1N6373 - 1N6381 Series (ICTE-5 - ICTE-36, MPTE-5 - MPTE-45)

1500 Watt Peak Power 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 − 5.0 V to 45 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
- Response Time is Typically < 1 ns
- Pb−Free Packages are Available*

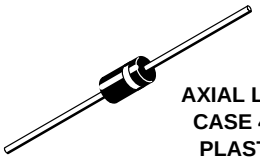
Mechanical Characteristics

CASE: Void-free, transfer-molded, thermosetting plastic
FINISH: All external surfaces are corrosion resistant and leads are readily solderable
MAXIMUM LEAD TEMPERATURE FOR SOLDERING PURPOSES: 230°C, 1/16″ from the case for 10 seconds
POLARITY: Cathode indicated by polarity band
MOUNTING POSITION: Any

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

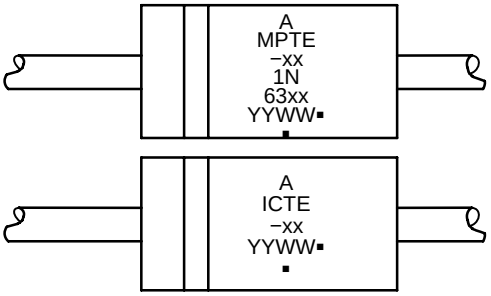
ON Semiconductor®

http://onsemi.com



AXIAL LEAD
CASE 41A
PLASTIC

MARKING DIAGRAMS



A = Assembly Location
MPTE−xx = ON Device Code
1N63xx = JEDEC Device Code
ICTE−xx = ON Device Code
YY = Year
WW = Work Week
▪ = Pb−Free Package
(Note: Microdot may be in either location)

ORDERING INFORMATION

Device	Package	Shipping†
MPTE−xx, G	Axial Lead (Pb−Free)	500 Units/Box
MPTE−xxRL4, G	Axial Lead (Pb−Free)	1500/Tape & Reel
ICTE−xx, G	Axial Lead (Pb−Free)	500 Units/Box
ICTE−xxRL4, G	Axial Lead (Pb−Free)	1500/Tape & Reel
1N63xx, G	Axial Lead (Pb−Free)	500 Units/Box
1N63xxRL4, G	Axial Lead (Pb−Free)	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.

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Peak Power Dissipation (Note 1) @ $T_L \le 25°C$	P_{PK}	1500	W
Steady State Power Dissipation @ $T_L \le 75°C$, Lead Length = 3/8″ Derated above $T_L = 75°C$	P_D	5.0 20	W 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	A
Operating and Storage Temperature Range	T_J, T_{stg}	− 65 to +175	°C

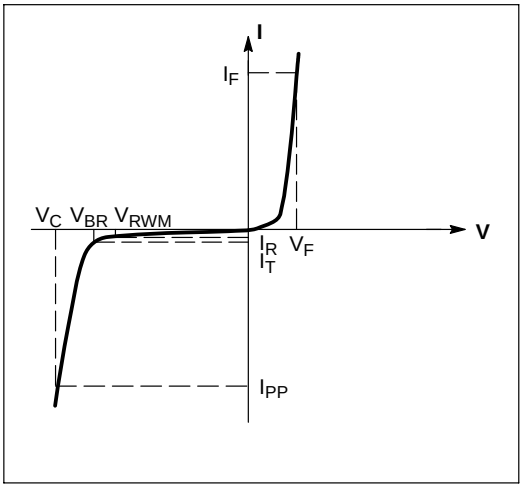
Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur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

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 1N6382 – 1N6389 (ICTE−10C − ICTE−36C, MPTE−8C − MPTE−45C) for Bidirectional Devices.

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 Variation 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)

