

# SM8S Series

## Surface Mount



### Agency Approvals

| Agency | Agency File Number |
|--------|--------------------|
|        | TBD                |

### Maximum Ratings and Thermal Characteristics ( $T_A=25^{\circ}\text{C}$ unless otherwise noted)

| Parameter                                                              | Symbol                | Value      | Unit                 |
|------------------------------------------------------------------------|-----------------------|------------|----------------------|
| Peak Pulse Power Dissipation by 10/1000 $\mu\text{s}$ test waveform    | $P_{\text{PPM}}$      | 7000       | W                    |
| Power dissipation on infinite heatsink at $T_C = 25^{\circ}\text{C}$   | $P_D$                 | 8.0        | W                    |
| Maximum Instantaneous Forward Voltage at 100 A for Unidirectional only | $V_F$                 | 1.8        | V                    |
| Peak forward surge current 8.3 ms single half sine-wave                | $I_{\text{FSM}}$      | 1000       | A                    |
| Operating Junction and Storage Temperature Range                       | $T_J, T_{\text{STG}}$ | -55 to 175 | $^{\circ}\text{C}$   |
| Typical Thermal Resistance Junction to Ambient                         | $R_{\theta\text{JA}}$ | 55         | $^{\circ}\text{C/W}$ |
| Typical Thermal Resistance Junction to case                            | $R_{\theta\text{JC}}$ | 0.9        | $^{\circ}\text{C/W}$ |

### Functional Diagram



## Description

The SM8S Series TVS Diode is housed in a SMT0-263 package with lead modifications. It is designed to protect sensitive electronics against lightning and inductive load switching voltage transient events.

## Features & Benefits

- 7000 W peak pulse power capability at 10/1000  $\mu\text{s}$  waveform, repetition rate (duty cycles): 0.01 %
- SMT0-263 low profile surface mount package minimizing PCB footprint and foot print is compatible to industrial popular DO-218AB package
- Typical failure mode is short from over-specified voltage or current
- Whisker test is conducted based on JEDEC JESD201A per its table 4a and 4c pass class 1/2
- IEC 61000-4-2 ESD 30kV(Air), 30kV (Contact)
- Glass passivated chip junction
- Low dynamic resistance
- $V_{\text{BR}} @ T_J = V_{\text{BR}} @ 25^{\circ}\text{C} \times (1 + \alpha T \times (T_J - 25))$  ( $\alpha$ : Temperature Coefficient, typical value is 0.1 %)
- Recognized compound meeting flammability rating UL94V-0
- Halogen free and RoHS compliant
- Pb-free E3 means 2<sup>nd</sup> level interconnect is Pb-free and the terminal finish material is tin (Sn) (IPC/JEDEC J-STD-609A.01)

## Applications

TVS components are ideal for the protection of I/O interfaces, VCC bus and other vulnerable circuits used in telecom, computer, industrial and consumer electronic applications.

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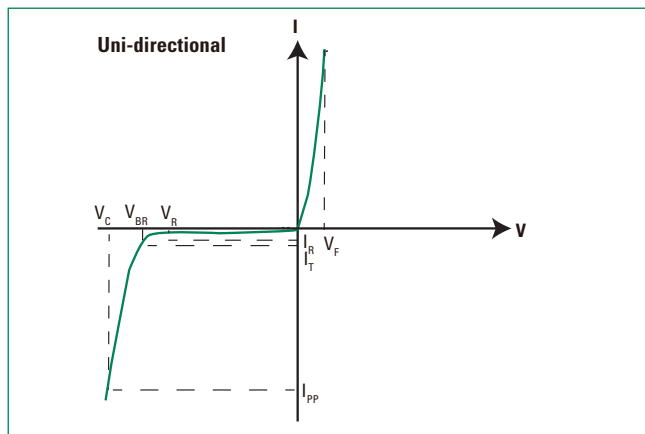
### Electrical Characteristics ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

