



**THE DATASHEET OF
SA6.5-E3/54**



TRANSZORB® Transient Voltage Suppressors


DO-204AC (DO-15)

| PRIMARY CHARACTERISTICS | |
|----------------------------------|---------------------------------|
| V_{WM} | 5.0 V to 170 V |
| V_{BR} (uni-directional) | 6.4 V to 209 V |
| V_{BR} (bi-directional) | 6.4 V to 209 V |
| P_{PPM} | 500 W |
| P_D | 3.0 W |
| I_{FSM} (uni-directional only) | 70 A |
| T_J max. | 175 °C |
| Polarity | Uni-directional, bi-directional |
| Package | DO-204AC (DO-15) |

DEVICES FOR BI-DIRECTION APPLICATIONS

For bi-directional types, use CA suffix (e.g. SA5.0CA, SA170CA).

Electrical characteristics apply in both directions.

FEATURES

- Glass passivated chip junction
- Available in uni-directional and bi-directional
- 500 W peak pulse power capability with a 10/1000 μ s waveform, repetitive rate (duty cycle): 0.01 %
- Excellent clamping capability
- Very fast response time
- Low incremental surge resistance
- Solder dip 275 °C max. 10 s, per JESD 22-B106
- AEC-Q101 qualified
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912


RoHS
COMPLIANT

TYPICAL APPLICATIONS

Use in sensitive electronics protection against voltage transients induced by inductive load switching and lighting on ICs, MOSFET, signal lines of sensor units for consumer, computer, industrial, and telecommunication.

MECHANICAL DATA

Case: DO-204AC, molded epoxy over passivated chip Molding compound meets UL 94 V-0 flammability rating Base P/N-E3 - RoHS compliant, commercial grade Base P/NHE3 - RoHS compliant, AEC-Q101 qualified

Terminals: Matte tin plated leads, solderable per J-STD-002 and JESD 22-B102

E3 suffix meets JESD 201 class 1A whisker test, HE3 suffix meets JESD 201 class 2 whisker test

Polarity: For uni-directional types the color band denotes cathode end, no marking on bi-directional types

| MAXIMUM RATINGS ($T_A = 25$ °C unless otherwise noted) | | | |
|--|----------------|----------------|------|
| PARAMETER | SYMBOL | VALUE | UNIT |
| Peak pulse power dissipation with a 10/1000 μ s waveform ⁽¹⁾ (fig. 1) | P_{PPM} | 500 | W |
| Peak pulse current with a 10/1000 μ s waveform ⁽¹⁾ | I_{PPM} | See next table | A |
| Power dissipation on infinite heatsink at $T_L = 75$ °C (fig. 5) | P_D | 3.0 | W |
| Peak forward surge current 10 ms single half sine-wave uni-directional only | I_{FSM} | 70 | A |
| Maximum instantaneous forward voltage at 100 A for uni-directional only ⁽³⁾ | V_F | 3.5 | V |
| 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⁾ 8.3 ms single half sine-wave or equivalent square wave, duty cycle = 4 pulses per minute maximum



