PROTEK DEVICES®

.....Engineered solutions for the transient environment

TVS
Transient Voltage Suppressors
1N6036 thru 1N6072A

DESCRIPTION

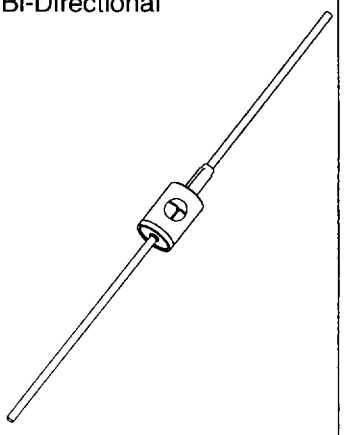
This specification sheet defines a series of Silicon Transient Suppressor (TVS) diodes used in applications where large voltage transients can permanently damage voltage sensitive components. The TVS is packaged in a hermetically sealed, glass-to-metal package. Screened parts to JAN and JANTX requirements of MIL-S-19500/504 are also available.

TVS diodes are characterized by their high surge capability, extremely fast response time, and low impedance, (R_{on}). Because of the unpredictable nature of transients and the variation of the impedance with respect to these transients, impedance ,per se, is not specified as a parametric value. However, a minimum voltage at low current conditions (V_{BR}) and a maximum clamping voltage (V_C) at a maximum peak pulse current is specified. In addition, a maximum clamping ratio is indicated. In some instances, the thermal effect (see V_C Clamping Voltage) may be responsible for 50 to 70 percent of the observed voltage differential when subjected to high current pulses or severe duty cycles, thus making a maximum impedance specification insignificant. Curves depicting clamping voltage vs. various current pulses are available from the factory. Extended power curves vs. pulse time are also available.

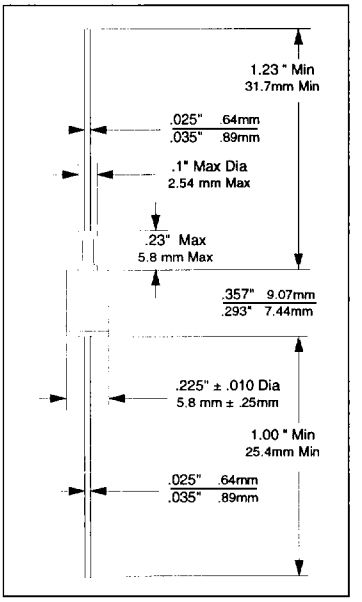
This TVS series has a peak pulse power rating of 1500 watts for one millisecond and therefore can be used in applications where induced lightning on rural or remote transmission lines presents a hazard to electronic circuitry (ref: REA specification PE 60). The response time of the TVS clamping action is theoretically instantaneous (1 x 10^{-12}sec), therefore, they can protect integrated circuits, MOS devices, hybrids, and other voltage-sensitive semiconductors and components. TVSs can also be used in series or parallel to increase the peak power ratings.

This series of devices has proven to be very effective as NEMP Suppressors. For the actual test results and application send for report number AD9092661. This specification sheet is only one of many series of Transient Voltage Suppressors available from ProTek Devices.

Bi-Directional



D0-13



FEATURES

- **1500 watts peak power dissipation**
- **Available in voltages from 5.5 V to 200V**
- **DO-13 hermetically sealed package**

MAXIMUM RATINGS

- 1500 watts of Peak Pulse Power dissipation at 25° C
- $t_{clamping}$ (0 volts to V_{BR} min): Less than 1 x 10^{-9} seconds
- Operating and Storage Temperatures: -65° to +175° C
- Steady State (Average) power dissipation: 1 watt at T_L of 75°C
- Repetition rate (duty cycle): .01%

MECHANICAL CHARACTERISTICS

- Standard DO-13 package - glass to metal hermetically sealed
- Weight: 1.5 grams (approximate)
- Bi-Polar Devices
- Body marked with logo and type number

ELECTRICAL CHARACTERISTICS

- Clamping Factor: 1.33 @ Full rated power
  1.20 @ 50% rated power

Clamping Factor: The ratio of the actual V_C (Clamping Voltage) to the V_{BR} (Breakdown Voltage) as measured on a specific device. (See Figure 3 for test pulse wave shape.)

