Microsemi
SCOTTSDALE DIVISION

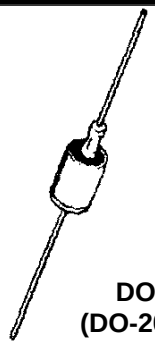
1N6356 thru 1N6372, e3
or MPT-5 thru MPT-45C, e3

1500 W LOW CLAMPING FACTOR TRANSIENT VOLTAGE SUPPRESSOR

DESCRIPTION

This Transient Voltage Suppressor (TVS) series for 1N6356 thru 1N6372 are JEDEC registered selections for both unidirectional and bidirectional devices. The 1N6356 thru 1N6364 are unidirectional and the 1N6365 thru 1N6372 are bi-directional where they all provide a very low specified clamping factor for minimal clamping voltages (V_C) above their respective breakdown voltages (V_{BR}) as specified herein. They are most often used in protecting sensitive components from inductive switching transients or induced secondary lightning effects as found in lower surge levels of IEC61000-4-5 . They are also very successful in protecting airborne avionics and electrical systems. Since their response time is virtually instantaneous, they can also protect from ESD and EFT per IEC61000-4-2 and IEC61000-4-4.

APPEARANCE



DO-13
(DO-202AA)

IMPORTANT: For the most current data, consult *MICROSEMI's* website: http://www.microsemi.com

FEATURES

- Unidirectional and bidirectional TVS series for thru-hole mounting
- Suppresses transients up to 1500 watts @ 10/1000 µs
- $t_{clamping}$ (0 volts to $V_{(BR)}$ min):
  Unidirectional – Less than 100 pico seconds.
  Bidirectional – Less than 5 nano seconds.
- Working voltage (V_{WM}) range 5 V to 45 V
- Low clamping factor (ratio of actual V_C/V_{BR}): 1.33 @ full rated power and 1.20 @ 50% rated power
- Hermetic sealed DO-13 metal package
- Options for screening in accordance with MIL-PRF-19500 for JAN, JANTX, JANTXV, and JANS are also available by adding MQ, MX, MV, SP prefixes respectively to part numbers, e.g. MX1N6356, etc.
- RoHS Compliant devices available by adding "e3" suffix
- Surface mount equivalent packages also available as SMCJ6356 – SMCJ6372 (consult factory for other surface mount options)
- Plastic axial-leaded equivalents available in the 1N6373 – 1N6389 series (see separate data sheet)

APPLICATIONS / BENEFITS

- Designed to protect Bipolar and MOS Microprocessor based systems.
- Protection from switching transients and induced RF
- ESD and EFT protection per IEC 61000-4-2 and -4-4
- Secondary lightning protection per IEC61000-4-5 with 42 Ohms source impedance:
  Class 1, 2 & 3 1N6356 to 1N6372
  Class 4: 1N6356 to 1N6362
- Secondary lightning protection per IEC61000-4-5 with 12 Ohms source impedance:
  Class 1 & 2: 1N6356 to 1N6372
  Class 3: 1N6356 to 1N6362
  Class 4: 1N6356 to 1N6358
- Secondary lightning protection per IEC61000-4-5 with 2 Ohms source impedance:
  Class 2: 1N6356 to 1N6361
  Class 3: 1N6356 to 1N6358
- Inherently radiation hard per Microsemi MicroNote 050

MAXIMUM RATINGS

- 1500 Watts for 10/1000 µs with repetition rate of 0.01% or less* at lead temperature (T_L) 25°C (See Figs. 1, 2, & 4)
- Operating & Storage Temperatures: -65° to +175°C
- THERMAL RESISTANCE: 50°C/W junction to lead at 0.375 inches (10 mm) from body or 110 °C/W junction to ambient when mounted on FR4 PC board with 4 mm^2 copper pads (1 oz) and track width 1 mm, length 25 mm
- DC Power Dissipation*: 1 Watt at $T_L \leq +125°C$ 3/8" or 10 mm from body (also see Figure 5)
- Forward surge current: 200 Amps for 8.3ms half-sine wave at T_A = +25°C for unidirectional only (1N6356-6364)
- Solder Temperatures: 260 ° C for 10 s (maximum)

MECHANICAL AND PACKAGING

- CASE: DO-13 (DO-202AA), welded, hermetically sealed metal and glass
- FINISH: All external metal surfaces are Tin-Lead or RoHS Compliant annealed matte-Tin plating solderable per MIL-STD-750 method 2026
- POLARITY: Cathode connected to case and polarity indicated by diode symbol
- MARKING: Part number and polarity diode symbol
- WEIGHT: 1.4 grams. (Approx)
- TAPE & REEL option: Standard per EIA-296 (add "TR" suffix to part number)
- See package dimension on last page

* TVS devices are not typically used for dc power dissipation and are instead operated at or less than their rated standoff voltage (V_{WM}) except for transients that briefly drive the device into avalanche breakdown (V_{BR} to V_C region).

