



# PROTEK DEVICES®

..... Engineered solutions for the transient environment

TVS  
Transient Voltage  
Suppressors  
SA5.0  
SA170A

## DESCRIPTION

The SA series device types are designed in a small package size where power and space is a consideration. They 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 ( $BV$ ) and a maximum clamping voltage ( $V_C$ ) at a maximum peak pulse current is specified.

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 for several duty cycles, thus making a maximum impedance specification insignificant. In case of severe current overload or abnormal transient beyond the maximum ratings, the TVS will initially fail "short", thus tripping the system's circuit breaker or fuse while protecting the entire circuit. Curves depicting clamping voltage vs. various current pulses are available from the factory. Extended power curves vs. pulse time are also available.

## APPLICATION

This TVS series is a low cost commercial product for use in applications where large voltage transients can permanently damage voltage-sensitive components. It has a peak pulse power rating of 500 watts for one millisecond. The response time of TVS's clamping action is theoretically instantaneous ( $1 \times 10^{-12}$  sec.); therefore, they can protect integrated circuits, MOS devices, Hybrids, and other voltage-sensitive components. TVSs can also be used in series or parallel to increase the peak pulse power ratings. This is only one of many series of Transient Voltage Suppressors available from ProTek Devices.

## FEATURES

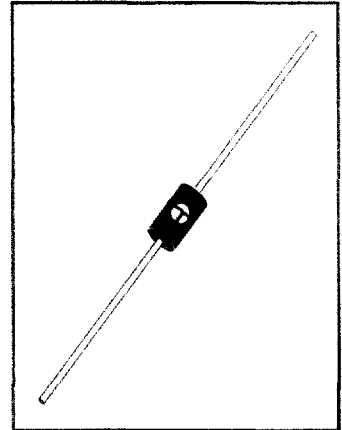
- 500 watts Peak Pulse Power
- Available in ranges from 5.0 to 170  $V_{wm}$
- Bidirectional types available
- Each device 100% tested
- UL 94V-0 Flammability Classification

## MAXIMUM RATINGS

- 500 Watts of Peak Power dissipation at 25°C (see derating curve)
- Operating and Storage temperatures: -65° to +175°C
- $t_{clamping}$  (0 volts to  $BV$  min): Less than  $5 \times 10^{-12}$  second (theoretical)
- Forward surge rating: half cycle 35A, 1/120 sec @ 25 C (Unidirectional)
- Steady State power dissipation: 1.0 watt @  $T_L = 75^\circ C$ , Lead Length = 3/8"
- Repetition rate (duty cycle): .01%

## MECHANICAL CHARACTERISTICS

- Molded case
- Weight: 1.0 grams (approximate)
- Positive terminal marked with band (except Bidirectional)
- Body marked with Logo and type number



Discrete TVS Diodes

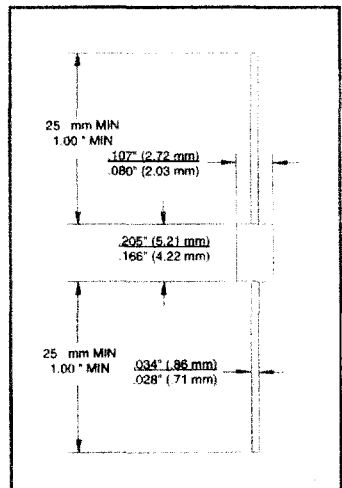


FIGURE 1  
Peak Pulse Power vs Pulse Time

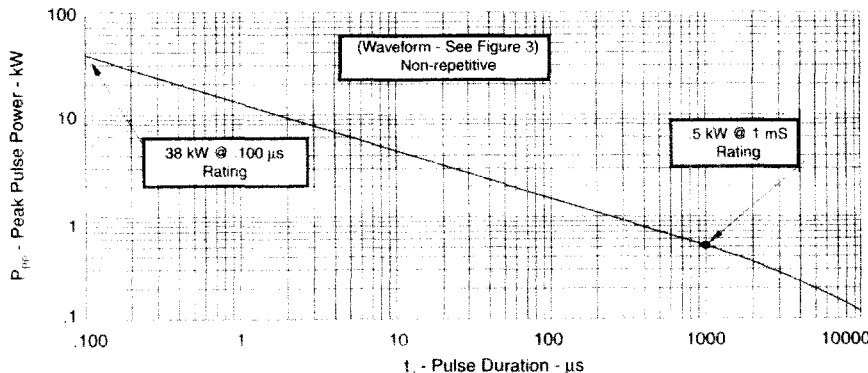
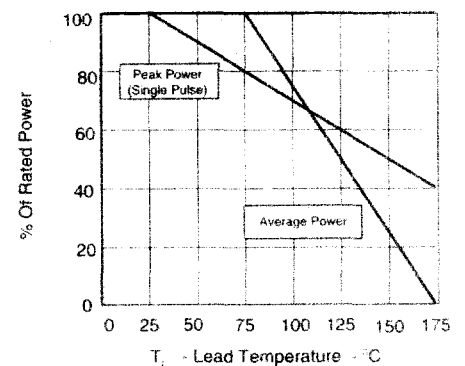


