


SZ1SMC Series



Description

The SZ1SMC series is designed to protect voltage sensitive components from high voltage, high energy transients. They have excellent clamping capability, high surge capability, low zener impedance and fast response time. The SZ1SMC series is supplied in the Littelfuse exclusive, cost-effective, highly reliable DO-214AB package and is ideally suited for use in communication systems, automotive, numerical controls, process controls, medical equipment, business machines, power supplies and many other industrial/consumer applications.

Agency Approvals

| Agency | Agency File Number |
|---|--------------------|
|  | E128662 |

Maximum Ratings and Thermal Characteristics

| Parameter | Symbol | Value | Unit |
|--|--------------------|----------------|---------------------------|
| Peak Power Dissipation (Note 1) @ $T_L = 25^\circ\text{C}$, Pulse Width = 1 ms | P_{PK} | 1500 | W |
| DC Power Dissipation @ $T_L = 75^\circ\text{C}$ Measured Zero Lead Length (Note 2) Derate Above 75°C | P_D | 4.0 54.6 | W mW/ $^\circ\text{C}$ |
| Thermal Resistance from Junction-to-Lead | $R_{\theta JL}$ | 18.3 | $^\circ\text{C}/\text{W}$ |
| DC Power Dissipation (Note 3) @ $T_A = 25^\circ\text{C}$ Derate Above 25°C | P_D | 0.75 6.1 | W mW/ $^\circ\text{C}$ |
| Thermal Resistance from Junction-to-Ambient | $R_{\theta JA}$ | 165 | $^\circ\text{C}/\text{W}$ |
| Forward Surge Current (Note 4) @ $T_A = 25^\circ\text{C}$ | I_{FSM} | 200 | A |
| Operating and Storage Temperature Range | T_J T_{stg} | -65 to +150 | $^\circ\text{C}$ |

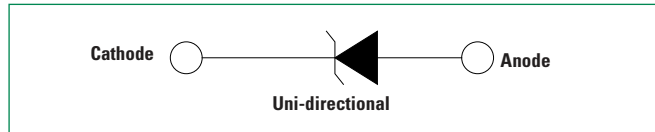
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. 10 x 1000 μs , non-repetitive.
2. 1 in square copper pad, FR-4 board.
3. FR-4 board, using Littelfuse minimum recommended footprint
4. 1/2 sine wave (or equivalent square wave), PW = 8.3 ms, duty cycle = 4 pulses per minute maximum.

Features

- Zener Transient Overvoltage Suppressors
- Working Peak Reverse Voltage Range – 5.0 V to 78 V
- Standard Zener Breakdown Voltage Range – 6.4 V to 95.8 V
- Peak Power – 1500 W@1 ms
- ESD Rating of Class 3 (> 16 KV) per Human Body Model
- Maximum Clamp Voltage @ Peak Pulse Current
- Low Leakage < 5 μA Above 10 V
- UL Recognized to UL 497B as an Isolated Loop Circuit Protector.
- Maximum Temperature Coefficient Specified
- Response Time is Typically < 1 ns
- Pb-Free Packages are Available
- SZ Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable

Functional Diagram



Additional Information



Datasheet

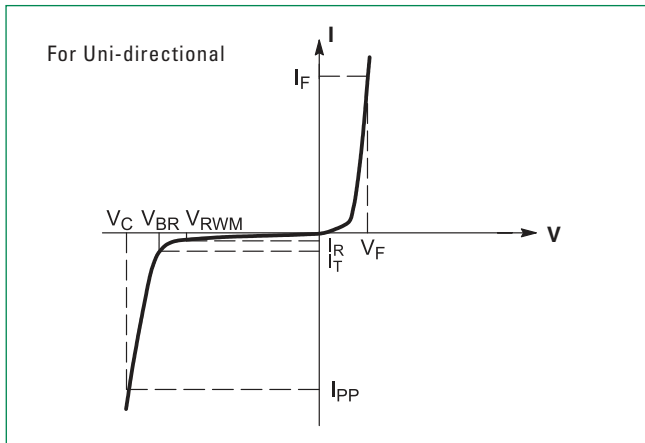


Resources



Samples

I-V Curve Characteristics ($T_A = 25^\circ\text{C}$ unless otherwise noted, $V_F = 3.5\text{ V Max @ } I_F = 100\text{ A}$) (Note 5)



| Symbol | Parameter |
|-----------|---|
| I_{PP} | Maximum Reverse Peak Pulse Current |
| V_C | Clamping Voltage @ I_{PP} |
| V_{RWM} | Working Peak Reverse Voltage |
| I_R | Maximum Reverse Leakage Current @ V_{RWM} |
| V_{BR} | Breakdown Voltage @ I_T |
| I_T | Test Current |
| I_F | Forward Current |
| V_F | Forward Voltage @ I_F |