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ELECTRICAL CHARACTERISTICS @ 25°C (Unidirectional)

MICROSEMI PART NUMBER		STAND-OFF VOLTAGE (NOTE 1) V_{WM} VOLTS	MAXIMUM REVERSE LEAKAGE @V_{WM} I_D µA	MINIMUM* BREAKDOWN VOLTAGE @ 1.0 mA $V_{(BR)}$ (min) VOLTS	MAXIMUM CLAMPING VOLTAGE (Fig. 2) I_{PP1} = 1A V_C VOLTS	MAXIMUM CLAMPING VOLTAGE (Fig. 2) @ I_{PP2} = 10A V_C VOLTS	MAXIMUM PEAK PULSE CURRENT I_{PP3} A
1N6356	MPT-5	5.0	300	6.0	7.1	7.5	160
1N6357	MPT-8	8.0	25	9.4	11.3	11.5	100
1N6358	MPT-10	10.0	2	11.7	13.7	14.1	90
1N6359	MPT-12	12.0	2	14.1	16.1	16.5	70
1N6360	MPT-15	15.0	2	17.6	20.1	20.6	60
1N6361	MPT-18	18.0	2	21.2	24.2	25.2	50
1N6362	MPT-22	22.0	2	25.9	29.8	32.0	40
1N6363	MPT-36	36.0	2	42.4	50.6	54.3	23
1N6364	MPT-45	45.0	2	52.9	63.3	70.0	19

V_F at 100 amps peak is 3.5 volts maximum at 8.3 ms half-sine wave.

ELECTRICAL CHARACTERISTICS @ 25°C (Bidirectional)

	MPT-5C	5.0	300	6.0	7.1	7.5	160
1N6365	MPT-8C	8.0	25	9.4	11.4	11.6	100
1N6366	MPT-10C	10.0	2	11.7	14.1	14.5	90
1N6367	MPT-12C	12.0	2	14.1	16.7	17.1	70
1N6368	MPT-15C	15.0	2	17.6	20.8	21.4	60
1N6369	MPT-18C	18.0	2	21.2	24.8	25.5	50
1N6370	MPT-22C	22.0	2	25.9	30.8	32.0	40
1N6371	MPT-36C	36.0	2	42.4	50.6	54.3	23
1N6372	MPT-45C	45.0	2	52.9	63.3	70.0	19

C Suffix indicates Bidirectional

NOTE 1: TVS devices are normally selected according to the reverse "Stand Off Voltage" (V_{WM}) which should be equal to or greater than the DC or continuous peak operating voltage level.

* The minimum breakdown voltage as shown takes into consideration the ± volt tolerance normally specified for power supply regulation on most integrated circuit manufacturers data sheets. Similar devices are available with reduced clamping voltages where tighter regulated power supply voltages are employed.

