

SZSMF Series



Description

The SZSMF series is designed to protect sensitive systems or components from high voltage, high energy transients. It offers a fast response time, low Zener impedance, high surge and excellent clamping capabilities. Because of its small size, it is ideal for use in cellular phones, portable devices, business machines, power supplies and other industrial and consumer applications.

Features

- Zener Transient Overvoltage Suppressors
- Stand-off Voltage: 5 – 58 Volts
- Peak Power: 200 Watts @ 1 ms
- Low Leakage
- Response Time is Typically < 1 ns
- ESD Rating of Class 3 (> 16 kV) per Human Body Model
- ESD Rating of Level 4 (8 kV Contact Discharge) per IEC 61000-4-2
- EFT (Electrical Fast Transients) Rating of 40 A per IEC 61000-4-4
- Low Profile: Maximum Height of 1.0 mm
- Small Footprint: Footprint Area of 8.45 mm²
- Supplied in 8 mm Tape and Reel – 3,000 Units per Reel
- Cathode Indicated by Polarity Band
- Lead Orientation in Tape: Cathode Lead to Sprocket Holes
- These components are Pb-Free and are RoHS Compliant
- SZ Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable

Agency Approvals

| AGENCY | AGENCY FILE NUMBER |
|--------|--------------------|
| | E128662 |

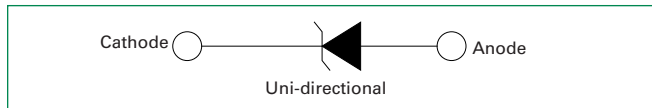
Maximum Ratings and Thermal Characteristics

| Rating | Symbol | Value | Unit |
|--|-----------------------------------|-------------|-------|
| Maximum P _{pk} Dissipation (PW=10/1000 μs) (Note 1) | P _{PK} | 200 | W |
| Maximum P _{PK} Dissipation @ T _A = 25°C, (PW=8/20 μs) (Note 2) | P _{PK} | 1000 | W |
| DC Power Dissipation @ T _A = 25°C (Note 3) | P _D | 385 | mW |
| Derate Above 25°C | | 4.0 | mW/°C |
| Thermal Resistance from Junction-to-Ambient (Note 3) | R _{θJA} | 325 | °C/W |
| Thermal Resistance, Junction-to-Lead (Note3) | R _{θJL} | 26 | °C/W |
| Operating and Storage Temperature Range | T _J , T _{stg} | -55 to +150 | °C |

Stresses exceeding Maximum Ratings may damage the component. 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 component reliability.

1. Non-repetitive current pulse at T_A = 25°C, per waveform of Figure 2.
2. Non-repetitive current pulse at T_A = 25°C, per waveform of Figure 3.
3. Mounted with recommended minimum pad size, DC board FR-4.
4. 1/2 sine wave (or equivalent square wave), PW = 8.3 ms, duty cycle = 4 pulses per minute maximum.

Functional Diagram



Additional Information



Datasheet



Resources



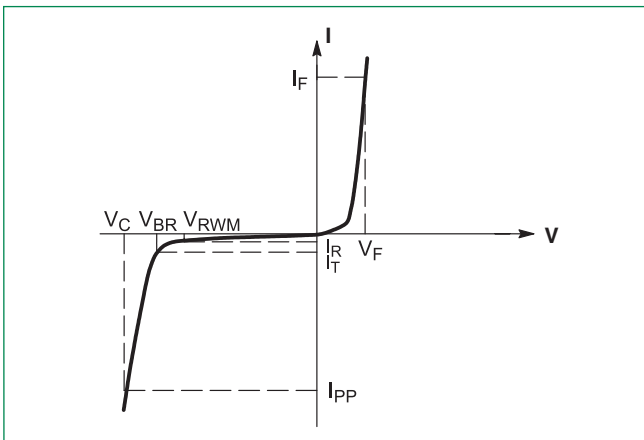
Samples

Electrical Characteristics ($T_L = 30^\circ\text{C}$ unless otherwise noted, $V_F = 1.25$ Volts @ 200 mA)

