1N6382 - 1N6389 Series (ICTE-10C - ICTE-36C, MPTE-8C - MPTE-45C)

1500 Watt Peak Power **Mosorb™ Zener Transient Voltage Suppressors**

Bidirectional*

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 8 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

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 band does not imply polarity

MOUNTING POSITION: Any

MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|--|-----------------------------------|-----------------|----------------|
| Peak Power Dissipation (Note 1) @ T _L ≤ 25°C | P _{PK} | 1500 | Watts |
| Steady State Power Dissipation @ T _L ≤ 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 | $R_{	heta JL}$ | 20 | °C/W |
| Operating and Storage Temperature Range | T _J , T _{stg} | - 65 to +175 | ç |

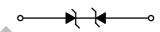
^{1.} Nonrepetitive current pulse per Figure 4 and derated above $T_A = 25^{\circ}C$ per Figure 2.

1

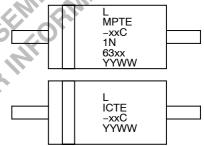


ON Semiconductor®

http://onsemi.com







L = Assembly Location MPTE-xxC = ON Device Code ICTE-xxC = ON Device Code 1N63xx = JEDEC Device Code YY = Year

WW = Work Week

ORDERING INFORMATION

| Device | Package | Shipping | | |
|-------------|------------|------------------|--|--|
| MPTE-xxC | Axial Lead | 500 Units/Box | | |
| MPTE-xxCRL4 | Axial Lead | 1500/Tape & Reel | | |
| ICTE-xxC* | Axial Lead | 500 Units/Box | | |
| ICTE-xxCRL4 | Axial Lead | 1500/Tape & Reel | | |
| 1N63xx | Axial Lead | 500 Units/Box | | |
| 1N63xxRL4 | Axial Lead | 1500/Tape & Reel | | |

^{*}ICTE-10C Not Available in 500 Units/Box

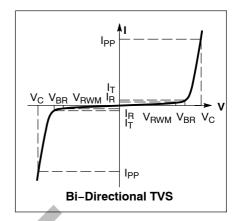
^{*}Please see 1N6373 - 1N6381 (ICTE-5 - ICTE-36, MPTE-5 - MPTE-45) for Unidirectional Devices

1N6382 - 1N6389 Series (ICTE-10C - ICTE-36C, MPTE-8C - MPTE-45C)

ELECTRICAL CHARACTERISTICS

(T_A = 25°C unless otherwise noted)

| * * * * | • | | | | | |
|------------------|--|--|--|--|--|--|
| 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} | | | | | |



ELECTRICAL CHARACTERISTICS ($T_A = 25^{\circ}C$ unless otherwise noted)

| | | | | Breakdown Voltage V _C @ I _{PP} (Note 4) | | | | V _C (Volts | | | | |
|----------------------------------|----------------------------------|------------------------------|--------------------------------------|---|-------------|-------------|-------------------|-----------------------|-----------------|----------------------|--------------------|------------------|
| JEDEC Device Device | | V _{RWM} (Note 2) | I _R @ V _{RWM} | | Note 3) (| | @ I _T | V _C ipp | I _{PP} | @ Ipp | @ lpp | ΘV _{BR} |
| (ON Device) | Marking | (Volts) | (μΑ) | Min | Nom | Max | (mA) | (Volts) | (A) | = 1 A | = 10 A | (mV/°C) |
| 1N6382 (MPTE-8C) | 1N6382 MPTE-8C | 8.0 | 25 | 9.4 | - | - | 1.0 | 15 | 100 | 11.3 | 11.5 | 8.0 |
| 1N6383 (MPTE-10C) | 1N6383 MPTE-10C | 10 | 2.0 | 11.7 | 1 | _ | 1.0 | 16.7 | 90 | 13.7 | 14.1 | 12 |
| 1N6384 (MPTE-12C) | 1N6384 MPTE-12C | 12 | 2.0 | 14.1 | _ | - | 1.0 | 21.2 | 70 | 16.1 | 16.5 | 14 |
| 1N6385 (MPTE-15C) | 1N6385 MPTE-15C | 15 | 2.0 | 17.6 | - | Ç | 1.0 | 25 | 60 | 20.1 | 20.6 | 18 |
| 1N6386 (MPTE-18C) | 1N6386 MPTE-18C | 18 | 2.0 | 21.2 | ₹C | - | 1.0 | 30 | 50 | 24.2 | 25.2 | 21 |
| 1N6387 (MPTE-22C) | 1N6387 MPTE-22C | 22 | 2.0 | 25.9 | - | 6 | 1.0 | 37.5 | 40 | 29.8 | 32 | 26 |
| 1N6388 (MPTE-36C) | 1N6388 MPTE-36C | 36 | 2.0 | 42.4 | (C) | - | 1.0 | 65.2 | 23 | 50.6 | 54.3 | 50 |
| 1N6389 (MPTE-45C) | 1N6389 MPTE-45C | 45 | 2.0 | 52.9 | 1.1 | - | 1.0 | 78.9 | 19 | 63.3 | 70 | 60 |
| ICTE-10C* ICTE-12C | ICTE-10C* ICTE-12C | 10 12 | 2.0 2.0 | 11.7 14.1 |) - | - | 1.0 1.0 | 16.7 21.2 | 90 70 | 13.7 16.1 | 14.1 16.5 | 8.0 12 |
| ICTE-15C ICTE-18C ICTE-22C | ICTE-15C ICTE-18C ICTE-22C | 15 18 22 | 2.0 2.0 2.0 | 17.6 21.2 25.9 | - - - | - - - | 1.0 1.0 1.0 | 25 30 37.5 | 60 50 40 | 20.1 24.2 29.8 | 20.6 25.2 32 | 14 18 21 |
| ICTE-36C | ICTE-36C | 36 | 2.0 | 42.4 | - | _ | 1.0 | 65.2 | 23 | 50.6 | 54.3 | 26 |

NOTES:

 $^{2. \ \} A \ transient \ suppressor \ is \ normally \ selected \ according \ to \ the \ maximum \ working \ peak \ reverse \ voltage \ (V_{RWM}), \ which \ should \ be \ equal \ to$ or greater than the dc or continuous peak operating voltage level.