| ELECTRICAL CHARACTERISTICS (T _A = 25 °C unless otherwise noted) | | | | | | | | |
|--|--|------|----------------------------------|---------------------------------------|---|--|---|---|
| DEVICE TYPE | BREAKDOWN VOLTAGE V _{BR} AT I _T ⁽¹⁾ (V) | | TEST CURRENT I _T (mA) | STAND-OFF VOLTAGE V _{WM} (V) | MAXIMUM REVERSE LEAKAGE AT V _{WM} ⁽³⁾ I _D (μA) | MAXIMUM PEAK PULSE CURRENT I _{PPM} ⁽²⁾ (A) | MAXIMUM CLAMPING VOLTAGE AT I _{PPM} V _C (V) | MAXIMUM TEMPERATURE COEFFICIENT AT V _{BR} (%/°C) |
| | MIN. | MAX. | | | | | | |
| SA5.0A ⁽⁴⁾ | 6.40 | 7.07 | 10 | 5.0 | 600 | 54.3 | 9.2 | 5 |
| SA6.0A | 6.67 | 7.37 | 10 | 6.0 | 600 | 48.5 | 10.3 | 5 |
| SA6.5A | 7.22 | 7.98 | 10 | 6.5 | 400 | 44.7 | 11.2 | 5 |
| SA7.0A | 7.78 | 8.60 | 10 | 7.0 | 150 | 41.7 | 12.0 | 6 |
| SA7.5A | 8.33 | 9.21 | 1.0 | 7.5 | 50 | 38.8 | 12.9 | 7 |
| SA8.0A | 8.89 | 9.83 | 1.0 | 8.0 | 25 | 36.8 | 13.6 | 7 |
| SA8.5A | 9.44 | 10.4 | 1.0 | 8.5 | 10 | 34.7 | 14.4 | 8 |
| SA9.0A | 10.0 | 11.1 | 1.0 | 9.0 | 5.0 | 32.5 | 15.4 | 9 |
| SA10A | 11.1 | 12.3 | 1.0 | 10 | 1.0 | 29.4 | 17.0 | 10 |
| SA11A | 12.2 | 13.5 | 1.0 | 11 | 1.0 | 27.5 | 18.2 | 11 |
| SA12A | 13.3 | 14.7 | 1.0 | 12 | 1.0 | 25.1 | 19.9 | 12 |
| SA13A | 14.4 | 15.9 | 1.0 | 13 | 1.0 | 23.3 | 21.5 | 13 |
| SA14A | 15.6 | 17.2 | 1.0 | 14 | 1.0 | 21.6 | 23.2 | 14 |
| SA15A | 16.7 | 18.5 | 1.0 | 15 | 1.0 | 20.5 | 24.4 | 16 |
| SA16A | 17.8 | 19.7 | 1.0 | 16 | 1.0 | 19.2 | 26.0 | 17 |
| SA17A | 18.9 | 20.9 | 1.0 | 17 | 1.0 | 18.1 | 27.6 | 19 |
| SA18A | 20.0 | 22.1 | 1.0 | 18 | 1.0 | 17.1 | 29.2 | 20 |
| SA20A | 22.2 | 24.5 | 1.0 | 20 | 1.0 | 15.4 | 32.4 | 23 |
| SA22A | 24.4 | 26.9 | 1.0 | 22 | 1.0 | 14.1 | 35.5 | 25 |
| SA24A | 26.7 | 29.5 | 1.0 | 24 | 1.0 | 12.9 | 38.9 | 28 |
| SA26A | 28.9 | 31.9 | 1.0 | 26 | 1.0 | 11.9 | 42.1 | 30 |
| SA28A | 31.1 | 34.4 | 1.0 | 28 | 1.0 | 11 | 45.4 | 31 |
| SA30A | 33.3 | 36.8 | 1.0 | 30 | 1.0 | 10 | 48.4 | 36 |
| SA33A | 36.7 | 40.6 | 1.0 | 33 | 1.0 | 9.4 | 53.3 | 39 |
| SA36A | 40.0 | 44.2 | 1.0 | 36 | 1.0 | 8.6 | 58.1 | 41 |
| SA40A | 44.4 | 49.1 | 1.0 | 40 | 1.0 | 7.8 | 64.5 | 46 |
| SA43A | 47.8 | 52.8 | 1.0 | 43 | 1.0 | 7.2 | 69.4 | 50 |
| SA45A | 50.0 | 55.3 | 1.0 | 45 | 1.0 | 6.9 | 72.7 | 52 |
| SA48A | 53.3 | 58.9 | 1.0 | 48 | 1.0 | 6.5 | 77.4 | 56 |
| SA51A | 56.7 | 62.7 | 1.0 | 51 | 1.0 | 6.1 | 82.4 | 61 |
| SA54A | 60.0 | 66.3 | 1.0 | 54 | 1.0 | 5.7 | 87.1 | 65 |
| SA58A | 64.4 | 71.2 | 1.0 | 58 | 1.0 | 5.3 | 93.6 | 70 |
| SA60A | 66.7 | 73.7 | 1.0 | 60 | 1.0 | 5.2 | 96.8 | 71 |
| SA64A | 71.1 | 78.6 | 1.0 | 64 | 1.0 | 4.9 | 103 | 76 |
| SA70A | 77.8 | 86.0 | 1.0 | 70 | 1.0 | 4.4 | 113 | 85 |
| SA75A | 83.3 | 92.1 | 1.0 | 75 | 1.0 | 4.1 | 121 | 91 |
| SA78A | 86.7 | 95.8 | 1.0 | 78 | 1.0 | 4 | 126 | 95 |
| SA85A | 94.4 | 104 | 1.0 | 85 | 1.0 | 3.6 | 137 | 103 |
| SA90A | 100 | 111 | 1.0 | 90 | 1.0 | 3.4 | 146 | 110 |
| SA100A | 111 | 123 | 1.0 | 100 | 1.0 | 3.1 | 162 | 123 |
| SA110A | 122 | 135 | 1.0 | 110 | 1.0 | 2.8 | 177 | 133 |
| SA120A | 133 | 147 | 1.0 | 120 | 1.0 | 2.6 | 193 | 146 |
| SA130A | 144 | 159 | 1.0 | 130 | 1.0 | 2.4 | 209 | 158 |
| SA150A | 167 | 185 | 1.0 | 150 | 1.0 | 2.1 | 243 | 184 |
| SA160A | 178 | 197 | 1.0 | 160 | 1.0 | 1.9 | 259 | 196 |
| SA170A | 189 | 209 | 1.0 | 170 | 1.0 | 1.8 | 275 | 208 |