| Device | Device Marking | V_{RWM} | $V_{BR} @ I_T$ (V) (Note 6) | | | @ I_T | $I_R @ V_{RWM}$ | $V_C(\text{Max})$ | $I_{PP}(\text{Max})$ (A) |
|--------------|----------------|-----------|-----------------------------|-------|-------|---------|-----------------|-------------------|--------------------------|
| | | | V | Min | Nom | | | | |
| SZSMF5.0AT1G | KE | 5 | 6.40 | 6.70 | 7.00 | 10 | 400 | 9.2 | 21.7 |
| SZSMF6.0AT1G | KG | 6 | 6.67 | 7.02 | 7.37 | 10 | 400 | 10.3 | 19.4 |
| SZSMF6.5AT1G | KK | 6.5 | 7.22 | 7.60 | 7.98 | 10 | 250 | 11.2 | 17.9 |
| SZSMF7.0AT1G | KM | 7 | 7.78 | 8.19 | 8.60 | 10 | 100 | 12 | 16.7 |
| SZSMF7.5AT1G | KP | 7.5 | 8.33 | 8.77 | 9.21 | 1 | 50 | 12.9 | 15.5 |
| SZSMF8.0AT1G | KR | 8 | 8.89 | 9.36 | 9.83 | 1 | 25 | 13.6 | 14.7 |
| SZSMF9.0AT1G | KV | 9 | 10.00 | 10.55 | 11.10 | 1 | 5 | 15.4 | 13.0 |
| SZSMF10AT1G | KX | 10 | 11.10 | 11.70 | 12.30 | 1 | 2.5 | 17 | 11.8 |
| SZSMF11AT1G | KZ | 11 | 12.20 | 12.85 | 13.50 | 1 | 2.5 | 18.2 | 11.0 |
| SZSMF12AT1G | LE | 12 | 13.30 | 14.00 | 14.70 | 1 | 2.5 | 19.9 | 10.1 |
| SZSMF13AT1G | LG | 13 | 14.40 | 15.15 | 15.90 | 1 | 1 | 21.5 | 9.3 |
| SZSMF14AT1G | LK | 14 | 15.60 | 16.40 | 17.20 | 1 | 1 | 23.2 | 8.6 |
| SZSMF15AT1G | LM | 15 | 16.70 | 17.60 | 18.50 | 1 | 1 | 24.4 | 8.2 |
| SZSMF18AT1G | LT | 18 | 20.00 | 21.00 | 22.10 | 1 | 1 | 29.2 | 6.8 |
| SZSMF20AT1G | LV | 20 | 22.20 | 23.35 | 24.50 | 1 | 1 | 32.4 | 6.2 |
| SZSMF22AT1G | LX | 22 | 24.40 | 25.60 | 26.90 | 1 | 1 | 35.5 | 5.6 |
| SZSMF24AT1G | LZ | 24 | 26.70 | 28.10 | 29.50 | 1 | 1 | 38.9 | 5.1 |
| SZSMF26AT1G | ME | 26 | 28.90 | 30.40 | 31.90 | 1 | 1 | 42.1 | 4.8 |
| SZSMF28AT1G | MG | 28 | 31.10 | 32.80 | 34.40 | 1 | 1 | 45.4 | 4.4 |
| SZSMF30AT1G | MK | 30 | 33.30 | 35.10 | 36.80 | 1 | 1 | 48.4 | 4.1 |
| SZSMF33AT1G | MM | 33 | 36.70 | 38.70 | 40.60 | 1 | 1 | 53.3 | 3.8 |
| SZSMF36AT1G | MP | 36 | 40.00 | 42.10 | 44.20 | 1 | 1 | 58.1 | 3.4 |
| SZSMF48AT1G | MX | 48 | 53.30 | 56.10 | 58.90 | 1 | 1 | 77.4 | 2.6 |
| SZSMF58AT1G | NG | 58 | 64.40 | 67.80 | 71.20 | 1 | 1 | 93.6 | 2.1 |

- A transient suppressor is normally selected according to the Working Peak Reverse Voltage (V_{RWM}) which should be equal to or greater than the DC or continuous peak operating voltage level.
- V_{BR} measured at pulse test current I_T at ambient temperature of 25°C .
- Surge current waveform per Figure 2 and derate per Figure 3.