| Part Number (Uni) | Marking | Breakdown Voltage $V_{BR}$ @ $I_T$ (V) |      | Test Current $I_T$ (mA) | Reverse Stand off Voltage $V_R$ (V) | Maximum Reverse Leakage $I_R$ @ $V_R$ ( $\mu\text{A}$ ) | $T_J = 150^\circ\text{C}$ Max. Reverse Leakage $I_R$ @ $V_R$ ( $\mu\text{A}$ ) | Maximum Peak Pulse Surge Current $I_{PP}$ (A) | Maximum Clamping Voltage $V_C$ @ $I_{PP}$ (V) | Agency Approval |
|-------------------|---------|----------------------------------------|------|-------------------------|-------------------------------------|---------------------------------------------------------|--------------------------------------------------------------------------------|-----------------------------------------------|-----------------------------------------------|-----------------|
|                   |         | Min                                    | Max  |                         |                                     |                                                         |                                                                                |                                               |                                               |                 |
| SM8S14A           | SM8S14A | 15.6                                   | 17.2 | 5.0                     | 14                                  | 10                                                      | 50                                                                             | 301                                           | 23.2                                          | -               |
| SM8S15A           | SM8S15A | 16.7                                   | 18.5 | 5.0                     | 15                                  | 10                                                      | 50                                                                             | 286                                           | 24.4                                          | -               |
| SM8S16A           | SM8S16A | 17.8                                   | 19.7 | 5.0                     | 16                                  | 2.0                                                     | 50                                                                             | 269                                           | 26.0                                          | -               |
| SM8S17A           | SM8S17A | 18.9                                   | 20.9 | 5.0                     | 17                                  | 2.0                                                     | 50                                                                             | 253                                           | 27.6                                          | -               |
| SM8S18A           | SM8S18A | 20.0                                   | 22.1 | 5.0                     | 18                                  | 2.0                                                     | 50                                                                             | 240                                           | 29.2                                          | -               |
| SM8S20A           | SM8S20A | 22.2                                   | 24.5 | 5.0                     | 20                                  | 2.0                                                     | 50                                                                             | 216                                           | 32.4                                          | -               |
| SM8S22A           | SM8S22A | 24.4                                   | 26.9 | 5.0                     | 22                                  | 2.0                                                     | 50                                                                             | 197                                           | 35.5                                          | -               |
| SM8S24A           | SM8S24A | 26.7                                   | 29.5 | 5.0                     | 24                                  | 2.0                                                     | 50                                                                             | 180                                           | 38.9                                          | -               |
| SM8S26A           | SM8S26A | 28.9                                   | 31.9 | 5.0                     | 26                                  | 2.0                                                     | 50                                                                             | 167                                           | 42.1                                          | -               |
| SM8S27A           | SM8S27A | 29.9                                   | 33.1 | 5.0                     | 27                                  | 2.0                                                     | 50                                                                             | 160                                           | 43.6                                          | -               |
| SM8S28A           | SM8S28A | 31.1                                   | 34.4 | 5.0                     | 28                                  | 2.0                                                     | 50                                                                             | 154                                           | 45.4                                          | -               |
| SM8S30A           | SM8S30A | 33.3                                   | 36.8 | 5.0                     | 30                                  | 2.0                                                     | 50                                                                             | 144                                           | 48.4                                          | -               |
| SM8S33A           | SM8S33A | 36.7                                   | 40.6 | 5.0                     | 33                                  | 2.0                                                     | 50                                                                             | 132                                           | 53.3                                          | -               |
| SM8S36A           | SM8S36A | 40.0                                   | 44.2 | 5.0                     | 36                                  | 2.0                                                     | 50                                                                             | 121                                           | 58.1                                          | -               |
| SM8S40A           | SM8S40A | 44.4                                   | 49.1 | 5.0                     | 40                                  | 2.0                                                     | 50                                                                             | 108                                           | 64.5                                          | -               |
| SM8S43A           | SM8S43A | 47.8                                   | 52.8 | 5.0                     | 43                                  | 2.0                                                     | 50                                                                             | 101                                           | 69.4                                          | -               |
| SM8S45A           | SM8S45A | 50.0                                   | 55.3 | 5.0                     | 45                                  | 2.0                                                     | 50                                                                             | 96.3                                          | 72.7                                          | -               |
| SM8S48A           | SM8S48A | 53.3                                   | 58.9 | 5.0                     | 48                                  | 2.0                                                     | 50                                                                             | 89.7                                          | 77.4                                          | -               |
| SM8S51A           | SM8S51A | 56.7                                   | 62.7 | 5.0                     | 51                                  | 2.0                                                     | 50                                                                             | 85.0                                          | 82.4                                          | -               |
| SM8S57A           | SM8S57A | 63.8                                   | 69.9 | 5.0                     | 57                                  | 2.0                                                     | 50                                                                             | 75.5                                          | 92.7                                          | -               |
| SM8S60A           | SM8S60A | 66.7                                   | 73.7 | 5.0                     | 60                                  | 2.0                                                     | 50                                                                             | 72.3                                          | 96.8                                          | -               |
| SM8S64A           | SM8S64A | 71.1                                   | 78.6 | 5.0                     | 64                                  | 2.0                                                     | 50                                                                             | 68.0                                          | 103.0                                         | -               |

