Transient Voltage Suppressor Diode

SA5.0

(SA5.0 thru SA170A Series)

Standoff-Voltage 5.0 to 170V

Peak Pulse Power 500W

DATASHEET

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OEM – General Semiconductor

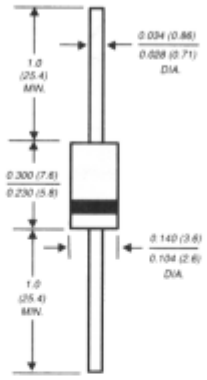
Source: General Semiconductor Databook 1998

SA5.0 THRU SA170CA

GLASS PASSIVATED JUNCTION TRANSIENT VOLTAGE SUPPRESSOR

***Stand-off Voltage** - 5.0 to 170 Volts* ***Peak Pulse Power** - 500 Watts*

DO-204AC



Dimensions in inches and (millimeters)

FEATURES

- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Glass passivated junction
- 500W peak pulse power surge capability with a 10/1000μs waveform, repetition rate (duty cycle): 0.01%
- Excellent clamping capability
- Low incremental surge resistance
- Fast response time: typically less than 1.0ps from 0 Volts to $V_{(BR)}$ for unidirectional and 5.0ns for bidirectional types
- For devices with $V_{(BR)} \geq 10V$, I_D are typically less than 1.0μA
- High temperature soldering guaranteed: 265°C/10 seconds 0.375" (9.5mm) lead length, 5lbs (2.3 kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AC molded plastic body over passivated junction
Terminals: Solder plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes positive end (cathode) except bidirectionals
Mounting Position: Any
Weight: 0.015 ounce, 0.4 gram

DEVICES FOR BIDIRECTIONAL APPLICATIONS

For bidirectional use C or CA Suffix. (e.g. SA5.0C, SA170CA).
Electrical characteristics apply in both directions.

MAXIMUM RATINGS AND CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified

	SYMBOL	VALUE	UNITS
Peak pulse power dissipation with a 10/1000μs waveform (NOTE 1, FIG. 1)	P_{PPM}	Minimum 500	Watts
Peak pulse current with a 10/1000μs waveform (NOTE 1, FIG. 3)	I_{PPM}	SEE TABLE 1	Amps
Steady state power dissipation at T_L=75°C lead lengths 0.375" (9.5mm) (NOTE 2)	$P_{M(AV)}$	1.0	Watts
Peak forward surge current, 8.3ms single half sine-wave superimposed on rated load, unidirectional only (JEDEC Method) (NOTE 3)	I_{FSM}	70	Amps
Maximum instantaneous forward voltage at 35A for unidirectional only (NOTE 3)	V_F	3.5	Volts
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +175	°C

NOTES
(1) Non-repetitive current pulse, per Fig. 3 and derated above T_A=25°C per Fig. 2
(2) Mounted on copper pad area of 1.6 x 1.6" (40 x 40mm) per Fig. 5
(3) 8.3ms single half sine-wave or equivalent square wave, duty cycle=4 pulses per minute maximum

ELECTRICAL CHARACTERISTICS at (T_A=25°C unless otherwise noted)

