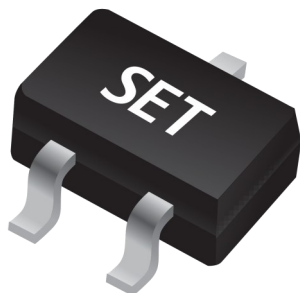


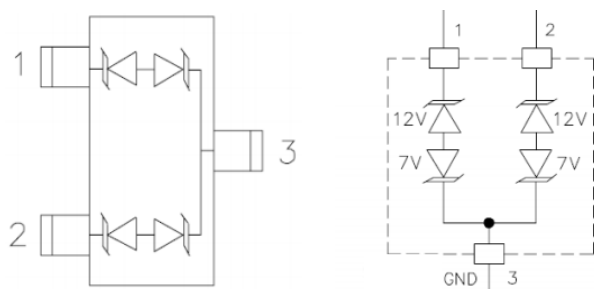
# ESD Protection Diodes

Asymmetrical Transient Voltage Protection for Extended Common-Mode RS-485

SD71217T23G SOT23



## Pinout and Functional Block Diagram



## Applications

- Protection of RS-485 transceivers with extended common-mode range
- Security systems
- Automatic Teller Machines
- HFC systems
- Networks

## Order Information

| Type        | Package | Marking Code | Delivery Form | Delivery Quantity |
|-------------|---------|--------------|---------------|-------------------|
| SD71217T23G | SOT23   | 712 or C72   | 7" T&R        | 3000 PCS          |

## Description

The SD71217T23G transient voltage suppressor (TVS) diode is designed for asymmetrical (12 V to -7 V) protection in multi-point data transmission standard RS-485 applications. SD71217T23G may be used to protect devices from transient voltages resulting from electrostatic discharge (ESD), electrical fast transients (FET), and lightning.

The SD71217T23G features 400 Watts ( $t_p=8 / 20 \mu s$ ) of power handling capability to accommodate the higher transient voltage levels which may be expected in extended common mode applications. This provides higher equipment reliability and eliminates the "guess work" required when using zener diodes that are not rated to handle such transient conditions. The integrated design aids in reducing voltage over-shoot associated with trace inductance. The low clamping voltage of the SD71217T23G minimizes the stress on the protected transceiver. The SOT-23 package allows flexibility in the design of "crowded" circuit boards.

## Features

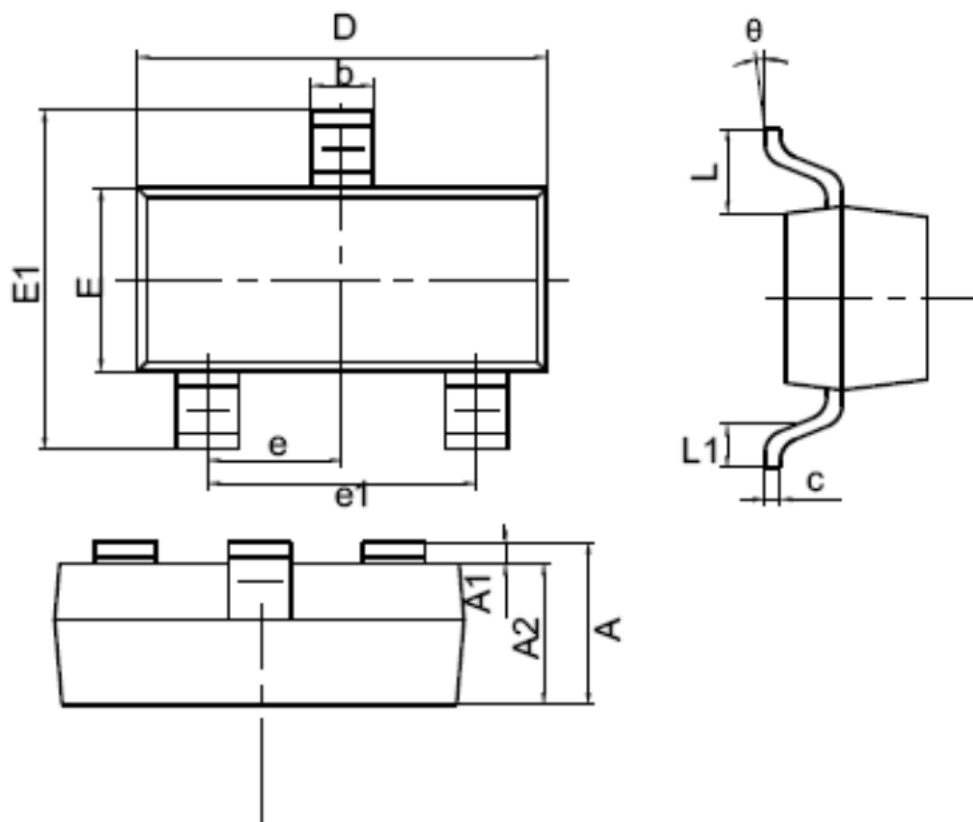
- Peak Power Dissipation: 400 W@8 / 20  $\mu s$
- Transient Protection for Asymmetrical Data Lines to
- IEC 61000-4-2 (ESD)  $\pm 30$  kV(Air),  $\pm 30$  kV(Contact)
- IEC 61000-4-4 (FET) 40 A (5 / 50 ns)
- IEC 61000-4-5 (Lightning) 12 A (8 / 20  $\mu s$ )
- Protects Two +12 V to -7 V Lines
- Low Clamping Voltage
- Low Leakage Current
- High Temperature Soldering Guaranteed: 260 °C / 10 sec
- High Temperature to Reflow Soldering Guaranteed: 260 °C / 10 sec
- MSL1
- Flammability Rating: UL 94 V-0
- Halogen Free and RoHS Compliant