#### Notes:

Surge current waveform per 10/1000 exponential wave and derated per Fig. 5

### I-V Curve Characteristics



- $P_{PPM}$  Peak Pulse Power Dissipation ( $I_{PP} \times V_C$ )** - Max power dissipation
- $V_R$  Stand-off Voltage** - Maximum voltage that can be applied to the TVS without operation
- $V_{BR}$  Breakdown Voltage** - Maximum voltage that flows though the TVS at a specified test current ( $I_T$ )
- $V_C$  Clamping Voltage** - Peak voltage measured across the TVS at a specified  $I_{PPM}$  (peak impulse current)
- $I_R$  Reverse Leakage Current** - Current measured at  $V_R$
- $V_F$  Forward Voltage Drop for Uni-directional**

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Ratings and Characteristic Curves ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

Figure 1 - Peak Pulse Power Rating Curve

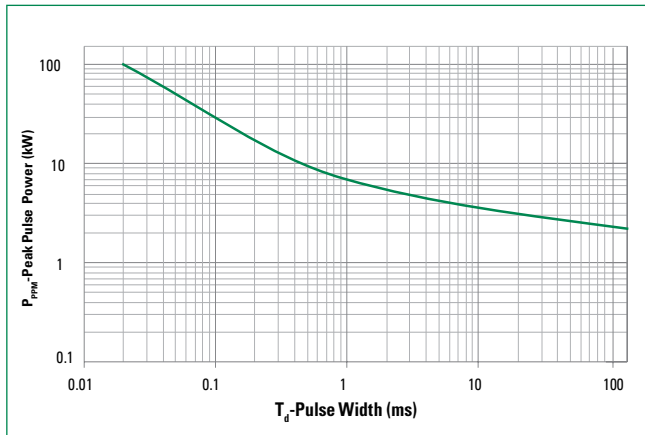


Figure 2 - Peak Pulse Power Derating Curve

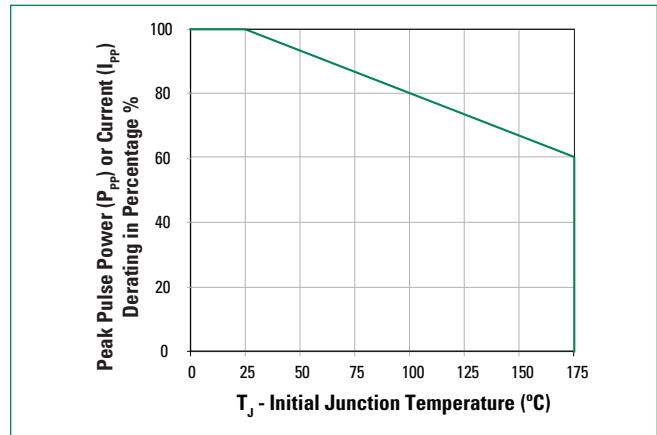


Figure 3 - Typical Transient Thermal Impedance

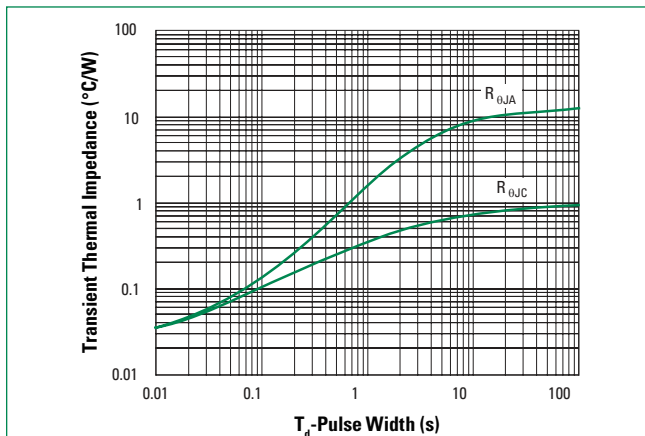


Figure 4 - Typical Junction Capacitance

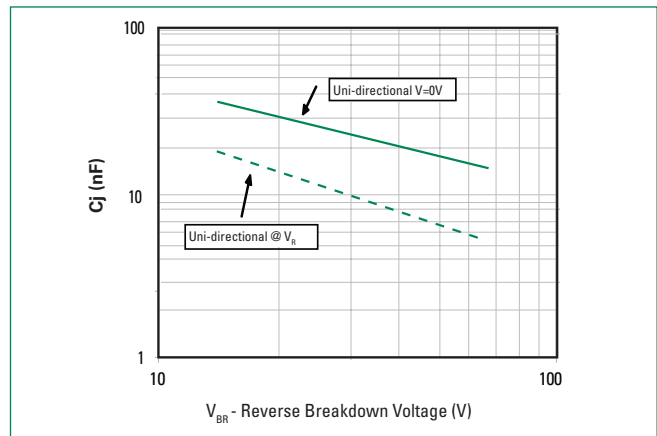
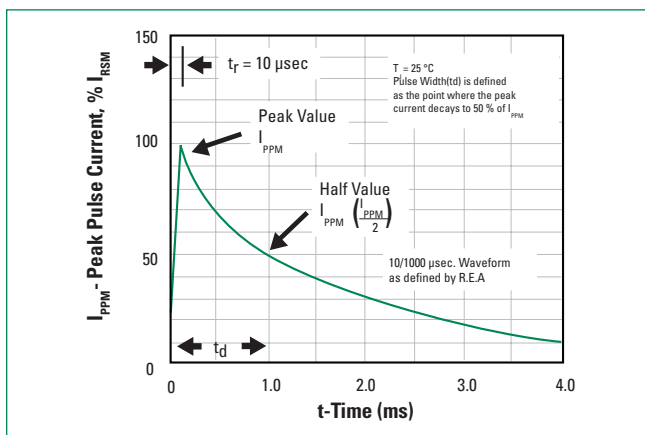