Device Type	Breakdown Voltage $V_{(BR)}$ (Volts) (NOTE 1) MIN	MAX	Test Current at I_T (mA)	Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D (NOTE3) (µA)	Maximum Peak Pulse Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)	Maximum Temperature Coefficient of $V_{(BR)}$ (mV / °C)
SA5.0	6.40	7.30	10	5.0	600	52.1	9.6	5.0
SA5.0A	6.40	7.00	10	5.0	600	54.3	9.2	5.0
SA6.0	6.67	8.15	10	6.0	600	43.9	11.4	5.0
SA6.0A	6.67	7.37	10	6.0	600	48.5	10.3	5.0
SA6.5	7.22	8.82	10	6.5	400	40.7	12.3	5.0
SA6.5A	7.22	7.98	10	6.5	400	44.7	11.2	5.0
SA7.0	7.78	9.51	10	7.0	150	37.6	13.3	6.0
SA7.0A	7.78	8.60	10	7.0	150	41.7	12.0	6.0
SA7.5	8.33	10.2	1.0	7.5	50	35.0	14.3	7.0
SA7.5A	8.33	9.21	1.0	7.5	50	38.8	12.9	7.0
SA8.0	8.89	10.9	1.0	8.0	25	33.3	15.0	7.0
SA8.0A	8.89	9.83	1.0	8.0	25	36.8	13.6	7.0
SA8.5	9.44	11.5	1.0	8.5	10	31.4	15.9	8.0
SA8.5A	9.44	10.4	1.0	8.5	10	34.7	14.4	8.0
SA9.0	10.0	12.2	1.0	9.0	5.0	29.6	16.9	9.0
SA9.0A	10.0	11.1	1.0	9.0	5.0	32.5	15.4	9.0
SA10	11.1	13.6	1.0	10.0	1.0	26.6	18.8	10.0
SA10A	11.1	12.3	1.0	10.0	1.0	29.4	17.0	10.0
SA11	12.2	14.9	1.0	11.0	1.0	24.9	20.1	11.0
SA11A	12.2	13.5	1.0	11.0	1.0	27.5	18.2	11.0
SA12	13.3	16.3	1.0	12.0	1.0	22.7	22.0	12.0
SA12A	13.3	14.7	1.0	12.0	1.0	25.1	19.9	12.0
SA13	14.4	17.6	1.0	13.0	1.0	21.0	23.8	13.0
SA13A	14.4	15.9	1.0	13.0	1.0	23.3	21.5	13.0
SA14	15.6	19.1	1.0	14.0	1.0	19.4	25.8	14.0
SA14A	15.6	17.2	1.0	14.0	1.0	21.6	23.2	14.0
SA15	16.7	20.4	1.0	15.0	1.0	18.6	26.9	16.0
SA15A	16.7	18.5	1.0	15.0	1.0	20.5	24.4	16.0
SA16	17.8	21.8	1.0	16.0	1.0	17.4	28.8	19.0
SA16A	17.8	19.7	1.0	16.0	1.0	19.2	26.0	17.0
SA17	18.9	23.1	1.0	17.0	1.0	16.4	30.5	20.0
SA17A	18.9	20.9	1.0	17.0	1.0	18.1	27.6	19.0
SA18	20.0	24.4	1.0	18.0	1.0	15.5	32.2	21.0
SA18A	20.0	22.1	1.0	18.0	1.0	17.1	29.2	20.0
SA20	22.2	27.1	1.0	20.0	1.0	14.0	35.8	25.0
SA20A	22.2	24.5	1.0	20.0	1.0	15.4	32.4	23.0
SA22	24.4	29.8	1.0	22.0	1.0	22.7	39.4	28.0
SA22A	24.4	26.9	1.0	22.0	1.0	14.1	35.5	25.0
SA24	26.7	32.6	1.0	24.0	1.0	11.6	43.0	31.0
SA24A	26.7	29.5	1.0	24.0	1.0	12.9	38.9	28.0
SA26	28.9	35.3	1.0	26.0	1.0	10.7	46.6	31.0
SA26A	28.9	31.9	1.0	26.0	1.0	11.9	42.1	30.0
SA28	31.1	38.0	1.0	28.0	1.0	10.0	50.1	35.0
SA28A	31.1	34.4	1.0	28.0	1.0	11.0	45.4	31.0
SA30	33.3	40.7	1.0	30.0	1.0	9.3	53.5	39.0
SA30A	33.3	36.8	1.0	30.0	1.0	10	48.4	36.0
SA33	36.7	44.9	1.0	33.0	1.0	8.5	59.0	42.0
SA33A	36.7	40.6	1.0	33.0	1.0	9.4	53.3	39.0
SA36	40.0	48.9	1.0	36.0	1.0	7.8	64.3	46.0
SA36A	40.0	44.2	1.0	36.0	1.0	8.6	58.1	41.0
SA40	44.4	54.3	1.0	40.0	1.0	7.0	71.4	51.0
SA40A	44.4	49.1	1.0	40.0	1.0	7.8	64.5	46.0
SA43	47.8	58.4	1.0	43.0	1.0	6.5	76.7	55.0
SA43A	47.8	52.8	1.0	43.0	1.0	7.2	69.4	50.0

ELECTRICAL CHARACTERISTICS at (T_A=25°C unless otherwise noted)

