

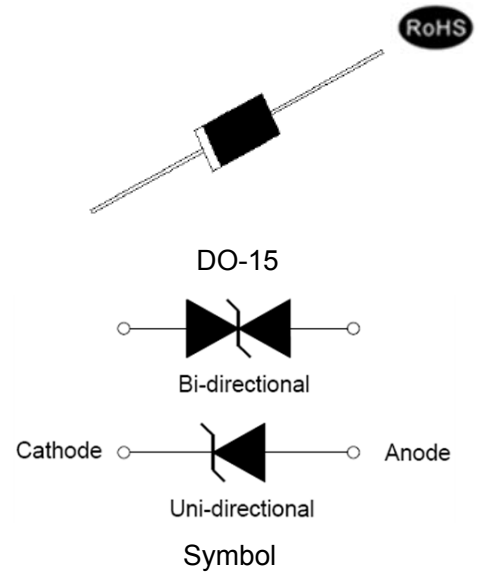


SA Series 500W Transient Voltage Suppressor

Rev.3.3

DESCRIPTION

The SA series of high current uni/bi-directional transient suppressors are designed for A.C. line protection and high power DC bus clamping applications. These devices offer uni/bi-directional port protection from 5.0 volts to 220 volts. They provide a clamping voltage lower than the avalanche voltage. Therefore, any voltage rise due to increased current conduction is contained to a minimum, providing the best possible protection level. They can also be connected in series and/or parallel to create very high capacity protection solutions.



FEATURES

- ✧ Low incremental surge resistance.
- ✧ Excellent clamping capability.
- ✧ Color band denoted cathode except bidirectional.
- ✧ Typical I_R less than 1 μ A above 10V.
- ✧ High temperature wave soldering: 265 $^{\circ}$ C/10s at terminals.
- ✧ Plastic package has underwriters laboratory flammability 94V-0.
- ✧ 500W peak pulse power capability at 10/1000 μ s waveform.
- ✧ Meets MSL level 1, per J-STD-020, LF maximum peak of 260 $^{\circ}$ C.
- ✧ Terminal: solder plated, solderable per J-STD-002.
- ✧ Fast response time: typically less than 1.0ps from 0V to V_{BR} min.
- ✧ IEC61000-4-2 (ESD) \pm 30kV (air), \pm 30kV (contact).

ABSOLUTE MAXIMUM RATINGS ($T_A=25^{\circ}$ C, RH=45%-75%, unless otherwise noted)

| Parameter | Symbol | Value | Unit |
|--|----------------|-------------|--------------|
| Operating junction and storage temperature range | T_J, T_{STG} | -55 to +175 | $^{\circ}$ C |
| Peak pulse power dissipation at 10/1000 μ s waveform | P_{PP} | 500 | W |
| Steady state power dissipation at $T_L=75^{\circ}$ C | $P_{M(AV)}$ | 3.0 | W |
| Maximum instantaneous forward voltage at 35A for unidirectional | V_F | 3.5 | V |
| Peak forward surge current, 8.3ms single half sine-wave for unidirectional only (NOTE 1) | I_{FSM} | 70 | A |

ABSOLUTE MAXIMUM RATINGS ($T_A=25^{\circ}\text{C}$, RH=45%-75%, unless otherwise noted, continued)

| Parameter | Symbol | Value | Unit |
|--|-----------------|-------|-----------------------------|
| Typical thermal resistance junction to lead | $R_{\theta JL}$ | 20 | $^{\circ}\text{C}/\text{W}$ |
| Typical thermal resistance junction to ambient | $R_{\theta JA}$ | 75 | $^{\circ}\text{C}/\text{W}$ |

Notes:

1. Measured on 8.3ms single half sine wave or equivalent square wave for unidirectional device only, duty cycle=4 per minute maximum