5. 1/2 sine wave or equivalent, PW= 8.3 ms non-repetitive duty cycle

Electrical Characteristics ($T_A = 25^\circ\text{C}$ unless otherwise noted)

| Device | Device Marking | V_{RWM} (Note 6) | I_R @ V_{RWM} | Breakdown Voltage | | | | V_C @ I_{PP} (Note 8) | |
|---------------|----------------|-----------------------|----------------------|--------------------------|-------|-------|---------|------------------------------|----------|
| | | | | V_{BR} (V) (Note 7) | | | @ I_T | V_C | I_{PP} |
| | | | | Min | Nom | Max | | | |
| SZ1SMC5.0AT3G | GDE | 5.0 | 1000 | 6.40 | 6.70 | 7.00 | 10 | 9.2 | 163.0 |
| SZ1SMC6.0AT3G | GDG | 6.0 | 1000 | 6.67 | 7.02 | 7.37 | 10 | 10.3 | 145.6 |
| SZ1SMC6.5AT3G | GDK | 6.5 | 500 | 7.22 | 7.60 | 7.98 | 10 | 11.2 | 133.9 |
| SZ1SMC7.5AT3G | GDP | 7.5 | 100 | 8.33 | 8.77 | 9.21 | 1 | 12.9 | 116.3 |
| SZ1SMC8.0AT3G | GDR | 8.0 | 50 | 8.89 | 9.36 | 9.83 | 1 | 13.6 | 110.3 |
| SZ1SMC9.0AT3G | GDV | 9.0 | 10 | 10.00 | 10.55 | 11.10 | 1 | 15.4 | 97.4 |
| SZ1SMC10AT3G | GDX | 10 | 5 | 11.10 | 11.70 | 12.30 | 1 | 17.0 | 88.2 |
| SZ1SMC12AT3G | GEE | 12 | 5 | 13.30 | 14.00 | 14.70 | 1 | 19.9 | 75.3 |
| SZ1SMC13AT3G | GEG | 13 | 5 | 14.40 | 15.15 | 15.90 | 1 | 21.5 | 69.7 |
| SZ1SMC14AT3G | GEK | 14 | 5 | 15.60 | 16.40 | 17.20 | 1 | 23.2 | 64.7 |
| SZ1SMC15AT3G | GEM | 15 | 5 | 16.70 | 17.60 | 18.50 | 1 | 24.4 | 61.5 |
| SZ1SMC16AT3G | GEP | 16 | 5 | 17.80 | 18.75 | 19.70 | 1 | 26.0 | 57.7 |
| SZ1SMC17AT3G | GER | 17 | 5 | 18.90 | 19.90 | 20.90 | 1 | 27.6 | 53.3 |
| SZ1SMC18AT3G | GET | 18 | 5 | 20.00 | 21.05 | 22.10 | 1 | 29.2 | 51.4 |
| SZ1SMC20AT3G | GEV | 20 | 5 | 22.20 | 23.35 | 24.50 | 1 | 32.4 | 46.3 |
| SZ1SMC22AT3G | GEX | 22 | 5 | 24.40 | 25.65 | 26.90 | 1 | 35.5 | 42.2 |
| SZ1SMC24AT3G | GEZ | 24 | 5 | 26.70 | 28.10 | 29.50 | 1 | 38.9 | 38.6 |
| SZ1SMC26AT3G | GFE | 26 | 5 | 28.90 | 30.40 | 31.90 | 1 | 42.1 | 35.6 |
| SZ1SMC28AT3G | GFG | 28 | 5 | 31.10 | 32.75 | 34.40 | 1 | 45.4 | 33.0 |
| SZ1SMC30AT3G | GFK | 30 | 5 | 33.30 | 35.05 | 36.80 | 1 | 48.4 | 31.0 |
| SZ1SMC33AT3G | GFM | 33 | 5 | 36.70 | 38.65 | 40.60 | 1 | 53.3 | 28.1 |
| SZ1SMC36AT3G | GFP | 36 | 5 | 40.00 | 42.10 | 44.20 | 1 | 58.1 | 25.8 |
| SZ1SMC40AT3G | GFR | 40 | 5 | 44.40 | 46.75 | 49.10 | 1 | 64.5 | 22.2 |
| SZ1SMC43AT3G | GFT | 43 | 5 | 47.80 | 50.30 | 52.80 | 1 | 69.4 | 21.6 |
| SZ1SMC48AT3G | GFX | 48 | 5 | 53.30 | 56.10 | 58.90 | 1 | 77.4 | 19.4 |
| SZ1SMC51AT3G | GFZ | 51 | 5 | 56.70 | 59.70 | 62.70 | 1 | 82.4 | 18.2 |
| SZ1SMC54AT3G | GGE | 54 | 5 | 60.00 | 63.15 | 66.30 | 1 | 87.1 | 17.2 |
| SZ1SMC58AT3G | GGG | 58 | 5 | 64.40 | 67.80 | 71.20 | 1 | 93.6 | 16.0 |
| SZ1SMC60AT3G | G GK | 60 | 5 | 66.70 | 70.20 | 73.70 | 1 | 96.8 | 15.5 |
| SZ1SMC64AT3G | GGM | 64 | 5 | 71.10 | 74.85 | 78.60 | 1 | 103.0 | 14.6 |
| SZ1SMC70AT3G | G GP | 70 | 5 | 77.80 | 81.90 | 86.00 | 1 | 113.0 | 13.3 |
| SZ1SMC75AT3G | G GR | 75 | 5 | 83.30 | 87.70 | 92.10 | 1 | 121.0 | 12.4 |
| SZ1SMC78AT3G | G GT | 78 | 5 | 86.70 | 91.25 | 95.80 | 1 | 126.0 | 11.4 |