I-V Curve Characteristics ($T_A = 25^\circ\text{C}$ unless otherwise noted, $V_F = 3.5$ V Max. @ I_F (Note 4) = 12 A)



| 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 |

Ratings and Characteristic Curves

Figure 1. Pulse Rating Curve

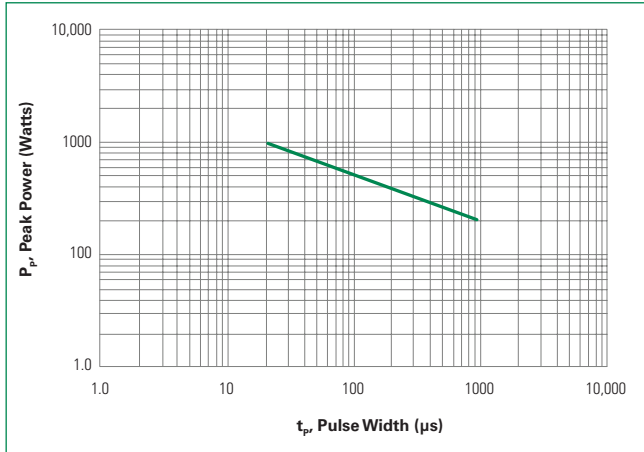


Figure 2. 10/1000 µs Pulse Waveform

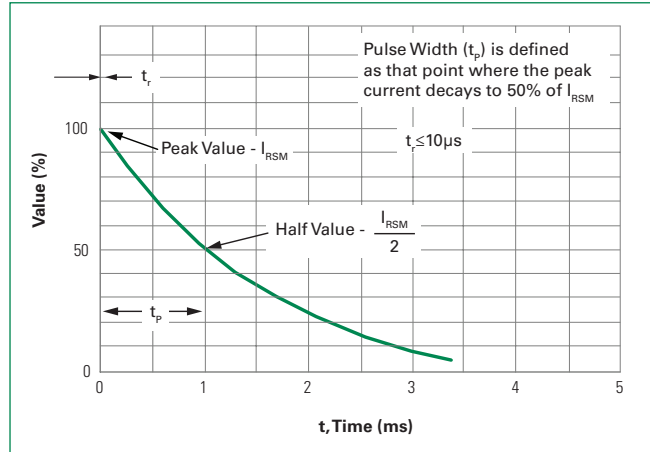


Figure 3. 8/20 µs Pulse Waveform

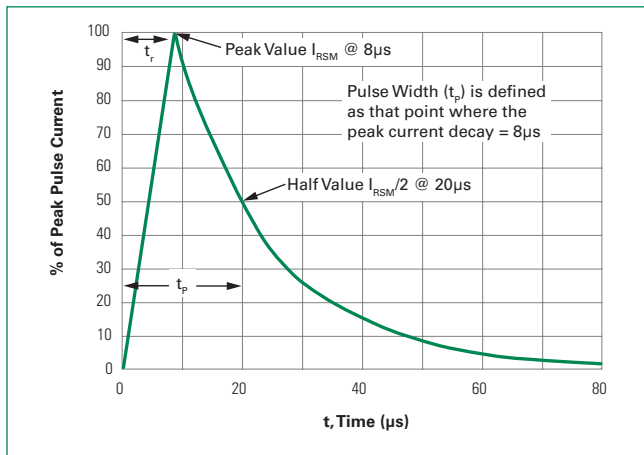


Figure 4. Surge Derating Curve

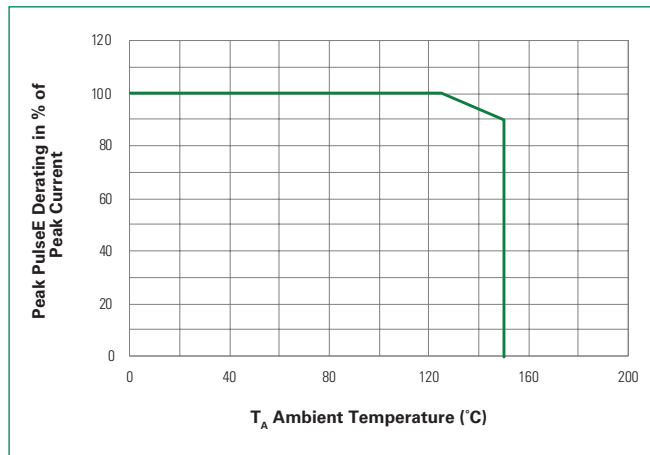


Figure 5. Typical Derating Factor for Duty Cycle