ELECTRICAL CHARACTERISTICS ($T_A=25^{\circ}\text{C}$)

| Part Number | | V_R | $I_R@V_R$ | $V_{BR}@I_T$ | | I_T | $V_C@I_{PP}$ | $I_{PP}^{\text{①}}$ |
|-------------|----------|-------|----------------------|--------------|--------|-------|--------------|---------------------|
| Uni-Polar | Bi-Polar | V | max(μA) | min(V) | max(V) | mA | max(V) | A |
| SA5.0A | SA5.0CA | 5.0 | 200 | 6.40 | 7.00 | 10 | 9.2 | 55.4 |
| SA6.0A | SA6.0CA | 6.0 | 200 | 6.67 | 7.37 | 10 | 10.3 | 49.5 |
| SA6.5A | SA6.5CA | 6.5 | 120 | 7.22 | 7.98 | 10 | 11.2 | 45.5 |
| SA7.0A | SA7.0CA | 7.0 | 50 | 7.78 | 8.60 | 10 | 12.0 | 42.5 |
| SA7.5A | SA7.5CA | 7.5 | 50 | 8.33 | 9.21 | 1 | 12.9 | 39.5 |
| SA8.0A | SA8.0CA | 8.0 | 20 | 8.89 | 9.83 | 1 | 13.6 | 37.5 |
| SA8.5A | SA8.5CA | 8.5 | 10 | 9.44 | 10.40 | 1 | 14.4 | 35.5 |
| SA9.0A | SA9.0CA | 9.0 | 5 | 10.00 | 11.10 | 1 | 15.4 | 33.1 |
| SA10A | SA10CA | 10.0 | 2 | 11.10 | 12.30 | 1 | 17.0 | 30.0 |
| SA11A | SA11CA | 11.0 | 1 | 12.20 | 13.50 | 1 | 18.2 | 28.0 |
| SA12A | SA12CA | 12.0 | 1 | 13.30 | 14.70 | 1 | 19.9 | 25.6 |
| SA13A | SA13CA | 13.0 | 1 | 14.40 | 15.90 | 1 | 21.5 | 23.7 |
| SA14A | SA14CA | 14.0 | 1 | 15.60 | 17.20 | 1 | 23.2 | 22.0 |
| SA15A | SA15CA | 15.0 | 1 | 16.70 | 18.50 | 1 | 24.4 | 20.9 |
| SA16A | SA16CA | 16.0 | 1 | 17.80 | 19.70 | 1 | 26.0 | 19.6 |
| SA17A | SA17CA | 17.0 | 1 | 18.90 | 20.90 | 1 | 27.6 | 18.5 |
| SA18A | SA18CA | 18.0 | 1 | 20.00 | 22.10 | 1 | 29.2 | 17.5 |
| SA20A | SA20CA | 20.0 | 1 | 22.20 | 24.50 | 1 | 32.4 | 15.7 |
| SA22A | SA22CA | 22.0 | 1 | 24.40 | 26.90 | 1 | 35.5 | 14.4 |
| SA24A | SA24CA | 24.0 | 1 | 26.70 | 29.50 | 1 | 38.9 | 13.1 |
| SA26A | SA26CA | 26.0 | 1 | 28.90 | 31.90 | 1 | 42.1 | 12.1 |

ELECTRICAL CHARACTERISTICS ($T_A=25^{\circ}\text{C}$, continued)