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## Package Dimensions - SOT23



| Symbol | Millimeters |       | Inches     |       |
|--------|-------------|-------|------------|-------|
|        | Min.        | Max.  | Min.       | Max.  |
| A      | 0.900       | 1.150 | 0.035      | 0.045 |
| A1     | 0.000       | 0.100 | 0.000      | 0.004 |
| A2     | 0.900       | 1.050 | 0.035      | 0.041 |
| b      | 0.300       | 0.500 | 0.012      | 0.020 |
| c      | 0.080       | 0.150 | 0.003      | 0.006 |
| D      | 2.800       | 3.000 | 0.110      | 0.118 |
| E      | 1.200       | 1.400 | 0.047      | 0.055 |
| E1     | 2.250       | 2.550 | 0.089      | 0.100 |
| e      | 0.950 Ref.  |       | 0.037 Ref. |       |
| e1     | 1.800       | 2.000 | 0.071      | 0.079 |
| L      | 0.550 Ref.  |       | 0.022 Ref. |       |
| L1     | 0.300       | 0.500 | 0.012      | 0.020 |
| θ      | 0 °         | 8 °   | 0 °        | 8 °   |

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## Limiting Values

(T<sub>A</sub> = 25 °C, unless otherwise specified)

| Symbol           | Parameter                       | Conditions                       | Min | Max | Unit |
|------------------|---------------------------------|----------------------------------|-----|-----|------|
| V <sub>ESD</sub> | Electrostatic Discharge Voltage | IEC 61000-4-2; Contact Discharge | -   | 30  | kV   |
|                  |                                 | IEC 61000-4-2; Air Discharge     | -   | 30  | kV   |
| P <sub>PP</sub>  | Peak Pulse Power (8 / 20 μs)    | -                                | -   | 400 | W    |
| T <sub>A</sub>   | Operating Temperature Range     | -                                | -55 | 150 | °C   |
| T <sub>stg</sub> | Storage Temperature Range       | -                                | -55 | 150 | °C   |

## Electrical Characteristics

(T<sub>A</sub> = 25 °C, unless otherwise specified)

| Symbol           | Parameter                 | Test Conditions                                    | Pin 1 to 3 and Pin 2 to 3 (12 V TVS) |     |     | Pin 3 to 1 and Pin 3 to 2 (7 V TVS) |     |     | Unit |
|------------------|---------------------------|----------------------------------------------------|--------------------------------------|-----|-----|-------------------------------------|-----|-----|------|
|                  |                           |                                                    | Min                                  | Typ | Max | Min                                 | Typ | Max |      |
| V <sub>RWM</sub> | Reverse Working Voltage   | Pin 3 to 1 or Pin 2 to 1                           | -                                    | -   | 12  | -                                   | -   | 7   | V    |
| V <sub>BR</sub>  | Reverse Breakdown Voltage | I <sub>T</sub> = 1 mA                              | 13.3                                 | -   | -   | 7.5                                 | -   | -   | V    |
| I <sub>R</sub>   | Reverse Leakage Current   | V <sub>RWM</sub> = 12 V / 7 V                      | -                                    | -   | 1.0 | -                                   | -   | 20  | μA   |
| V <sub>C1</sub>  | Clamping Voltage 1        | I <sub>PP</sub> = 5 A, t <sub>p</sub> = 8 / 20 μs  | -                                    | -   | 20  | -                                   | -   | 12  | V    |
| V <sub>C2</sub>  | Clamping Voltage 2        | I <sub>PP</sub> = 17 A, t <sub>p</sub> = 8 / 20 μs | -                                    | -   | 26  | -                                   | -   | 16  | V    |
| C <sub>J1</sub>  | Junction Capacitance 1    | V <sub>R</sub> = 0 V, Measured at 1 MHz            | -                                    | -   | 75  | -                                   | -   | 75  | pF   |
| C <sub>J2</sub>  | Junction Capacitance 2    | V <sub>R</sub> = 7 / 12 V, Measured at 1 MHz       | -                                    | 28  | -   | -                                   | 42  | -   | pF   |