FIGURE 1
PEAK PULSE POWER vs PULSE TIME

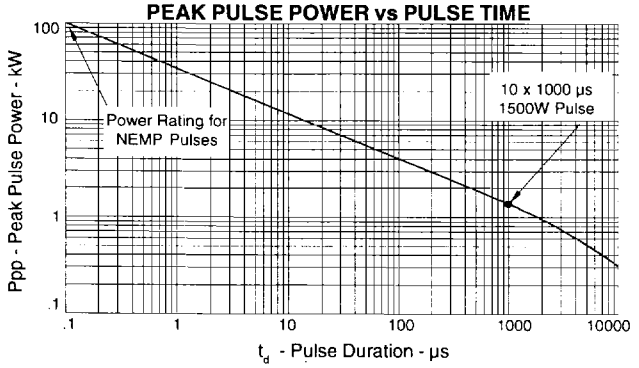


FIGURE 2
DERATING CURVE

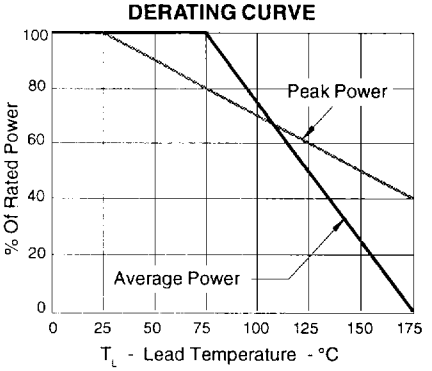
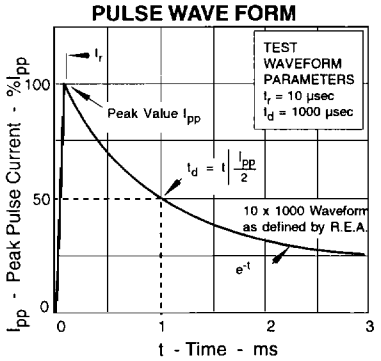


FIGURE 3
PULSE WAVE FORM



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ELECTRICAL CHARACTERISTICS AT 25° C