JEDEC Device† (ON Device)	Device Marking	V_{RWM} (Note 4)	I_R @ V_{RWM}	Breakdown Voltage				V_C @ I_{PP} (Note 6)		V_C (Volts) (Note 6)		ΘV_{BR}
				V_{BR} (Note 5) (Volts)			@ I_T	V_C	I_{PP}	@ I_{PP} = 1 A	@ I_{PP} = 10 A	
		(Volts)	(μA)	Min	Nom	Max	(mA)	(Volts)	(A)			(mV/°C)
1N6373, G (MPTE−5, G)	1N6373 MPTE−5	5.0	300	6.0	−	−	1.0	9.4	160	7.1	7.5	4.0
1N6374, G (MPTE−8, G)	1N6374 MPTE−8	8.0	25	9.4	−	−	1.0	15	100	11.3	11.5	8.0
1N6375, G (MPTE−10,G)	1N6375 MPTE−10	10	2.0	11.7	−	−	1.0	16.7	90	13.7	14.1	12
1N6376, G (MPTE−12, G)	1N6376 MPTE−12	12	2.0	14.1	−	−	1.0	21.2	70	16.1	16.5	14
1N6377, G (MPTE−15, G)	1N6377 MPTE−15	15	2.0	17.6	−	−	1.0	25	60	20.1	20.6	18
1N6379, G (MPTE−22, G)	1N6379 MPTE−22	22	2.0	25.9	−	−	1.0	37.5	40	29.8	32	26
1N6380, G (MPTE−36, G)	1N6380 MPTE−36	36	2.0	42.4	−	−	1.0	65.2	23	50.6	54.3	50
1N6381, G (MPTE−45, G)	1N6381 MPTE−45	45	2.0	52.9	−	−	1.0	78.9	19	63.3	70	60
ICTE−5, G	ICTE−5	5.0	300	6.0	−	−	1.0	9.4	160	7.1	7.5	4.0
ICTE−10, G	ICTE−10	10	2.0	11.7	−	−	1.0	16.7	90	13.7	14.1	8.0
ICTE−12, G	ICTE−12	12	2.0	14.1	−	−	1.0	21.2	70	16.1	16.5	12
ICTE−15, G	ICTE−15	15	2.0	17.6	−	−	1.0	25	60	20.1	20.6	14
ICTE−18, G	ICTE−18	18	2.0	21.2	−	−	1.0	30	50	24.2	25.2	18
ICTE−22, G	ICTE−22	22	2.0	25.9	−	−	1.0	37.5	40	29.8	32	21
ICTE−36, G	ICTE−36	36	2.0	42.4	−	−	1.0	65.2	23	50.6	54.3	26

3. Square waveform, PW = 8.3 ms, non−repetitive duty cycle.
4. 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.
5. V_{BR} measured at pulse test current I_T at an ambient temperature of 25°C and minimum voltage in V_{BR} is to be controlled.
6. Surge current waveform per Figure 5 and derate per Figures 1 and 2.

†The “G’’ suffix indicates Pb−Free package available.