FIGURE 2  
Power Derating Curve



# ELECTRICAL CHARACTERISTICS @ 25°C

PROTEK TYPE NUMBER	RATED STAND-OFF VOLTAGE (See Note 1) $V_{WM}$ VOLTS	BREAKDOWN VOLTAGE		$I_T$ mA	MAXIMUM STANDBY CURRENT $I_D$ $\mu$ A	MAXIMUM CLAMPING VOLTAGE $V_C$ VOLTS (See Fig. 3)	MAXIMUM PEAK PULSE CURRENT $I_{PP}$ A (See Fig. 3)	MAXIMUM TEMPERATURE COEFFICIENT OF $V_{BR}$ mV/°C
		$V_{BR}$ VOLTS						
		Min	Max					
P SA5.0	5.0	6.40	7.30	10	600	9.6	52.0	5.0
P SA5.0A	5.0	6.40	7.00	10	600	9.2	54.3	5.0
P SA6.0	6.0	6.67	8.15	10	600	11.4	43.9	5.0
P SA6.0A	6.0	6.67	7.37	10	600	10.3	46.5	5.0
SA6.5	6.5	7.22	8.82	10	400	12.3	40.7	5.0
SA6.5A	6.5	7.22	7.98	10	400	11.2	44.7	5.0
SA7.0	7.0	7.78	9.51	10	150	13.3	37.8	6.0
SA7.0A	7.0	7.78	8.60	10	150	12.0	41.7	6.0
SA7.5	7.5	8.33	10.2	1	50	14.3	35.0	7.0
SA7.5A	7.5	8.33	9.21	1	50	12.9	38.8	7.0
SA8.0	8.0	8.89	10.9	1	25	15.0	33.3	7.0
SA8.0A	8.0	8.89	9.83	1	25	13.6	36.7	7.0
SA8.5	8.5	9.44	11.5	1	10	15.9	31.4	8.0
SA8.5A	8.5	9.44	10.4	1	10	14.4	34.7	8.0
SA9.0	9.0	10.0	12.2	1	5	16.9	29.5	9.0
SA9.0A	9.0	10.0	11.1	1	5	15.4	32.5	9.0
SA10	10	11.1	13.6	1	3	18.8	26.6	10
SA10A	10	11.1	12.3	1	3	17.0	29.4	10
SA11	11	12.2	14.9	1	3	20.1	24.9	11
SA11A	11	12.2	13.5	1	3	18.2	27.4	11
SA12	12	13.3	16.3	1	3	22.0	22.7	12
SA12A	12	13.3	14.7	1	3	19.9	25.1	12
SA13	13	14.4	17.6	1	3	23.8	21.0	13
SA13A	13	14.4	15.9	1	3	21.5	23.2	13
SA14	14	15.6	19.1	1	3	25.8	19.4	14
SA14A	14	15.6	17.2	1	3	23.2	21.5	14
SA15	15	16.7	20.4	1	3	26.9	18.8	16
SA15A	15	16.7	18.5	1	3	24.4	20.6	16
SA16	16	17.8	21.8	1	3	28.8	17.6	19
SA16A	16	17.8	19.7	1	3	26.0	19.2	17
SA18	18	20.0	24.4	1	3	32.2	15.5	21
SA18A	18	20.0	22.1	1	3	29.9	17.2	20
SA20	20	22.2	27.1	1	3	35.8	13.9	25
SA20A	20	22.2	24.5	1	3	32.4	15.4	23
SA24	24	26.7	32.6	1	3	43.0	11.6	31
SA24A	24	26.7	29.5	1	3	38.9	12.8	28
SA26	26	28.9	35.3	1	3	46.6	10.7	31
SA26A	26	28.9	31.9	1	3	42.1	11.9	30
SA28	28	31.1	38.0	1	3	50.0	9.9	35
SA28A	28	31.1	34.4	1	3	45.4	11.0	31
SA30	30	33.3	40.7	1	3	53.5	9.3	39
SA30A	30	33.3	36.8	1	3	48.4	10.3	36
SA33	33	36.7	44.9	1	3	59.0	8.5	42
SA33A	33	36.7	40.6	1	3	53.3	9.4	39
SA36	36	40.0	48.9	1	3	64.3	7.8	46
SA36A	36	40.0	44.2	1	3	58.1	8.6	41
SA40	40	44.4	54.3	1	3	71.4	7.0	51
SA40A	40	44.4	49.1	1	3	64.5	7.8	46
SA43	43	47.8	58.4	1	3	76.7	6.5	55
SA43A	43	47.8	52.8	1	3	69.4	7.2	50
SA45	45	50.0	61.1	1	3	80.3	6.2	58
SA45A	45	50.0	55.3	1	3	72.7	6.9	52
SA48	48	53.3	65.1	1	3	85.5	5.8	63
SA48A	48	53.3	58.9	1	3	77.4	6.5	56
SA54	54	60.0	73.3	1	3	96.3	5.2	71
SA54A	54	60.0	66.3	1	3	87.1	5.7	65
SA58	58	64.4	78.7	1	3	103.0	4.9	78
SA58A	58	64.4	71.2	1	3	93.6	5.3	70
SA60	60	66.7	81.5	1	3	107.0	4.7	80
SA60A	60	66.7	73.7	1	3	96.8	5.2	71
SA64	64	71.1	86.9	1	3	114.0	4.4	86
SA64A	64	71.1	78.6	1	3	103.0	4.9	76
SA70	70	77.8	95.1	1	3	125.0	4.0	94
SA70A	70	77.8	86.0	1	3	113.0	4.4	85
SA78	78	86.7	106.0	1	3	139	3.6	105
SA78A	78	86.7	95.8	1	3	126	4.0	95
SA85	85	94.4	115.0	1	3	151	3.3	114
SA85A	85	94.4	104.0	1	3	137	3.8	103
SA90	90	100	122	1	3	160	3.1	121
SA90A	90	100	111	1	3	146	3.4	110
SA100	100	111	136	1	3	179	2.8	135
SA100A	100	111	123	1	3	162	3.1	123
SA110	110	122	149	1	3	196	2.6	148
SA110A	110	122	135	1	3	177	2.8	133
SA120	120	133	163	1	3	214	2.3	162
SA120A	120	133	147	1	3	193	2.0	146
SA130	130	144	176	1	3	231	2.2	175
SA130A	130	144	159	1	3	209	2.4	158
SA150	150	167	204	1	3	268	1.9	203
SA150A	150	167	185	1	3	243	2.1	184
SA160	160	178	218	1	3	287	1.7	217
SA160A	160	178	197	1	3	259	1.9	196
SA170	170	189	231	1	3	304	1.6	230
SA170A	170	189	209	1	3	275	1.8	208

