer Focus Center
4–32–1 Nishi–Gotanda, Shinagawa–ku, Tokyo, Japan 141–0031
Phone: 81–3–5740–2700
Email: r14525@onsemi.com

ON Semiconductor Website: http://onsemi.com

For additional information, please contact your local Sales Representative.