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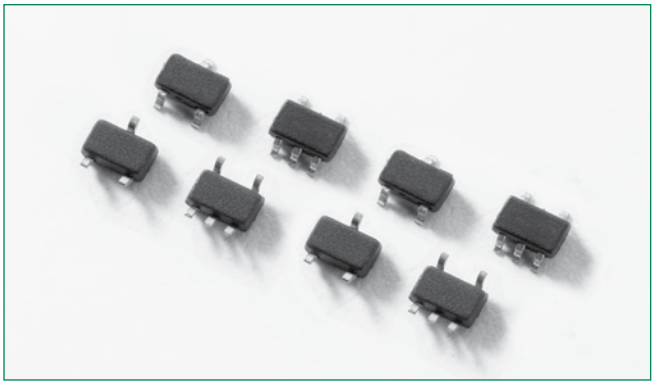
# TVS Diode Array

General Purpose ESD Protection - SP1002 Series

## SP1002 Series 5pF 8kV Bidirectional TVS Array

RoHS Pb GREEN

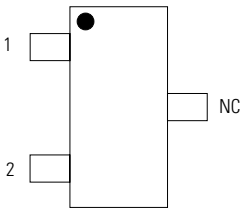


## Description

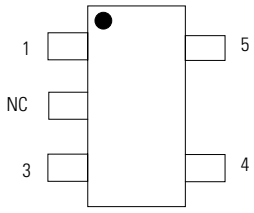
Back-to-Back Zener diodes fabricated in a proprietary silicon avalanche technology protect each I/O pin to provide a high level of protection for electronic equipment that may experience destructive electrostatic discharges (ESD). These robust diodes can safely absorb repetitive ESD strikes at the maximum level specified in the IEC 61000-4-2 international standard (Level 4, ±8kV contact discharge) without performance degradation. Their very low loading capacitance also makes them ideal for protecting high-speed signal pins.

## Pinout

SP1002-01JTG
(SC70-3)




SP1002-02JTG
(SC70-5)



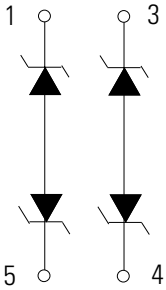

## Features

- Low capacitance of 5pF (TYP) I/O to I/O
- ESD protection of ±8kV contact discharge, ±15kV air discharge, (Level 4, IEC 61000-4-2)
- EFT protection, IEC 61000-4-4, 40A (5/50ns)
- Low leakage current of 0.5µA (MAX) at 5V
- Small package saves board space
- Lightning Protection, IEC 61000-4-5, 2nd edition 2A (8/20µs)
- RoHS compliant and lead free
- AEC-Q101 qualified

## Functional Block Diagram

SP1002-01JTG

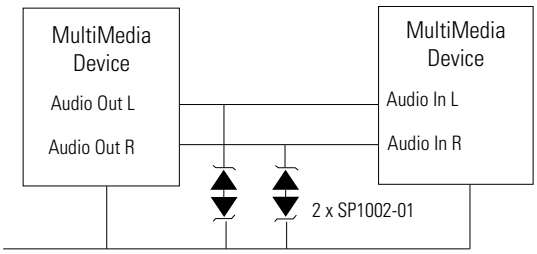
SP1002-02JTG




## Applications

- Computer Peripherals
- Mobile Phones
- Digital Cameras
- Desktops/Notebooks
- LCD/PDP TVs
- Set Top Boxes
- DVD Players
- MP3/PMP

## Application Example




SCART MultiMedia Application of SP1002-01

## Additional Information

**Datasheet** | **Resources** | **Samples**

Life Support Note:

**Not Intended for Use in Life Support or Life Saving Applications**

The products shown herein are not designed for use in life sustaining or life saving applications unless otherwise expressly indicated.

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## General Purpose ESD Protection - SP1002 Series

## Absolute Maximum Ratings

| Symbol | Parameter | Value | Units |
|---|---|---|---|
| $I_{PP}$ | Peak Current ($t_p$=8/20µs) | 2 | A |
| $T_{OP}$ | Operating Temperature | –40 to 125 | °C |
| $T_{STOR}$ | Storage Temperature | –55 to 150 | °C |

**CAUTION:** Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

## Thermal Information

| Parameter | Rating | Units |
|---|---|---|
| Storage Temperature Range | –55 to 150 | °C |
| Maximum Junction Temperature | 150 | °C |
| Maximum Lead Temperature (Soldering 20-40s) | 260 | °C |