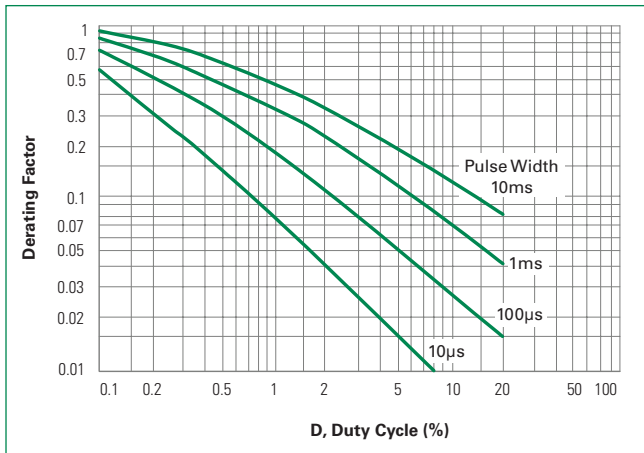


Figure 6. Steady State Power Derating

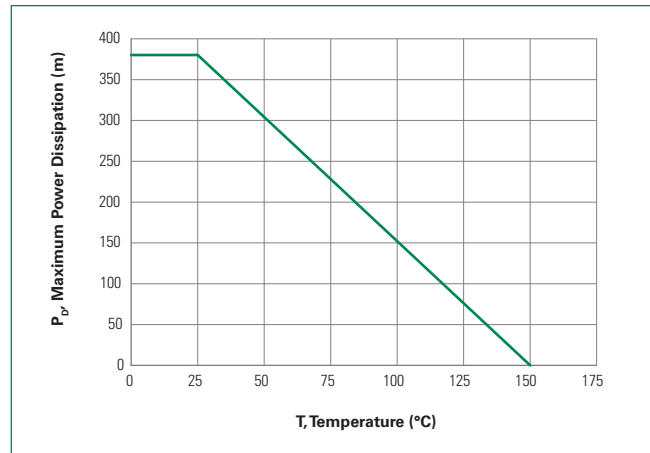


Figure 7. Forward Voltage

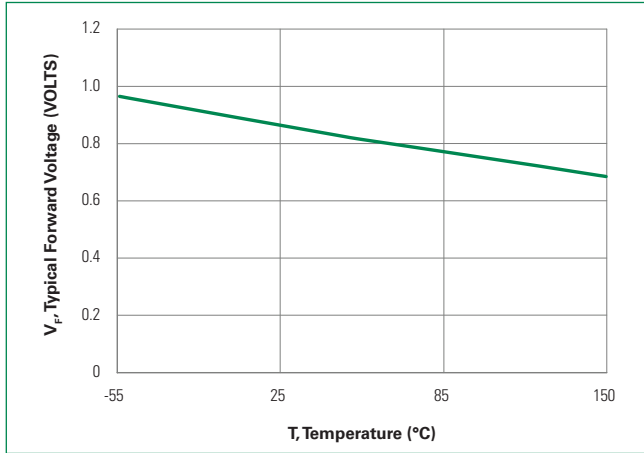
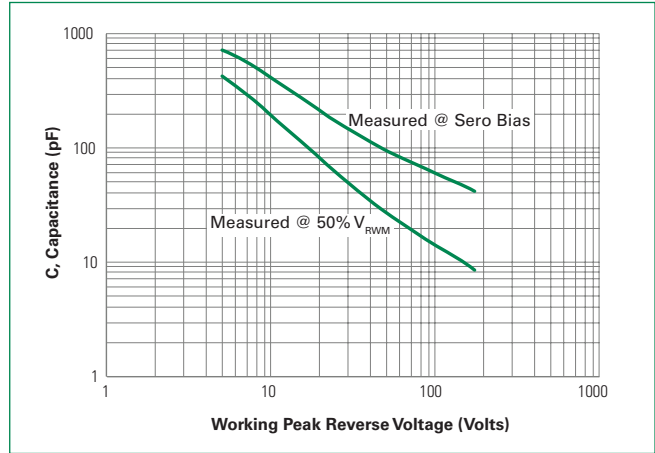
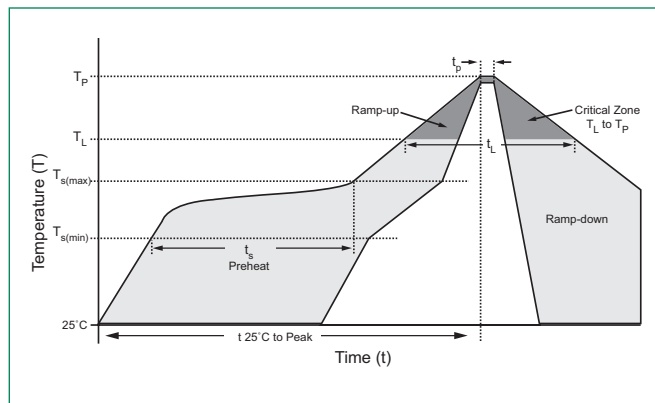


Figure 8. Capacitance vs. Working Peak Reverse Voltage



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_s) | 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 |



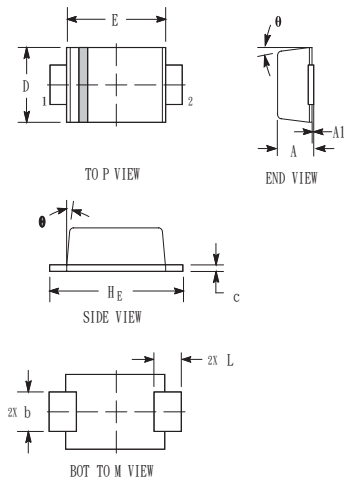
Physical Specifications

| | |
|-----------------|---|
| Weight | 0.004 ounce ,0.0116 grams |
| Case | JEDEC SOD-123FL. Void-free, transfer-molded, thermosetting plastic epoxy meets UL 94V-0 |
| Polarity | Color band denotes positive end (cathode) except Bidirectional. |
| Terminal | Matte Tin-plated leads, Solderable per JESD22-B102 |

Environmental Specifications

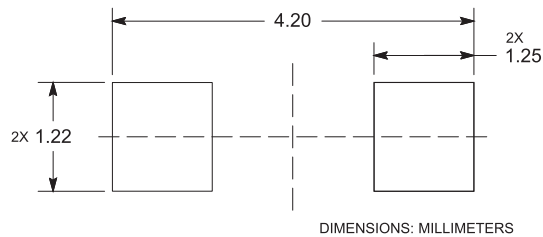
| | |
|----------------------------|--------------------------|
| High Temp. Storage | JESD22-A103 |
| HTRB | JESD22-A108 |
| Temperature Cycling | JESD22-A104 |
| MSL | JEDEC-J-STD-020, Level 1 |
| H3TRB | JESD22-A101 |
| RSH | JESD22-A111 |