# ESD Protection Diodes

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## Performance Curve for Reference

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

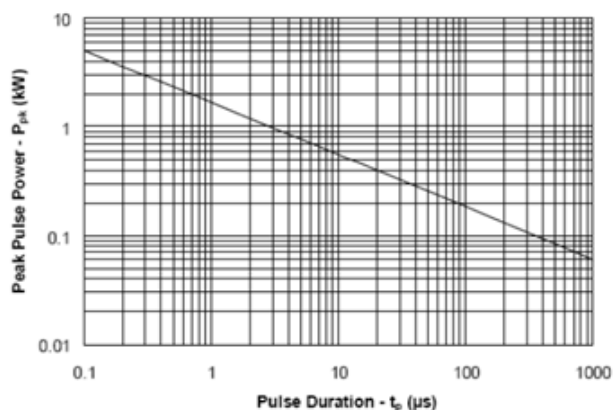


FIGURE 1

Non-Repetitive Peak Pulse Power VS. Pulse Time

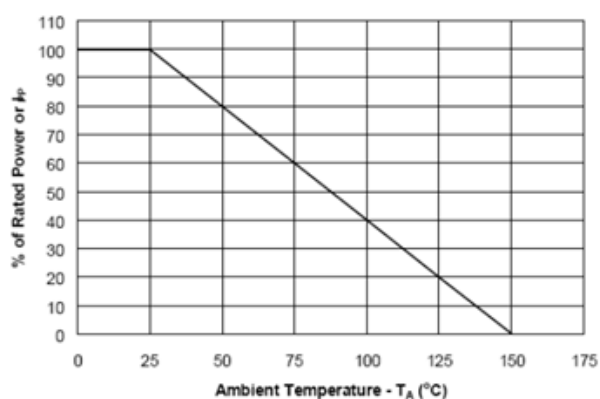


FIGURE 2

Power Derating Curve

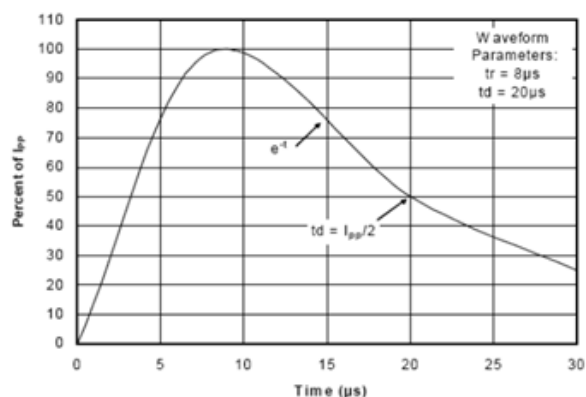


FIGURE 3

Pulse Waveform

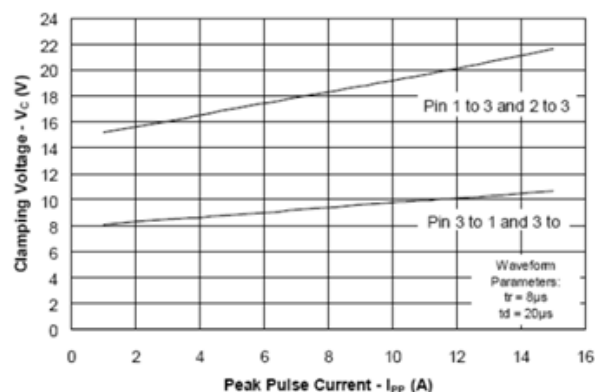


FIGURE 4

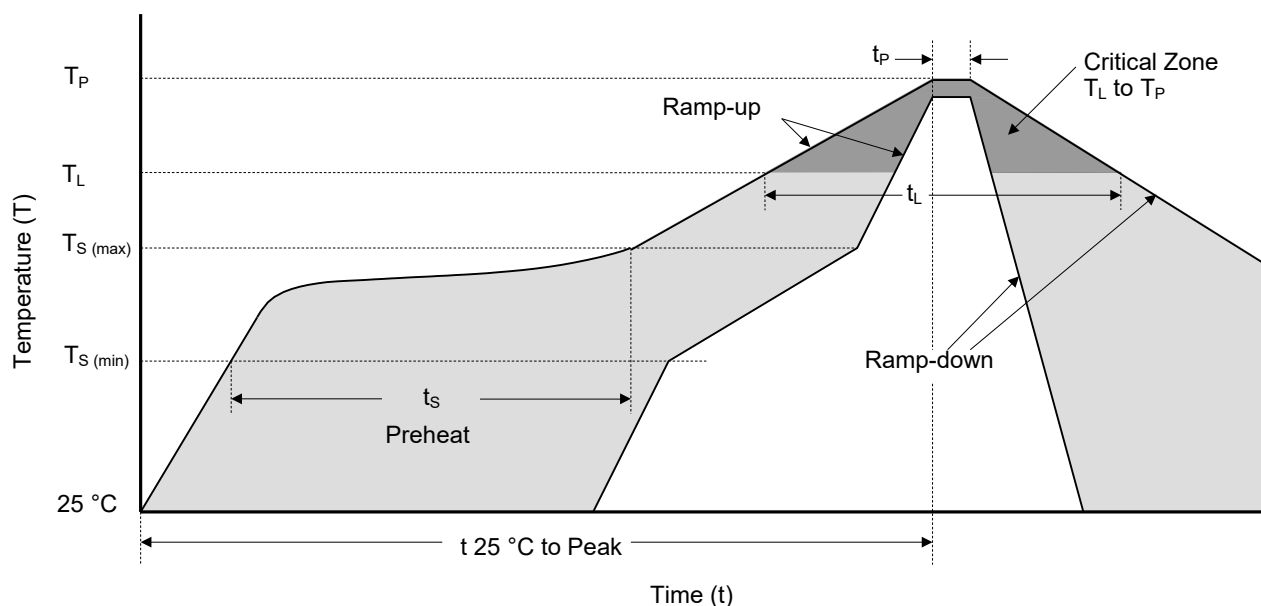
Clamping Voltage VS. Peak Pulse Current

# ESD Protection Diodes

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## Soldering Parameters



Reflowing Condition

| Reflow Soldering Parameters                              |                                  | 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 seconds        |
| 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 <sup>+0/-5</sup> °C |
| Time of within 5 °C of Actual Peak Temperature ( $t_P$ ) |                                  | 20 ~ 40 seconds         |
| Ramp-down Rate                                           |                                  | 6 °C / second max.      |
| Time from 25 °C to Peak Temperature                      |                                  | 8 Minutes max.          |
| Do Not Exceed                                            |                                  | 260 °C                  |



# ATTENTION

## Usage

1. TVS must be operated in the specified ambient temp.
2. Do not clean the TVS with strong polar solvent such as ketone, esters, benzene and halogenated hydrocarbon, to avoid damaging the encapsulating layer.
3. Please do not apply severe vibration, shock or pressure to TVS, to avoid element cracking.

## Replacement

1. If TVS is visually damaged, please replace it.
2. TVS is a non-repairable product. For safety sake, please use equivalent TVS for replacement.