Figure 5: 10/1000  $\mu\text{s}$  Pulse Waveform

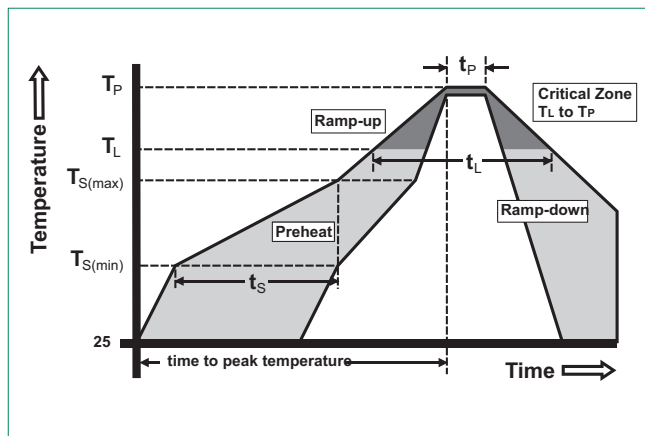


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### Soldering Parameters

|                                                                        |                                    |                         |
|------------------------------------------------------------------------|------------------------------------|-------------------------|
| <b>Reflow Condition</b>                                                |                                    | Pb – free assembly      |
| <b>Pre Heat</b>                                                        | - Temperature Min ( $T_{s(min)}$ ) | 150 °C                  |
|                                                                        | - Temperature Max ( $T_{s(max)}$ ) | 200 °C                  |
|                                                                        | - Time (min to max) ( $t_p$ )      | 60 – 120 seconds        |
| <b>Average Ramp Up Rate (Liquidus Temp) (<math>T_L</math>) to Peak</b> |                                    | 5 °C/second max         |
| <b><math>T_{s(max)}</math> to <math>T_L</math> - Ramp-up Rate</b>      |                                    | 5 °C/second max         |
| <b>Reflow</b>                                                          | - Temperature ( $T_L$ ) (Liquidus) | 217 °C                  |
|                                                                        | - Time (min to max) ( $T_{s_i}$ )  | 60 – 150 seconds        |
| <b>Peak Temperature (<math>T_p</math>)</b>                             |                                    | 260 <sup>+0/-5</sup> °C |
| <b>Time Within 5°C of Actual Peak Temperature (<math>t_p</math>)</b>   |                                    | 30 seconds              |
| <b>Ramp-down Rate</b>                                                  |                                    | 5 °C/second max         |
| <b>Time 25°C to Peak Temperature (<math>T_p</math>)</b>                |                                    | 8 minutes max           |
| <b>Do Not Exceed</b>                                                   |                                    | 260 °C                  |



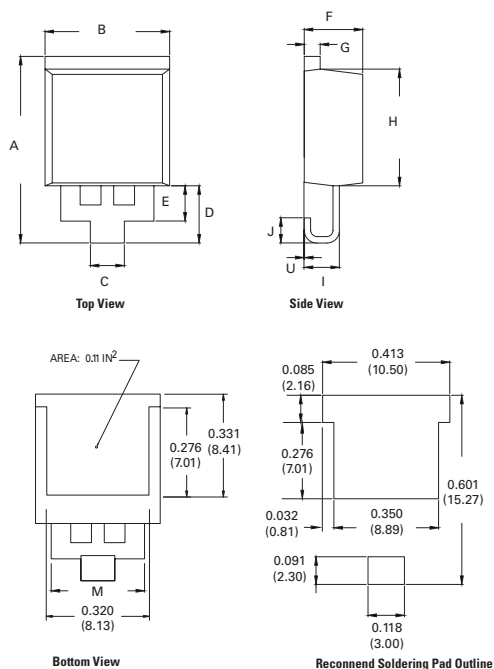
### Environmental Specifications

|                                           |                                                                                                                      |
|-------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| <b>High Temp Voltage Blocking (HTRB)</b>  | 100 % DC reverse voltage rated 150°C, 1008 hrs. JEDEC, JESD22-A-108                                                  |
| <b>Biased Temp &amp; Humidity (H3TRB)</b> | 1008 hours at $T_A = 85$ °C/85 % RH with part reverse biased at 80 % of rated breakdown voltage. JEDEC, JESD22-A-101 |
| <b>UAHST</b>                              | 96 hours at $T_A = 130$ °C/85 % RH. JEDEC, JESD22-A-118                                                              |
| <b>Temp Cycle (TC)</b>                    | -55 °C to +150 °C, 15min. dwell, 1000 cycles. JEDEC, JESD22-A104                                                     |
| <b>Resistance to soldering heat (RSH)</b> | +260°C, 30 secs. JEDEC JESD22-A111                                                                                   |
| <b>Moisture Sensitivity Level (MSL)</b>   | 85 %RH, +85 °C, 168 hrs., 3 reflow cycles (+260 °C Peak). JEDEC-J-STD-020, Level 1                                   |

### Physical Specifications

|                 |                                                          |
|-----------------|----------------------------------------------------------|
| <b>Weight</b>   | Contact manufacturer                                     |
| <b>Case</b>     | SMT0-263 Molded component over glass passivated junction |
| <b>Polarity</b> | Uni-directional products are denoted with a cathode band |
| <b>Terminal</b> | Matte Tin-plated leads, Solderable per JESD22-B102       |