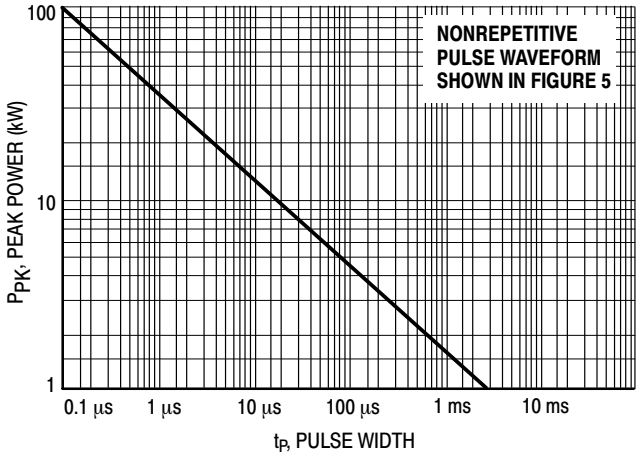


Figure 1. Pulse Rating Curve

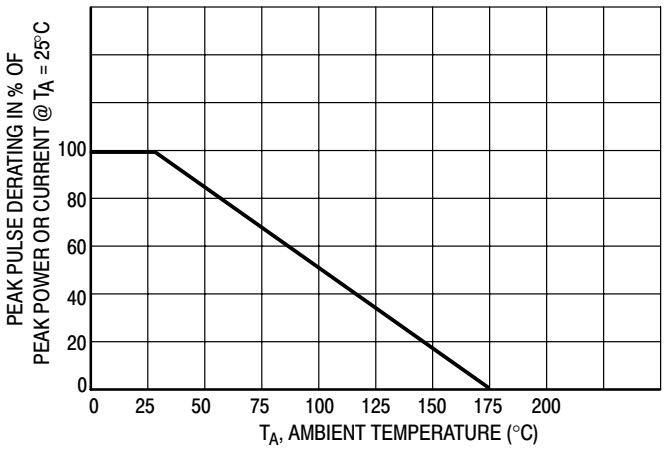


Figure 2. Pulse Derating Curve

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

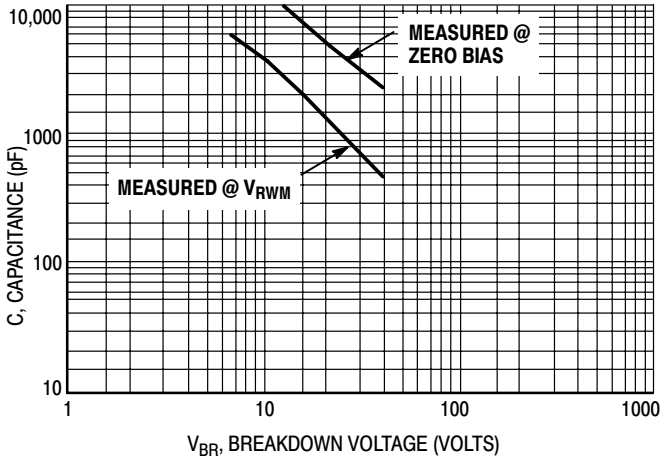


Figure 3. Capacitance versus Breakdown Voltage

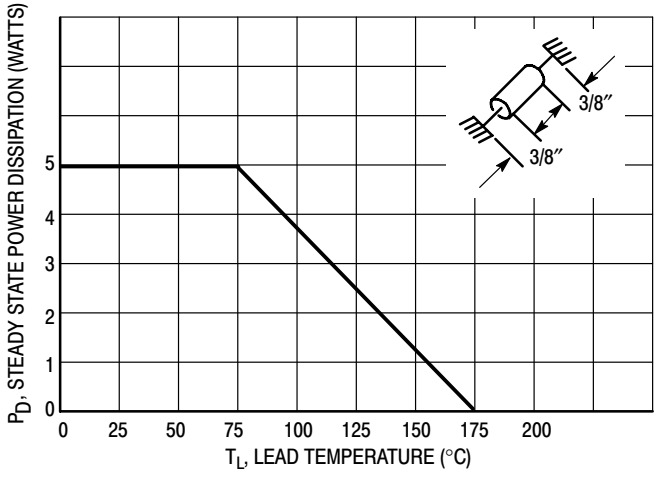


Figure 4. Steady State Power Derating

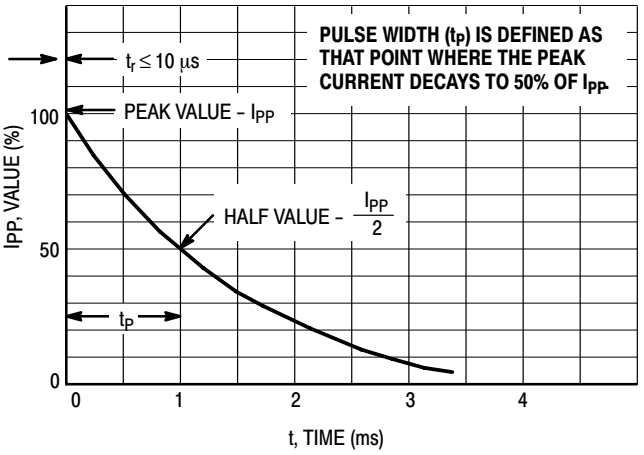
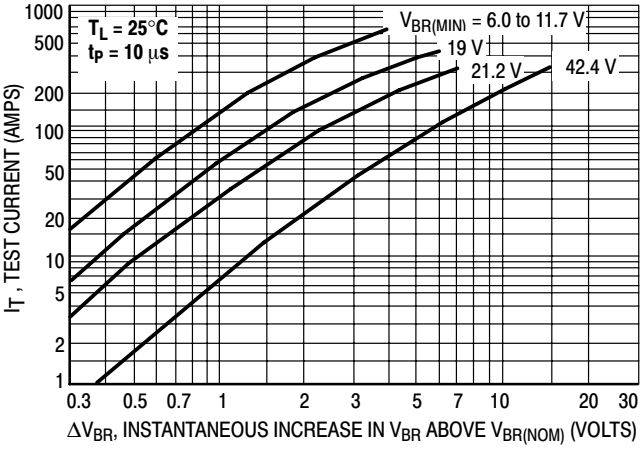