| Part Number | | V_R | $I_{R@V_R}$ | $V_{BR@I_T}$ | | I_T | $V_C@I_{PP}$ | $I_{PP}^{①}$ |
|-------------|----------|-------|----------------------|--------------|--------|-------|--------------|--------------|
| Uni-Polar | Bi-Polar | V | max(μA) | min(V) | max(V) | mA | max(V) | A |
| SA28A | SA28CA | 28.0 | 1 | 31.10 | 34.40 | 1 | 45.4 | 11.2 |
| SA30A | SA30CA | 30.0 | 1 | 33.30 | 36.80 | 1 | 48.4 | 10.5 |
| SA33A | SA33CA | 33.0 | 1 | 36.70 | 40.60 | 1 | 53.3 | 9.6 |
| SA36A | SA36CA | 36.0 | 1 | 40.00 | 44.20 | 1 | 58.1 | 8.8 |
| SA40A | SA40CA | 40.0 | 1 | 44.40 | 49.10 | 1 | 64.5 | 7.9 |
| SA43A | SA43CA | 43.0 | 1 | 47.80 | 52.80 | 1 | 69.4 | 7.3 |
| SA45A | SA45CA | 45.0 | 1 | 50.00 | 55.30 | 1 | 72.7 | 7.0 |
| SA48A | SA48CA | 48.0 | 1 | 53.30 | 58.90 | 1 | 77.4 | 6.6 |
| SA51A | SA51CA | 51.0 | 1 | 56.70 | 62.70 | 1 | 82.4 | 6.2 |
| SA54A | SA54CA | 54.0 | 1 | 60.00 | 66.30 | 1 | 87.1 | 5.9 |
| SA58A | SA58CA | 58.0 | 1 | 64.40 | 71.20 | 1 | 93.6 | 5.4 |
| SA60A | SA60CA | 60.0 | 1 | 66.70 | 73.70 | 1 | 96.8 | 5.3 |
| SA64A | SA64CA | 64.0 | 1 | 71.10 | 78.60 | 1 | 103.0 | 5.0 |
| SA70A | SA70CA | 70.0 | 1 | 77.80 | 86.00 | 1 | 113.0 | 4.5 |
| SA75A | SA75CA | 75.0 | 1 | 83.30 | 92.10 | 1 | 121.0 | 4.2 |
| SA78A | SA78CA | 78.0 | 1 | 86.70 | 95.80 | 1 | 126.0 | 4.0 |
| SA85A | SA85CA | 85.0 | 1 | 94.40 | 104.0 | 1 | 137.0 | 3.7 |
| SA90A | SA90CA | 90.0 | 1 | 100.0 | 111.0 | 1 | 146.0 | 3.5 |
| SA100A | SA100CA | 100.0 | 1 | 111.0 | 123.0 | 1 | 162.0 | 3.1 |
| SA110A | SA110CA | 110.0 | 1 | 122.0 | 135.0 | 1 | 177.0 | 2.9 |
| SA120A | SA120CA | 120.0 | 1 | 133.0 | 147.0 | 1 | 193.0 | 2.6 |
| SA130A | SA130CA | 130.0 | 1 | 144.0 | 159.0 | 1 | 209.0 | 2.4 |
| SA150A | SA150CA | 150.0 | 1 | 167.0 | 185.0 | 1 | 243.0 | 2.1 |
| SA160A | SA160CA | 160.0 | 1 | 178.0 | 197.0 | 1 | 259.0 | 2.0 |
| SA170A | SA170CA | 170.0 | 1 | 189.0 | 209.0 | 1 | 275.0 | 1.9 |
| SA180A | SA180CA | 180.0 | 1 | 201.0 | 222.0 | 1 | 292.0 | 1.7 |
| SA200A | SA200CA | 200.0 | 1 | 224.0 | 247.0 | 1 | 324.0 | 1.5 |
| SA220A | SA220CA | 220.0 | 1 | 246.0 | 272.0 | 1 | 356.0 | 1.4 |

① Surge waveform: 10/1000 μs V_R : Stand-off voltage -- maximum voltage that can be applied

V_{BR} : Breakdown voltage

V_C : Clamping voltage -- peak voltage measured across the suppressor at a specified I_{PP}

I_R : Reverse leakage current

RATINGS AND V-I CHARACTERISTICS CURVES ($T_A=25^{\circ}C$, unless otherwise noted)

FIG.1:V- I curve characteristics (Uni-directional)

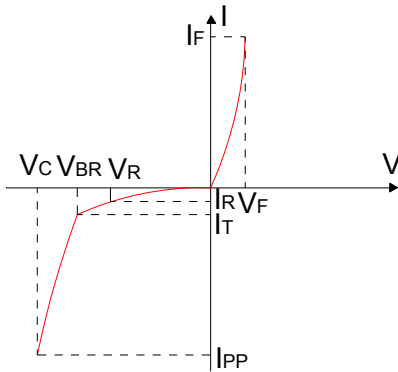


FIG.2:V- I curve characteristics (Bi-directional)