Device Type	Breakdown Voltage $V_{(BR)}$ Volts (NOTE 1) MIN	MAX	Test Current at I_T (mA)	Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D (NOTE3) (µA)	Maximum Peak Pulse Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)	Maximum Temperature Coefficient of $V_{(BR)}$ (mV / °C)
SA45	50.0	61.1	1.0	45.0	1.0	6.2	80.3	58.0
SA45A	50.0	55.3	1.0	45.0	1.0	6.9	72.7	52.0
SA48	53.3	65.2	1.0	48.0	1.0	5.8	85.5	63.0
SA48A	53.3	58.9	1.0	48.0	1.0	6.5	77.4	56.0
SA51	56.7	69.3	1.0	51.0	1.0	5.5	91.1	66.0
SA51A	56.7	62.7	1.0	51.0	1.0	6.1	82.4	61.0
SA54	60.0	73.3	1.0	54.0	1.0	5.2	96.3	71.0
SA54A	60.0	66.3	1.0	54.0	1.0	5.7	87.1	65.0
SA58	64.4	78.7	1.0	58.0	1.0	4.9	103	78.0
SA58A	64.4	71.2	1.0	58.0	1.0	5.3	93.6	70.0
SA60	66.7	81.5	1.0	60.0	1.0	4.7	107	80.0
SA60A	66.7	73.7	1.0	60.0	1.0	5.2	96.8	71.0
SA64	71.1	86.9	1.0	64.0	1.0	4.4	114	86.0
SA64A	71.1	78.6	1.0	64.0	1.0	4.9	103	76.0
SA70	77.8	95.1	1.0	70.0	1.0	4.0	125	94.0
SA70A	77.8	86.0	1.0	70.0	1.0	4.4	113	85.0
SA75	83.3	102	1.0	75.0	1.0	3.7	134	101
SA75A	83.3	92.1	1.0	75.0	1.0	4.1	121	91.0
SA78	86.7	106	1.0	78.0	1.0	3.6	139	105
SA78A	86.7	95.8	1.0	78.0	1.0	4.0	126	95.0
SA85	94.4	115	1.0	85.0	1.0	3.3	151	114
SA85A	94.4	104	1.0	85.0	1.0	3.6	137	103
SA90	100	122	1.0	90.0	1.0	3.1	160	121
SA90A	100	111	1.0	90.0	1.0	3.4	146	110
SA100	111	136	1.0	100	1.0	2.8	179	135
SA100A	111	123	1.0	100	1.0	3.1	162	123
SA110	122	149	1.0	110	1.0	2.6	196	148
SA110A	122	135	1.0	110	1.0	2.8	177	133
SA120	133	163	1.0	120	1.0	2.3	214	162
SA120A	133	147	1.0	120	1.0	2.6	193	146
SA130	144	176	1.0	130	1.0	2.2	230	175
SA130A	144	159	1.0	130	1.0	2.4	209	158
SA150	167	204	1.0	150	1.0	1.9	268	203
SA150A	167	185	1.0	150	1.0	2.1	243	184
SA160	178	218	1.0	160	1.0	1.7	257	217
SA160A	178	197	1.0	160	1.0	1.9	259	196
SA170	189	231	1.0	170	1.0	1.6	304	230
SA170A	189	1209	1.0	170	1.0	1.8	275	208

NOTES
(1) $V_{(BR)}$ measured after I_T applied for 300µs. I_T=square wave pulse or equivalent
(2) Surge current waveform per Fig. 3 and derate per Fig. 2
(3) For bidirectional types with V_{WM} of 10 Volts and less, the I_D limit is doubled.
(4) All terms and symbols are consistent with ANSI/IEEE C62.35