JEDEC Registered Data

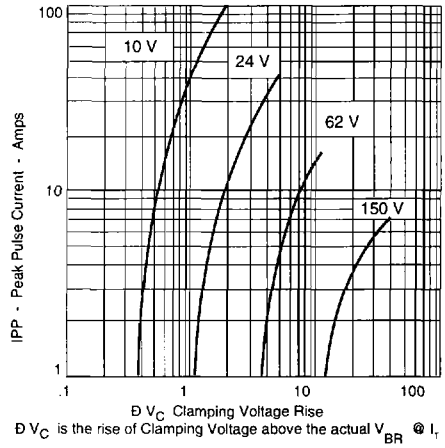
JEDEC TYPE NUMBER	RATED STAND-OFF VOLTAGE (See Note 1) V_{WM} VOLTS	BREAKDOWN VOLTAGE V_{BR} @ I_T VOLTS Min	Max	I_T mA	MAXIMUM STANDBY CURRENT @V_{WM} I_D µA	MAXIMUM CLAMPING VOLTAGE @I_{PP} (See Fig. 3) V_C VOLTS	MAXIMUM PEAK PULSE CURRENT (See Fig. 3) I_{PP} A	MAXIMUM TEMPERATURE COEFFICIENT OF V_{BR} mV/°C
1N6036	5.5	6.75	8.25	10	1000	11.7	128.0	5.0
1N6036A	6.0	7.13	7.88	10	1000	11.3	132.0	5.0
1N6037	6.5	7.38	9.02	10	500	12.5	120.0	5.0
1N6037A	7.0	7.79	8.61	10	500	12.1	124.0	5.0
1N6038	7.0	8.19	10.0	10	200	13.8	109.0	7.0
1N6038A	7.5	8.65	9.55	10	200	13.4	112.0	7.0
1N6039	8.0	9.00	11.0	1	50	15.0	100.0	7.0
1N6039A	8.5	9.50	10.5	1	50	14.5	103.0	7.0
1N6040	8.5	9.90	12.1	1	10	16.2	93.0	8.0
1N6040A	9.0	10.5	11.6	1	10	15.6	96.0	8.0
1N6041	9.0	10.8	13.2	1	5	17.3	87.0	9.0
1N6041A	10.0	11.4	12.6	1	5	16.7	90.0	9.0
1N6042	10.0	11.7	14.3	1	5	19.0	79.0	10
1N6042A	11.0	12.4	13.7	1	5	18.2	82.0	10
1N6043	11.0	13.5	16.7	1	5	22.0	68.0	11
1N6043A	12.0	14.3	15.8	1	5	21.2	71.0	12
1N6044	12.0	14.4	17.6	1	5	23.5	64.0	12
1N6044A	13.0	15.2	16.8	1	5	22.5	67.0	13
1N6045	14.0	16.2	19.8	1	5	26.5	56.5	14
1N6045A	15.0	17.1	18.9	1	5	25.2	59.5	15
1N6046	16.0	18.0	22.0	1	5	29.1	51.5	17
1N6046A	17.0	19.0	21.0	1	5	27.7	54.0	18
1N6047	17.0	19.8	24.2	1	5	31.9	47.0	19
1N6047A	18.0	20.9	23.1	1	5	30.6	49.0	20
1N6048	19.0	21.6	26.4	1	5	34.7	43.0	24
1N6048A	20.0	22.8	25.2	1	5	33.2	45.0	24
1N6049	21.0	24.3	29.7	1	5	39.1	38.5	27
1N6049A	22.0	25.7	28.4	1	5	37.5	40.0	28
1N6050	24.0	27.0	33.0	1	5	43.5	34.5	36
1N6050A	25.0	28.5	31.5	1	5	41.4	36.0	31
1N6051	26.0	29.7	36.3	1	5	47.7	31.5	32
1N6051A	28.0	31.4	34.7	1	5	45.7	33.0	34
1N6052	29.0	32.4	39.6	1	5	52.0	29.0	36
1N6052A	30.0	34.2	37.8	1	5	49.9	30.0	37
1N6053	31.0	35.1	42.9	1	5	56.4	26.5	39
1N6053A	33.0	37.1	41.0	1	5	53.9	28.0	40
1N6054	34.0	38.7	47.3	1	5	61.9	24.0	44
1N6054A	36.0	40.9	45.2	1	5	59.3	25.3	43
1N6055	38.0	42.3	51.7	1	5	67.8	22.2	49
1N6055A	40.0	44.7	49.4	1	5	64.8	23.2	47
1N6056	41.0	45.9	56.1	1	5	73.5	20.4	53
1N6056A	43.0	48.5	53.6	1	5	70.1	21.4	51
1N6057	45.0	50.4	61.6	1	5	80.5	18.6	58
1N6057A	47.0	53.2	58.8	1	5	77.0	19.5	56
1N6058	48.0	50.4	58.8	1	5	89.0	16.9	64
1N6058A	53.0	58.9	68.2	1	5	85.0	17.7	62
1N6059	55.0	61.2	74.8	1	5	98.0	15.3	70
1N6059A	58.0	64.6	71.4	1	5	92.0	16.3	68
1N6060	60.0	67.5	82.5	1	5	108.0	13.9	77
1N6060A	64.0	71.3	78.8	1	5	103.0	14.6	75
1N6061	66.0	73.8	90.2	1	5	118.0	12.7	84
1N6061A	70.0	77.9	86.1	1	5	113.0	13.3	82
1N6062	73.0	81.9	100.1	1	5	131.0	11.4	90
1N6062A	75.0	86.5	95.5	1	5	125.0	12.0	86
1N6063	81.0	90.0	110.0	1	5	144.0	10.4	99
1N6063A	82.0	95.0	105.0	1	5	137.0	11.0	94
1N6064	90.0	99.0	121.0	1	5	158.0	9.5	109
1N6064A	94.0	105.0	116.0	1	5	152.0	9.9	104
1N6065	95.0	108.0	132.0	1	5	176.0	8.5	120
1N6065A	100.0	114.0	126.0	1	5	168.0	8.9	115
1N6066	105.0	117.0	143.0	1	5	191.0	7.8	131
1N6066A	110.0	124.0	137.0	1	5	182.0	8.2	125
1N6067	121.0	135.0	165.0	1	5	223.0	6.7	142
1N6067A	128.0	143.0	158.0	1	5	213.0	7.0	136
1N6068	137.0	153.0	187.0	1	5	258.0	5.8	164
1N6068A	145.0	162.0	179.0	1	5	245.0	6.1	157
1N6069	145.0	162.0	198.0	1	5	274.0	5.5	175
1N6069A	150.0	171.0	189.0	1	5	261.0	5.7	167
1N6070	155.0	171.0	210.0	1	5	292.0	5.1	186
1N6070A	160.0	181.0	200.0	1	5	278.0	5.4	188
1N6071	165.0	180.0	220.0	1	5	308.0	4.9	197
1N6071A	170.0	190.0	210.0	1	5	294.0	5.1	188
1N6072	175.0	198.0	242.0	1	5	344.0	4.3	219
1N6072A	185.0	209.0	231.0	1	5	328.0	4.6	209