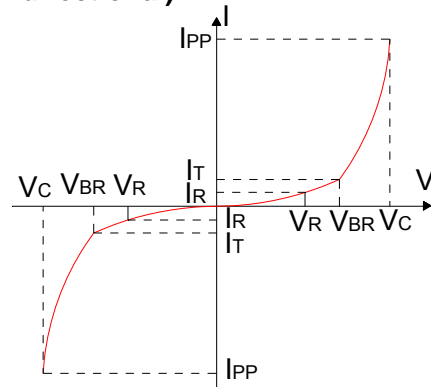


FIG.3: Pulse waveform

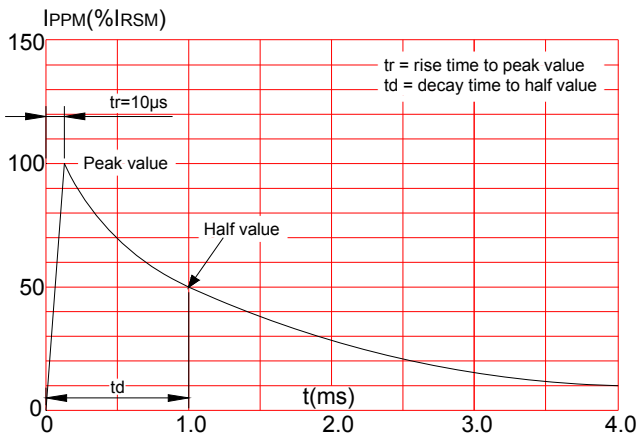
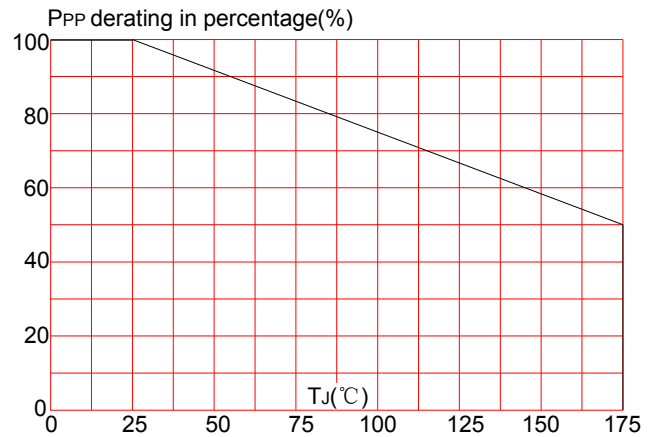
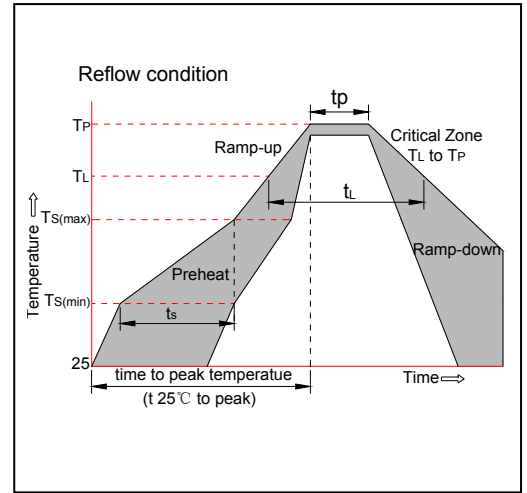