RATINGS AND CHARACTERISTIC CURVES SA5.0 THRU SA170CA

FIG. 1 - PEAK PULSE POWER RATING CURVE

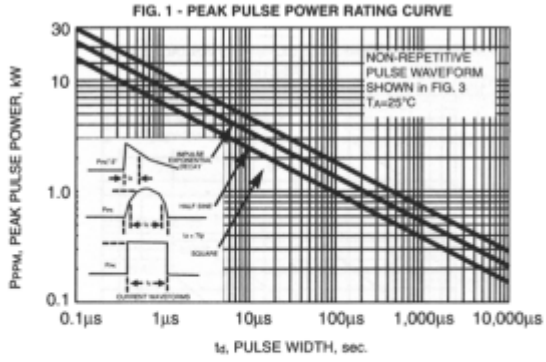


FIG. 2 - PULSE DERATING CURVE

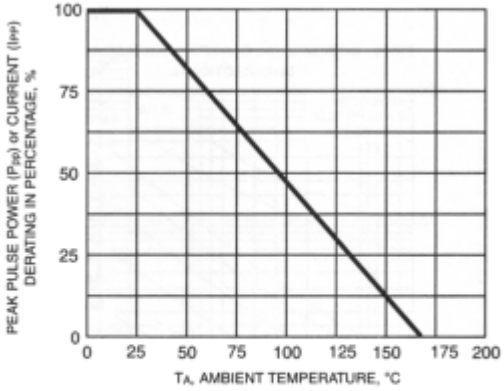


FIG. 3 - PULSE WAVEFORM

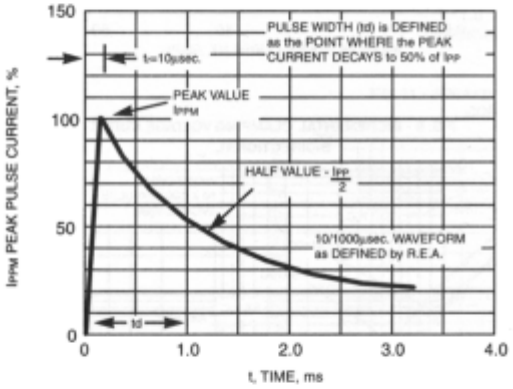


FIG. 4 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT UNIDIRECTIONAL ONLY

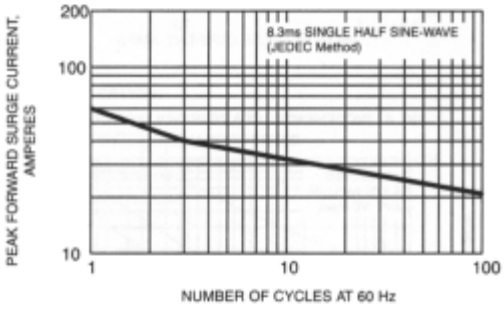


FIG. 5 - STEADY STATE POWER DERATING CURVE

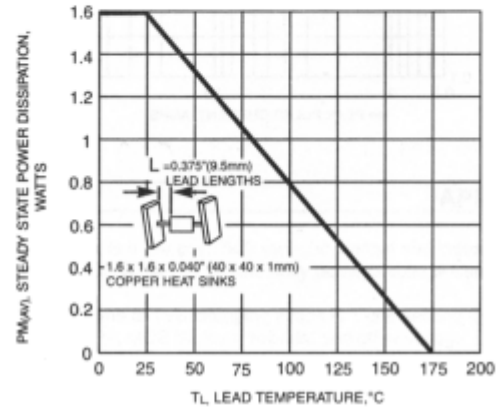
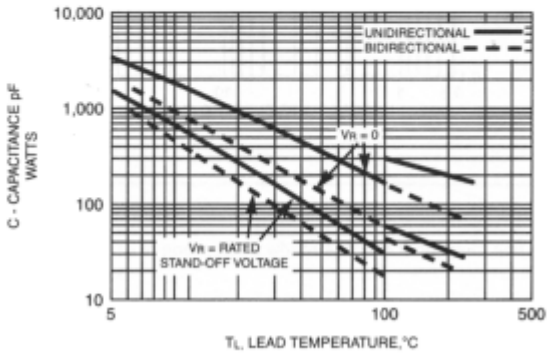