Figure 5. Pulse Waveform

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



1.5KE6.8CA through 1.5KE200CA

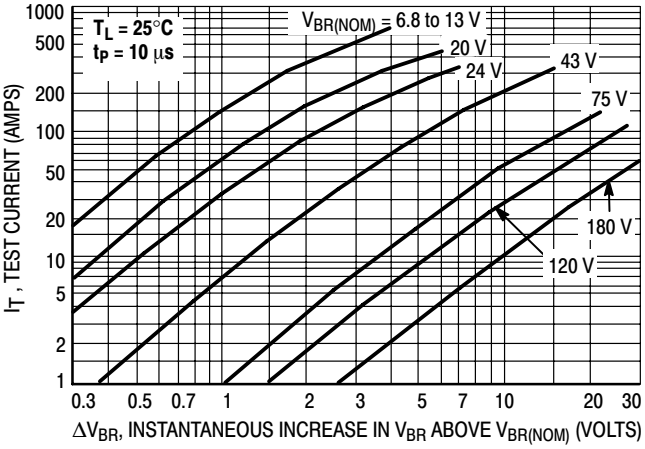


Figure 6. Dynamic Impedance

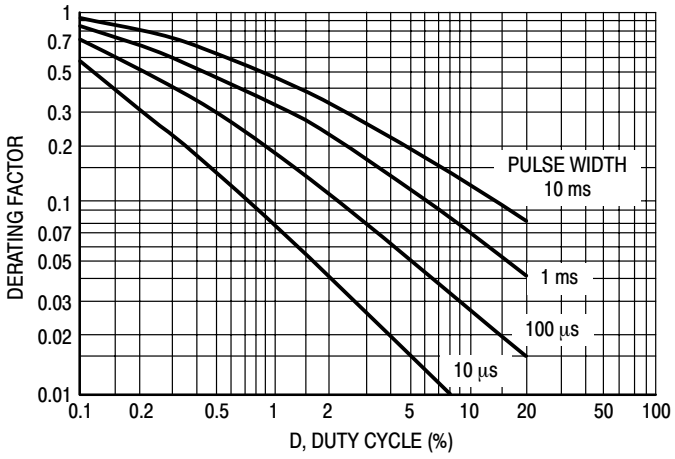


Figure 7. Typical Derating Factor for Duty Cycle

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.

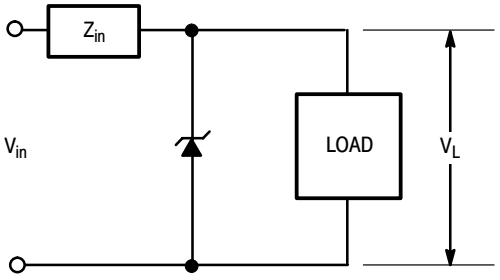
Some input impedance represented by Z_{in} is essential to prevent overstress of the protection device. This impedance should be as high as possible, without restricting the circuit operation.

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



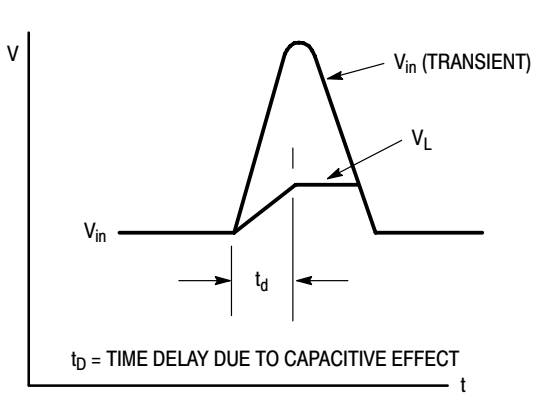


Figure 8.

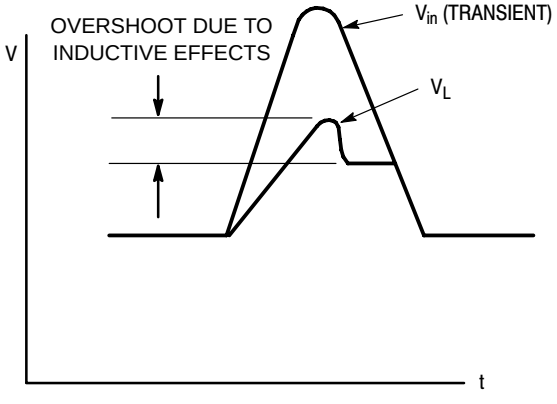
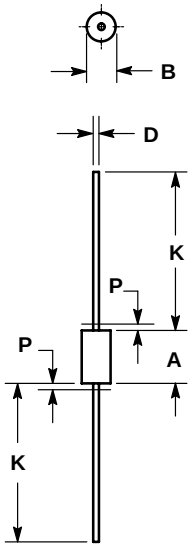


Figure 9.

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

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