GRAPHS

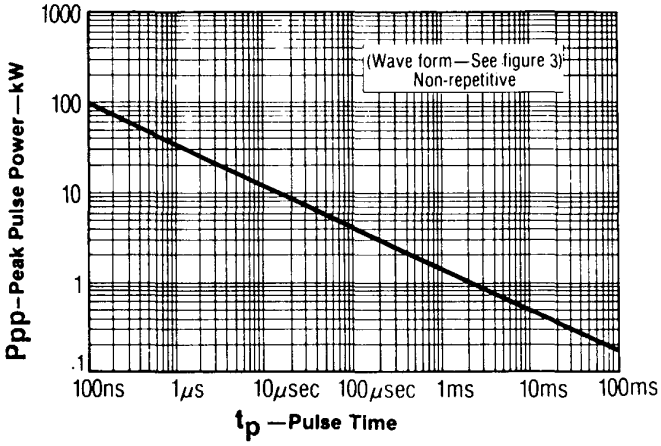


FIGURE 1
Peak Pulse Power vs. Pulse Time

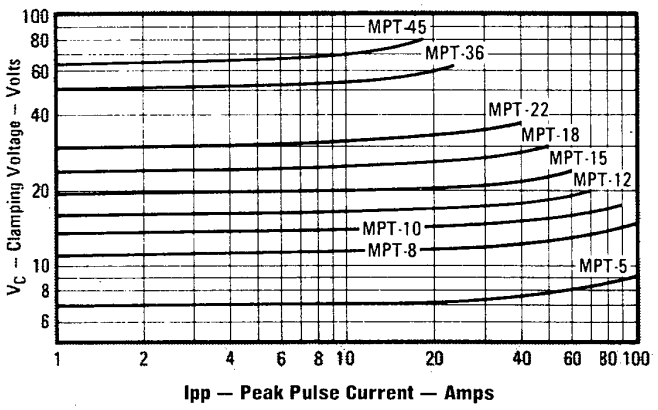


FIGURE 2
Typical Characteristic Clamping Voltage
vs. Peak Pulse Current

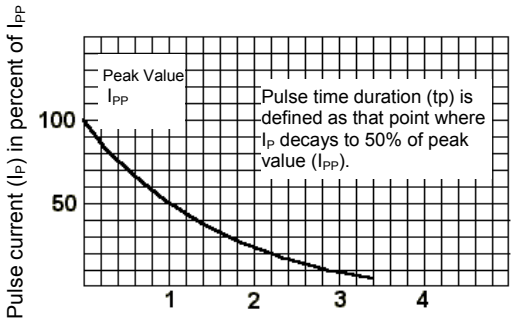


FIGURE 3
Pulse wave form for exponential surge

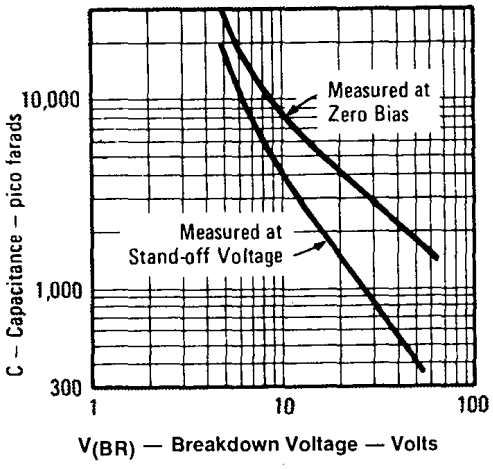


FIGURE 4
Typical Capacitance vs. Breakdown Voltage
(Unidirectional Types)

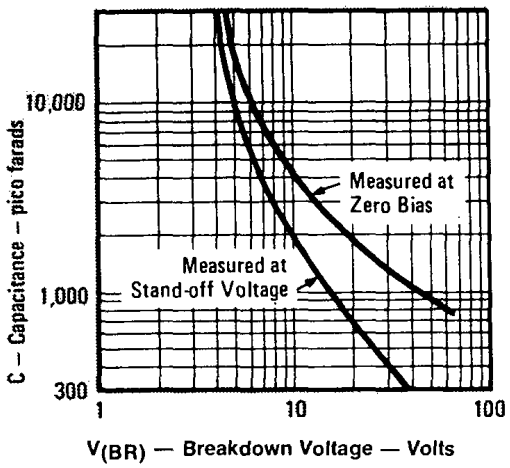
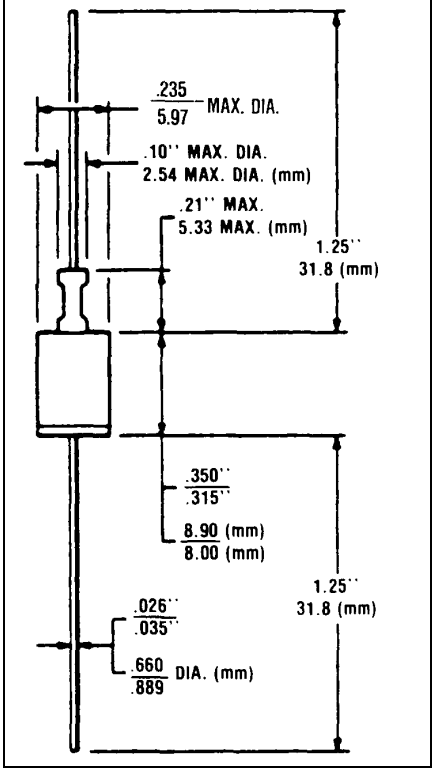


FIGURE 5
Typical Capacitance vs. Breakdown Voltage
(Bidirectional Types)

PACKAGE DIMENSIONS



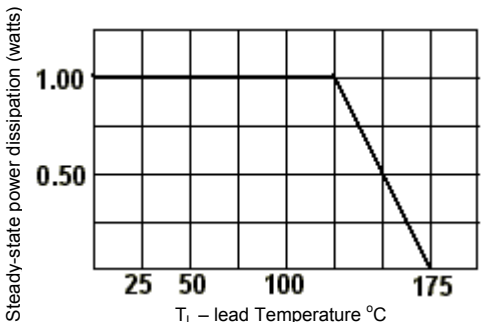


FIG. 5 Steady-state power derating curve