6. A transient suppressor is normally selected according to the maximum working peak reverse voltage (V_{RWM}), which should be equal to or greater than the DC or continuous peak operating voltage level.

7. V_{BR} measured at pulse test current I_T at an ambient temperature of 25°C .

8. Surge current waveform per Figure 2 and derate per Figure 3 of the General Data – 1500 Watt at the beginning of this group.

Ratings and Characteristic Curves

Figure 1. Pulse Rating Curve

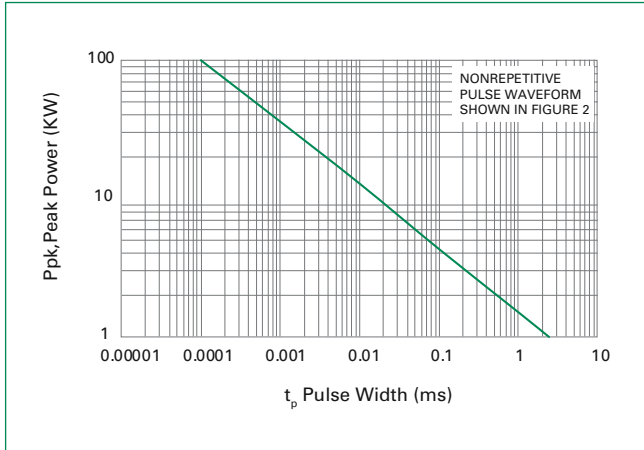


Figure 2. Pulse Waveform

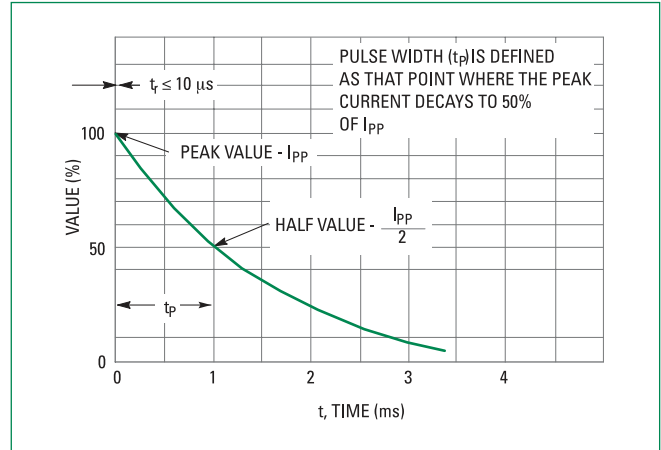


Figure 3. Surge Derating Curve

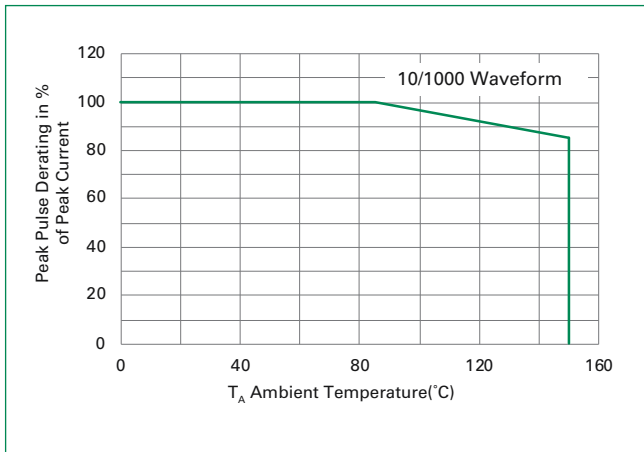
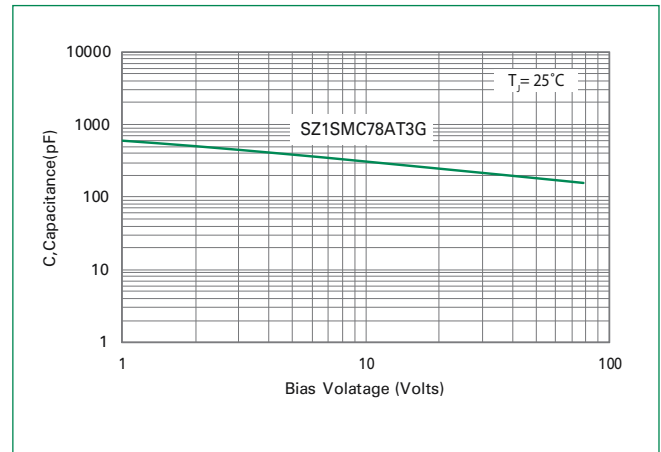
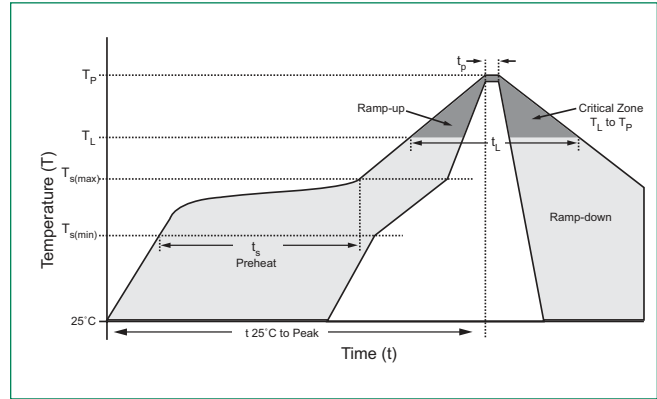


Figure 4. Typical Junction Capacitance vs. Bias Voltage