### Dimensions

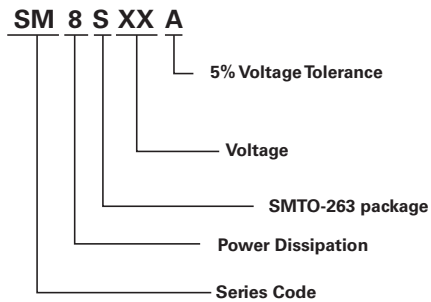


| Dimensions | Inches |       | Millimeters |       |
|------------|--------|-------|-------------|-------|
|            | Min    | Max   | Min         | Max   |
| <b>A</b>   | 0.568  | 0.600 | 14.44       | 15.24 |
| <b>B</b>   | 0.380  | 0.420 | 9.65        | 10.67 |
| <b>C</b>   | 0.098  | 0.114 | 2.50        | 2.90  |
| <b>D</b>   | 0.169  | 0.189 | 4.30        | 4.80  |
| <b>E</b>   | 0.102  | 0.118 | 2.60        | 3.00  |
| <b>F</b>   | 0.178  | 0.188 | 4.52        | 4.78  |
| <b>G</b>   | 0.045  | 0.060 | 1.14        | 1.52  |
| <b>H</b>   | 0.360  | 0.370 | 9.14        | 9.40  |
| <b>I</b>   | 0.106  | 0.122 | 2.69        | 3.09  |
| <b>J</b>   | 0.069  | 0.089 | 1.75        | 2.25  |
| <b>M</b>   | 0.284  | 0.300 | 7.22        | 7.62  |
| <b>U</b>   | 0      | 0.010 | 0           | 0.25  |

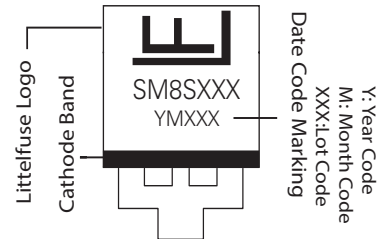
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### Part Numbering System



### Part Marking System

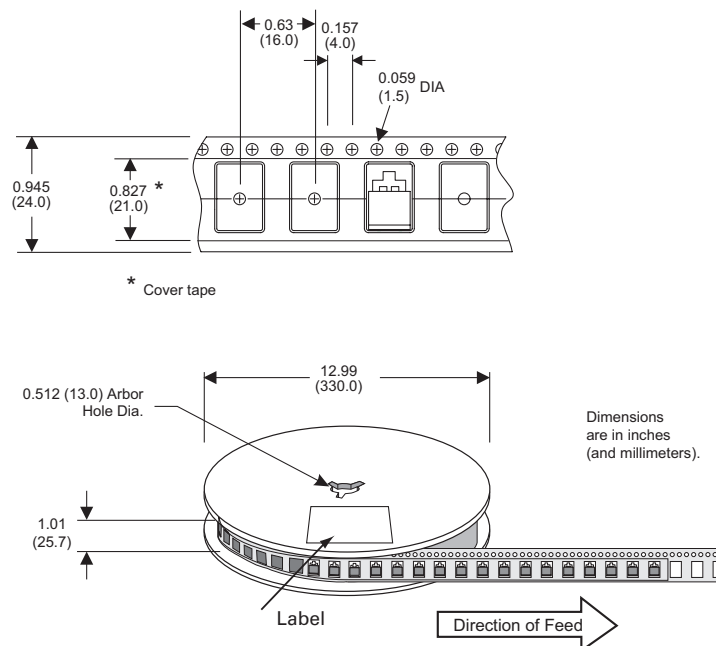


### Packaging

| Part Number | Component Package | Quantity | Packaging Option |
|-------------|-------------------|----------|------------------|
| SM8SxxA     | SMT0-263          | 500      | Embossed Carrier |

### SMT0-263 Embossed Carrier Reel Pack (RP) Specifications

Meets all EIA-481-2 Standards



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