FIG. 6 - CAPACITANCE



RATINGS AND CHARACTERISTIC CURVES SA5.0 THRU SA170CA

FIG. 6 - INCREMENTAL CLAMPING VOLTAGE CURVE
UNIDIRECTIONAL

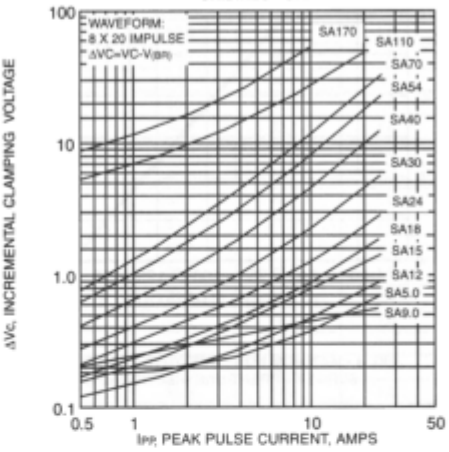


FIG. 7 - INCREMENTAL CLAMPING VOLTAGE CURVE
UNIDIRECTIONAL

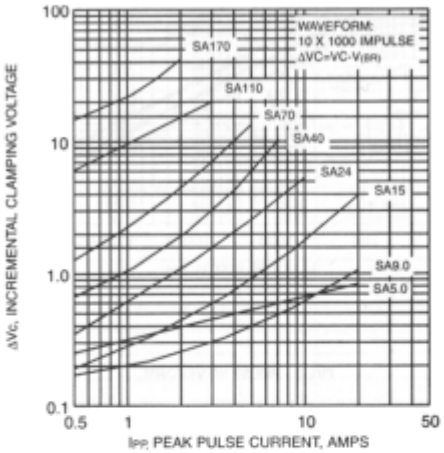


FIG. 8 - INCREMENTAL CLAMPING VOLTAGE CURVE
BIDIRECTIONAL

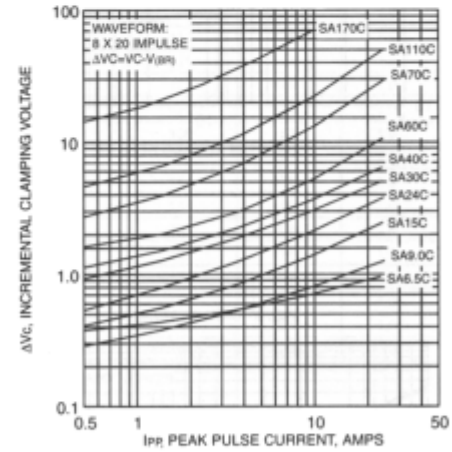
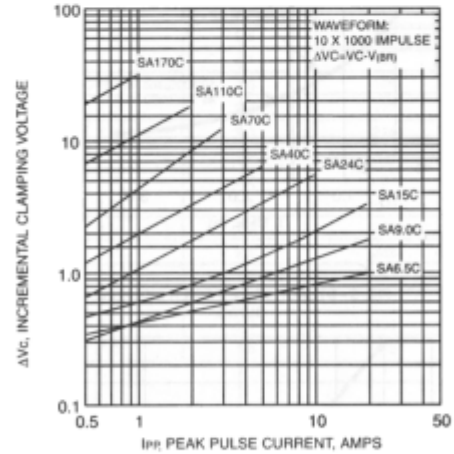


FIG. 9 - INCREMENTAL CLAMPING VOLTAGE CURVE
BIDIRECTIONAL



RATINGS AND CHARACTERISTIC CURVES SA5.0 THRU SA170CA

FIG. 10 - TYPICAL INSTANTANEOUS FORWARD VOLTAGE CHARACTERISTICS CURVE

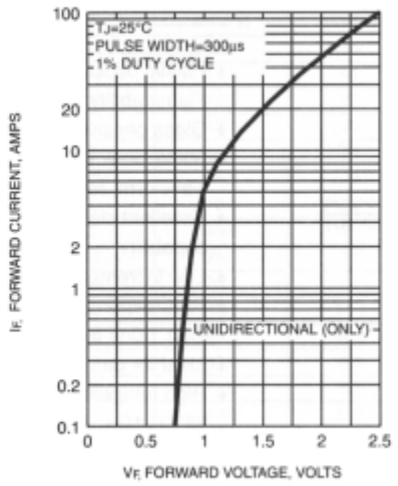
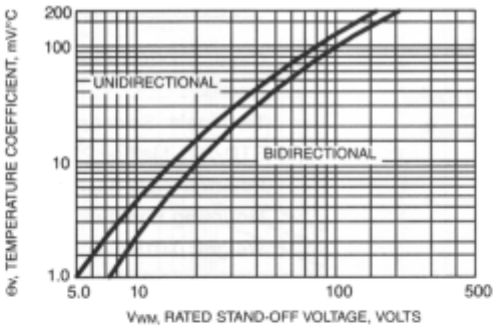


FIG. 11 - BREAKDOWN VOLTAGE TEMPERATURE COEFFICIENT CURVE



APPLICATIONS

This TVS series is a low cost, 500 watt commercial and industrial product for use in applications where space is a premium and where large voltage transients can permanently damage voltage-sensitive components.

The response time of TVS clamping action is 1.0ns second for unidirectional and 5.0ns for bidirectional; therefore, they can protect integrated circuits, MOS devices, hybrids, and other voltage-sensitive semiconductor components.