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.
 Surge current waveform per Figure 4 and derate per Figures 1 and 2.
 *Not Available in the 500 Units/Box.

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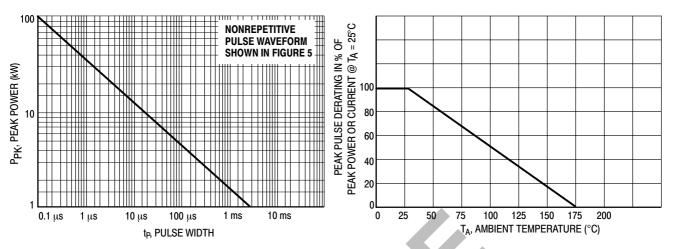


Figure 1. Pulse Rating Curve

Figure 2. Pulse Derating Curve

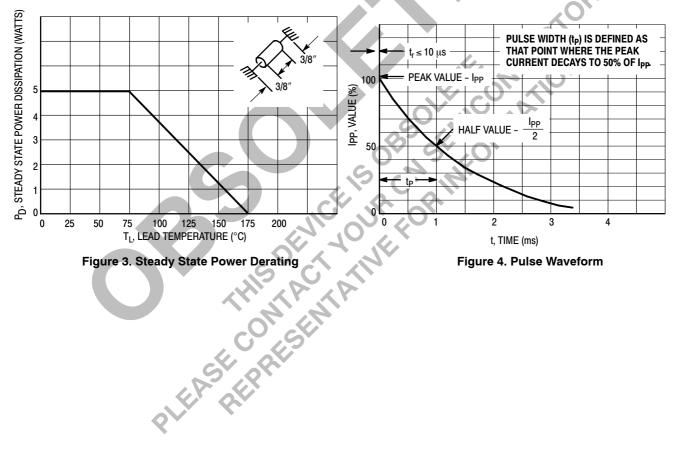


Figure 4. Pulse Waveform

1N6382 - 1N6389 Series (ICTE-10C - ICTE-36C, MPTE-8C - MPTE-45C)

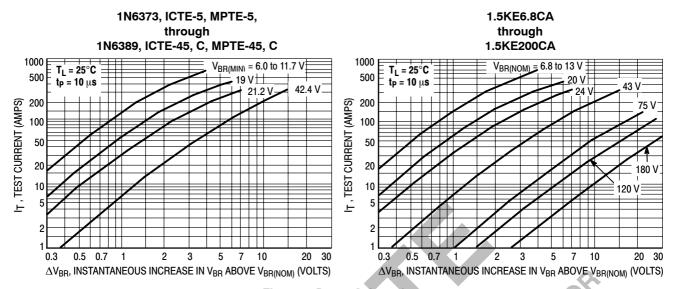


Figure 5. Dynamic Impedance

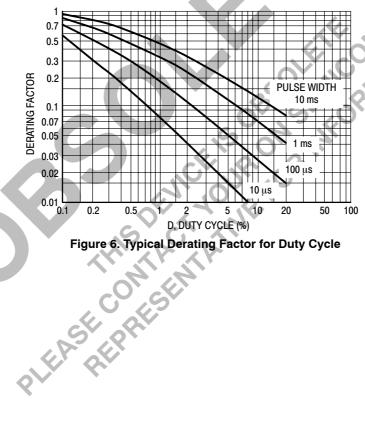


Figure 6. Typical Derating Factor for Duty Cycle

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 7.

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 8. 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 6. 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 6 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 6 is multiplied by the peak power value of Figure 1 for the same pulse, the results follow the expected trend.

TYPICAL PROTECTION CIRCUIT

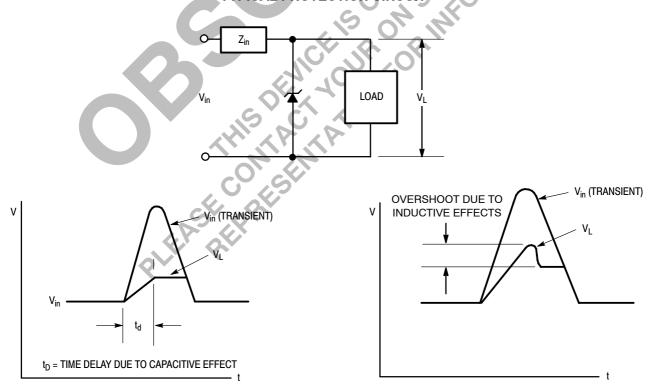


Figure 7. Figure 8.

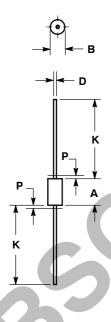
OUTLINE DIMENSIONS

Transient Voltage Suppressors – Axial Leaded

1500 Watt Peak Power Mosorb

MOSORB

CASE 41A-04 ISSUE D



- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M. 1982.
- CONTROLLING DIMENSION: INCH.
- LEAD FINISH AND DIAMETER UNCONTROLLED 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 | 4 | 0.050 | | 1.27 | | |

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