This series of TVS diodes can be used in series or parallel to increase their power handling capability. No precautions are required when using TVS diodes in a series string, as power dissipation for two or more devices of the same type is equally shared. When using TVS diodes in parallel it is recommended that ProTek's Applications Department is contacted for specific instructions. Matched sets can be ordered from the factory for a small additional charge.

The "A" suffix types are available screened to the JANTX requirements of MIL-S-19500/504.

FIGURE 4

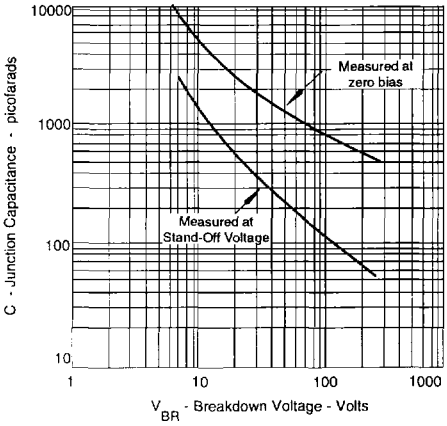
Ð Clamping Voltage vs Pulse Current



Ð V_C is the rise of Clamping Voltage above the actual V_{BR} @ I_T

FIGURE 5

TYPICAL CAPACITANCE vs BREAKDOWN VOLTAGE



ABBREVIATIONS & SYMBOLS

V_{WM} Rated Stand-Off Voltage: Maximum working (continuous) DC or peak voltage which may be applied over the standard operating temperature range. (Note: V_{WM} is a selected device parameter and should be equal to or greater than the maximum operating voltage of the line to be protected.)

V_{BR} (min) Minimum Breakdown Voltage: This is the minimum voltage the device will exhibit and is used to assure that conduction does not occur prior to that voltage at 25°C.

V_C Maximum Clamping Voltage: The maximum peak voltage that appears across the TVS when subjected to the peak pulse current in a 1 millisecond time interval. The peak pulse voltages are the combination of voltage rise due to both the series resistance and the thermal rise.

I_{PP} Peak Pulse Current - See Figure 3

P_P Peak Pulse Power - See Figure 1

I_D Standby Current

I_T Test Current

Note 1: A TVS is normally selected according to its "Rated Stand-Off Voltage" V_{WM} which should be equal to or greater than the continuous peak operating voltage level.

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