Notes

- (1) Pulse test: t_p ≤ 50 ms
- (2) Surge current waveform per fig. 3 and derate per fig. 2
- (3) For bi-directional types with V_{WM} of 10 V and less the I_D limit is doubled
- (4) For the bi-directional SA5.0CA, the maximum V_{BR} is 7.25 V
- (5) All terms and symbols are consistent with ANSI/IEEE CA62.35



| ORDERING INFORMATION (Example) | | | | |
|--------------------------------|-----------------|------------------------|---------------|----------------------------------|
| PREFERRED PIN | UNIT WEIGHT (g) | PREFERRED PACKAGE CODE | BASE QUANTITY | DELIVERY MODE |
| SA5.0A-E3/54 | 0.432 | 54 | 4000 | 13" diameter paper tape and reel |
| SA5.0AHE3/54 (1) | 0.432 | 54 | 4000 | 13" diameter paper tape and reel |

Note

(1) AEC-Q101 qualified

RATINGS AND CHARACTERISTICS CURVES ($T_A = 25^\circ\text{C}$ unless otherwise noted)



Fig. 1 - Peak Pulse Power Rating Curve



Fig. 3 - Pulse Waveform



Fig. 2 - Pulse Derating Curve



Fig. 4 - Maximum Non-Repetitive Forward Surge Current Uni-Directional Only



Fig. 5 - Steady State Power Derating Curve



Fig. 8 - Incremental Clamping Voltage Curve Uni-Directional



Fig. 6 - Capacitance



Fig. 9 - Incremental Clamping Voltage Curve Bi-Directional



Fig. 7 - Incremental Clamping Voltage Curve Uni-Directional



Fig. 10 - Incremental Clamping Voltage Curve Bi-Directional



Fig. 11 - Typical Instantaneous Forward Voltage



Fig. 12 - Breakdown Voltage Temperature Coefficient Curve

PACKAGE OUTLINE DIMENSIONS in inches (millimeters)

DO-204AC (DO-15)





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