FIGURE 3

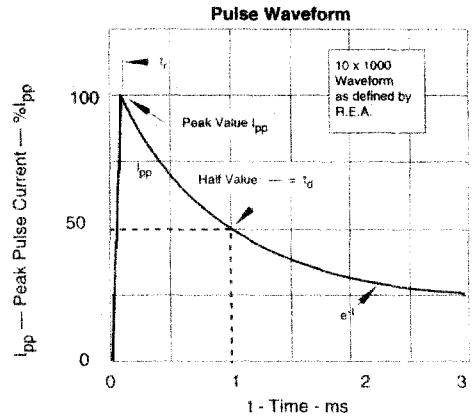
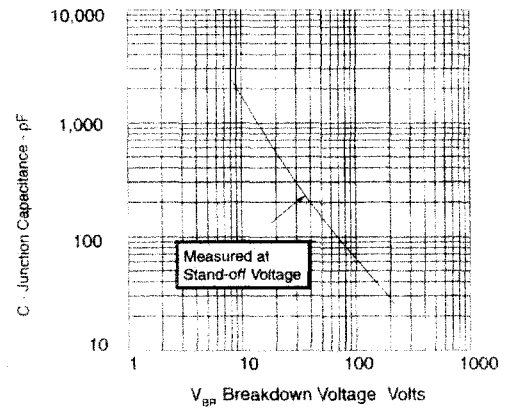


FIGURE 4  
Typical Capacitance vs  $V_{BR}$   
(Unidirectional Only)



NOTES

1. A TVS is normally selected according to the reverse "Stand Off Voltage" ( $V_R$ ) which should be equal to or greater than the DC or continuous peak operating voltage level.
2. For Bidirectional types, 10 volts and under, the  $I_D$  limit is doubled.
3. Part numbers shown are for unidirectional devices. Add C or CA suffix to specify bidirectional devices, such as SA7.5C or SA7.5CA.

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 must 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 ms 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

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$V_f$  at 50 amps peak, 8.3 ms sine wave = 3.5 volts maximum (Does not apply for bidirectional devices)

Note: P = Standard Part, for non-designated parts, contact the factory for minimum order quantity and delivery.