Dimensions



| Dim | Millimeters | | | Inches | | |
|----------------|-------------|------|------|--------|-------|-------|
| | Min | Nom | Max | Min | Nom | Max |
| A | 0.90 | 0.95 | 0.98 | 0.035 | 0.037 | 0.039 |
| A1 | 0.00 | 0.05 | 0.10 | 0.000 | 0.002 | 0.004 |
| b | 0.70 | 0.90 | 1.10 | 0.028 | 0.035 | 0.043 |
| c | 0.10 | 0.15 | 0.20 | 0.004 | 0.006 | 0.008 |
| D | 1.50 | 1.65 | 1.80 | 0.059 | 0.065 | 0.071 |
| E | 2.50 | 2.70 | 2.90 | 0.098 | 0.106 | 0.114 |
| L | 0.55 | 0.75 | 0.95 | 0.022 | 0.030 | 0.037 |
| H _E | 3.40 | 3.60 | 3.80 | 0.134 | 0.142 | 0.150 |
| θ | 0° | - | 8° | 0° | - | 8° |

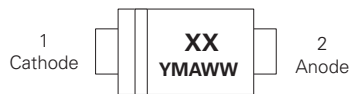
Soldering Footprint



Ordering Information

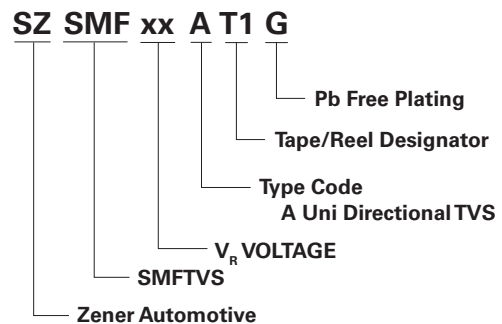
| Device | Package | Shipping |
|--------------|------------------------|------------------------|
| SZSMFxxxAT1G | SOD-123FL (Pb-Free) | 3,000 / Tape & Reel |

Part Marking System

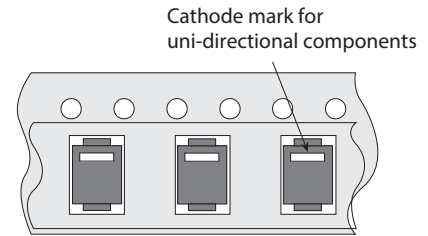
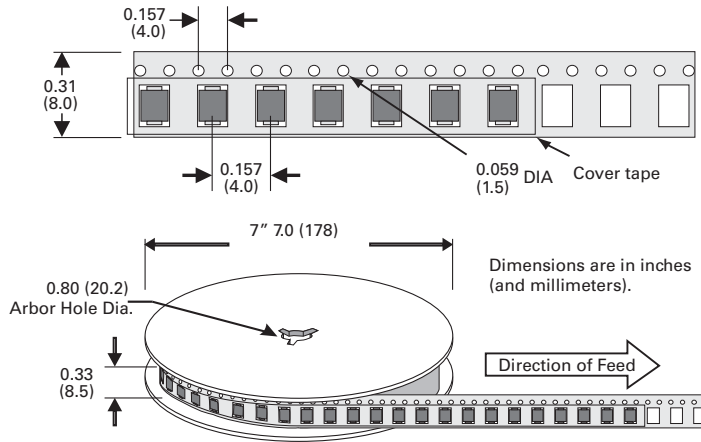


XX = Device Code
Y = Year
M = Month
A = Assembly Location
WW = Lot Code

Part Numbering System



Tape and Reel Specification



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