## Storage

1. Storage Temp. Range: (-55 to 150) °C.
2. Do not store the TVS at the high temp., high humidity or corrosive gas environment, to avoid influencing the solder- ability of the lead wires. The product shall be used up within 1 year after receiving the goods.

## Environmental Conditions

1. TVS should not be exposed to the open air, nor direct sunshine.
2. TVS should avoid rain, water vapor or other condition of high temp. and high humidity.
3. TVS should avoid sand dust, salt mist, or other harmful gases.

## Max. Typical Capacitance of TVS

The typical capacitance of TVS is listed in the specifications. Designers may refer to it when designing TVS in High frequency circuit.

## Installation Mechanical Stress

1. Do not knock TVS when installing, to avoid mechanical damage.
2. Please do not apply severe vibration, shock or pressure to TVS, to avoid surface resin or element cracking.

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## Circuit Diagram

## Package Outline

|  |         |  |         |  |            |  |         |  |            |  |         |  |             |  |            |  |         |  |         |  |         |  |         |  |           |  |         |  |         |  |           |
|--|---------|--|---------|--|------------|--|---------|--|------------|--|---------|--|-------------|--|------------|--|---------|--|---------|--|---------|--|---------|--|-----------|--|---------|--|---------|--|-----------|
|  | DFN0603 |  | DFN1006 |  | DFN1006-3L |  | DFN1610 |  | DFN2020-3L |  | DFN2510 |  | DFN2626-10L |  | DFN3810-9L |  | SOD-923 |  | SOD-523 |  | SOD-323 |  | SOD-123 |  | SOT-23-6L |  | SOT-363 |  | SOT-143 |  | SOT-23-6L |
|  | 1CH/UNI |  | 1CH/BI  |  | 2CH/UNI    |  | 2CH/BI  |  | 1CH/UNI    |  | 1CH/BI  |  | 2CH/UNI     |  | 2CH/BI     |  | 1CH/UNI |  | 2CH/UNI |  | 4CH/UNI |  | 4CH/UNI |  | 8CH/UNI   |  | 8CH/UNI |  | 8CH/UNI |  |           |