FIG.4: Pulse derating curve



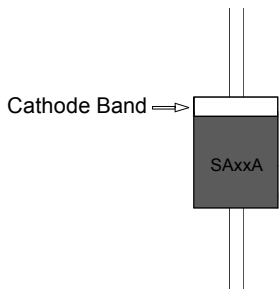
SOLDERING PARAMETERS

| | | |
|---|-----------------------------------|---|
| Reflow Condition | | Pb-Free assembly (see figure at right) |
| Pre Heat | -Temperature Min ($T_{s(min)}$) | +150°C |
| | -Temperature Max($T_{s(max)}$) | +200°C |
| | -Time (Min to Max) (t_s) | 60-180 secs. |
| Average ramp up rate (Liquidus Temp (T_L)to peak) | | 3°C/sec. Max |
| $T_{s(max)}$ to T_L - Ramp-up Rate | | 3°C/sec. Max |
| Reflow | -Temperature(T_L)(Liquidus) | +217°C |
| | -Temperature(t_L) | 60-150 secs. |
| Peak Temp (T_p) | | +260(+0/-5)°C |
| Time within 5°C of actual Peak Temp (t_p) | | 20-40secs. |
| Ramp-down Rate | | 6°C/sec. Max |
| Time 25°C to Peak Temp (T_p) | | 8 min. Max |
| Do not exceed | | +260°C |



| Flow/Wave Soldering(Solder Dipping) | |
|-------------------------------------|---------|
| Peak temperature | 265°C |
| Dipping time | 10 sec. |
| Soldering | 1 time |

MARKING & ORDERING INFORMATION



SA xx A
 (1) (2) (3)
 (1)Series:500 watts series
 (2)Reverse stand-off voltage
 (3)5% V_{BR} voltage tolerance

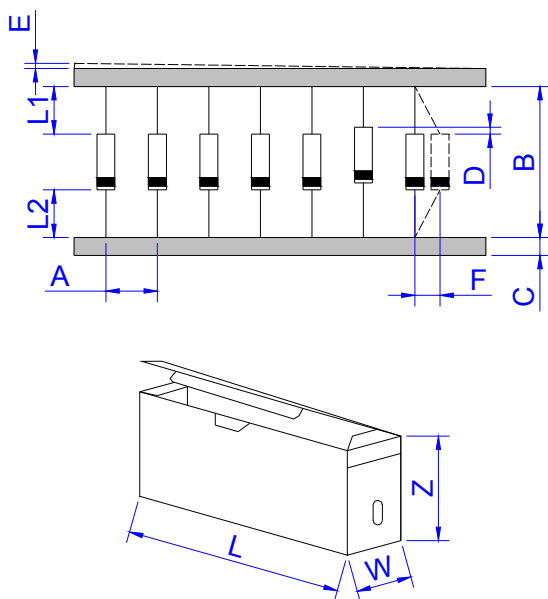


SA xx C A
 (1) (2) (3) (4)
 (1)Series:500 watts series
 (2)Reverse stand-off voltage
 (3)Bi-directional
 (4)5% V_{BR} voltage tolerance

PACKAGE MECHANICAL DATA

| <p>DO-15</p> | Ref. | Dimensions | | | |
|--------------|------|-------------|-------|--------|------|
| | | Millimeters | | Inches | |
| | | Min. | Max. | Min. | Max. |
| | A | 25.40 | - | 1.000 | - |
| B | 5.80 | 7.62 | 0.228 | 0.300 | |
| C | 0.71 | 0.86 | 0.028 | 0.034 | |
| D | 2.60 | 3.60 | 0.102 | 0.142 | |

TAPE AND BOX SPECIFICATION-DO-15



| Ref. | Dimensions | |
|-------|-------------|-------------|
| | Millimeters | Inches |
| A | 5.0±0.5 | 0.197±0.020 |
| B | 53.0±1.5 | 2.087±0.059 |
| C | 6.0±0.5 | 0.236±0.020 |
| D | 1.2(MAX) | 0.047(MAX) |
| E | 0.8(MAX) | 0.031(MAX) |
| F | 1.5(MAX) | 0.059(MAX) |
| L1-L2 | 1.0(MAX) | 0.039(MAX) |
| W | 80±5.0 | 3.150±0.197 |
| L | 250±5.0 | 9.843±0.197 |
| Z | 115±5.0 | 4.528±0.197 |

| PART No. | UNIT WEIGHT (g/PCS) typ. | PER BOX (PCS) | PER CARTON (PCS) | DESCRIPTION |
|----------|-----------------------------|------------------|---------------------|-------------|
| SAxxA/CA | 0.42 | 2,000 | 20,000 | Box |

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