Soldering Parameters

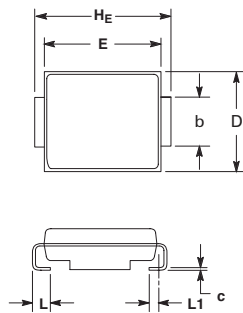
| | | |
|--|------------------------------------|-------------------------|
| Reflow Condition | | Lead-free assembly |
| Pre Heat | - Temperature Min ($T_{s(min)}$) | 150°C |
| | - Temperature Max ($T_{s(max)}$) | 200°C |
| | - Time (min to max) (t_p) | 60 – 120 secs |
| Average ramp up rate (Liquidus Temp (T_L) to peak) | | 3°C/second max |
| $T_{s(max)}$ to T_L - Ramp-up Rate | | 3°C/second max |
| Reflow | - Temperature (T_L) (Liquidus) | 217°C |
| | - Time (min to max) (t_L) | 60 – 150 seconds |
| Peak Temperature (T_p) | | 260 ^{+0/-5} °C |
| Time within 5°C of actual peak Temperature (t_p) | | 30 seconds max |
| Ramp-down Rate | | 6°C/second max |
| Time 25°C to peak Temperature (T_p) | | 8 minutes max. |
| Do not exceed | | 260°C |



Physical Specifications

| | |
|-----------------|--|
| Weight | 0.00733 ounce, 0.228 grams |
| Case | JEDEC DO-214AB. Void-Free, Transfer-Molded, Thermosetting Plastic Epoxy Meets UL 94V-0 |
| Polarity | Color band denotes cathode for unidirectional components. |
| Terminal | Matte Tin-plated leads, Solderable per JESD22-B102 |

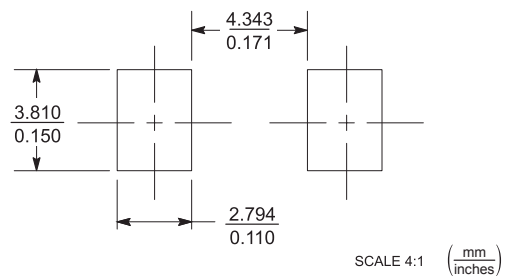
Dimensions



Environmental Specifications

| | |
|----------------------------|--------------------------|
| High Temp. Storage | JESD22-A103 |
| HTRB | JESD22-A108 |
| Temperature Cycling | JESD22-A104 |
| MSL | JEDEC-J-STD-020, Level 1 |
| H3TRB | JESD22-A101 |
| RSH | JESD22-A111 |

Soldering Footprint



| Dim | Inches | | | Millimeters | | |
|----------------|-----------|-------|-------|-------------|------|------|
| | Min | Nom | Max | Min | Nom | Max |
| A | 0.079 | 0.087 | 0.095 | 2.00 | 2.22 | 2.41 |
| A1 | 0.002 | 0.004 | 0.008 | 0.05 | 0.10 | 0.20 |
| b | 0.115 | 0.118 | 0.125 | 2.92 | 3.00 | 3.18 |
| c | 0.006 | 0.009 | 0.012 | 0.15 | 0.23 | 0.30 |
| D | 0.220 | 0.230 | 0.240 | 5.59 | 5.84 | 6.10 |
| E | 0.260 | 0.270 | 0.280 | 6.60 | 6.86 | 7.11 |
| H _E | 0.305 | 0.313 | 0.320 | 7.75 | 7.94 | 8.13 |
| L | 0.030 | 0.040 | 0.050 | 0.76 | 1.02 | 1.27 |
| L1 | 0.020 REF | | | 0.51 REF | | |

Ordering Information

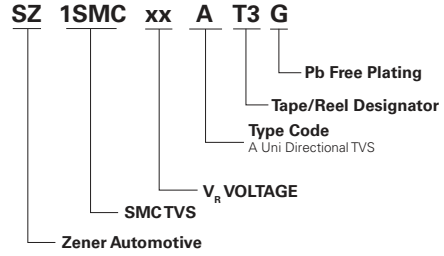
| Device | Package | Shipping |
|--------------|---------------|---------------------|
| SZ1SMCxxAT3G | SMC (Pb-Free) | 2,500 / Tape & Reel |

Part Marking System

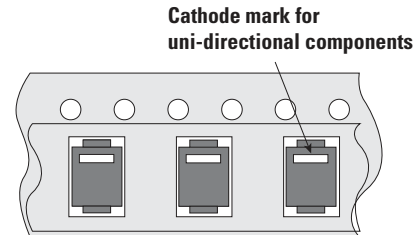
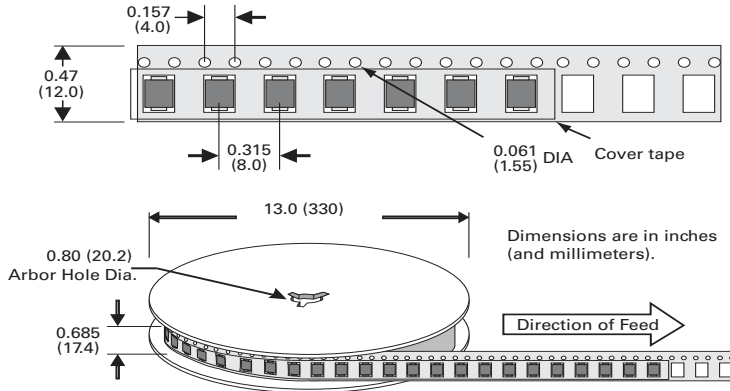


XXXX = Device Code
 Y = Year
 M = Month
 A = Assembly Location
 WW = Lot Code

Part Numbering System



Tape and Reel Specification



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