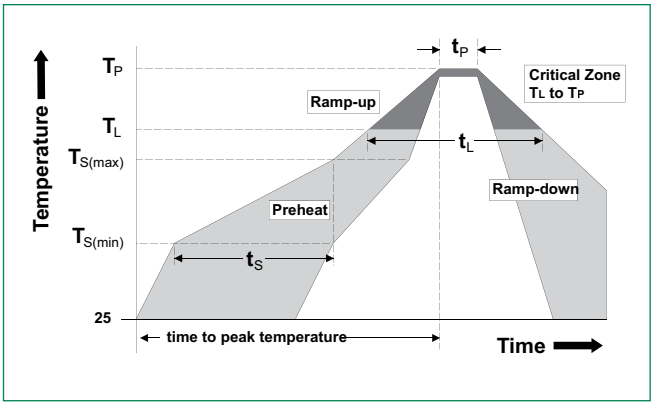
## Electrical Characteristics ($T_{OP}$ = 25°C)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| Voltage Drop | $V_D$ | $I_R$=1mA | 6.0 | | 9.5 | V |
| Reverse Standoff Voltage | $V_{RWM}$ | $I_R$≤1µA with 1 I/O at GND | | | 6.0 | V |
| Leakage Current | $I_{LEAK}$ | $V_R$=5V with I/O at GND | | | 0.5 | µA |
| Clamp Voltage[1] | $V_C$ | $I_{PP}$=1A, $t_p$=8/20µs, Fwd | | 9.2 | 13.0 | V |
| | | $I_{PP}$=2A, $t_p$=8/20µs, Fwd | | 11.2 | 16.0 | V |
| Dynamic Resistance | $R_{DYN}$ | $(V_{C2} - V_{C1}) / (I_{PP2} - I_{PP1})$ | | 2.0 | | Ω |
| ESD Withstand Voltage[1,2] | $V_{ESD}$ | IEC61000-4-2 (Contact) | ±8 | | | kV |
| | | IEC61000-4-2 (Air) | ±15 | | | kV |
| Diode Capacitance[1] | $C_D$ | Reverse Bias=0V | | 6 | | pF |
| | | Reverse Bias=2.5V | | 5 | | pF |
| | | Reverse Bias=5V | | 5 | | pF |

**Notes:**
[1] Parameter is guaranteed by device characterization
[2] A minimum of 1,000 ESD pulses are applied at 1s intervals

## Soldering Parameters

| | | |
|---|---|---|
| Reflow Condition | | Pb – 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 – 180 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 |
| | -Temperature ($t_L$) | 60 – 150 seconds |
| Peak Temperature ($T_P$) | | $260^{+0/-5}$ °C |
| Time within 5°C of actual peak Temperature ($t_p$) | | 20 – 40 seconds |
| Ramp-down Rate | | 6°C/second max |
| Time 25°C to peak Temperature ($T_P$) | | 8 minutes max. |
| Do not exceed | | 260°C |

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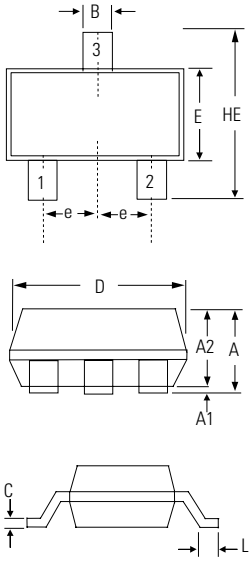
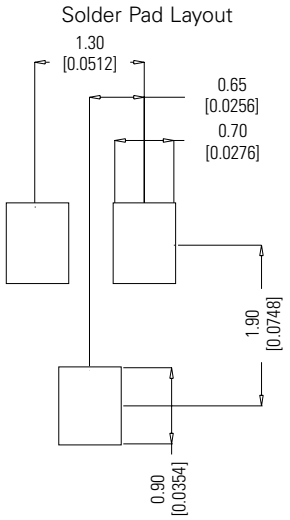
# TVS Diode Array

## General Purpose ESD Protection - SP1002 Series

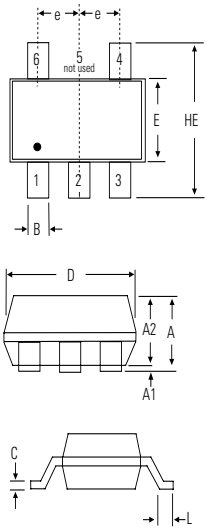
## Package Dimensions — SC70-3

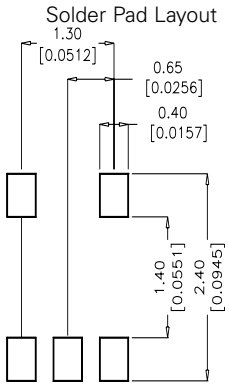



| Package | SC70-3 | | | |
|---|---|---|---|---|
| Pins | 3 | | | |
| JEDEC | MO-203 | | | |
| Symbol | Millimeters | | Inches | |
| | Min | Max | Min | Max |
| A | 0.80 | 1.10 | 0.031 | 0.043 |
| A1 | 0.00 | 0.10 | 0.000 | 0.004 |
| A2 | 0.70 | 1.00 | 0.028 | 0.039 |
| B | 0.15 | 0.30 | 0.006 | 0.012 |
| c | 0.08 | 0.25 | 0.003 | 0.010 |
| D | 1.85 | 2.25 | 0.073 | 0.089 |
| E | 1.15 | 1.35 | 0.045 | 0.053 |
| e | 0.66 BSC | | 0.026 BSC | |
| HE | 2.00 | 2.40 | 0.079 | 0.094 |
| L | 0.26 | 0.46 | 0.010 | 0.018 |

## Package Dimensions — SC70-5




| Package | SC70-5 | | | |
|---|---|---|---|---|
| Pins | 5 | | | |
| JEDEC | MO-203 | | | |
| Symbol | Millimeters | | Inches | |
| | Min | Max | Min | Max |
| A | 0.80 | 1.10 | 0.031 | 0.043 |
| A1 | 0.00 | 0.10 | 0.000 | 0.004 |
| A2 | 0.70 | 1.00 | 0.028 | 0.039 |
| B | 0.15 | 0.30 | 0.006 | 0.012 |
| c | 0.08 | 0.25 | 0.003 | 0.010 |
| D | 1.85 | 2.25 | 0.073 | 0.089 |
| E | 1.15 | 1.35 | 0.045 | 0.053 |
| e | 0.65 BSC | | 0.026 BSC | |
| HE | 2.00 | 2.40 | 0.079 | 0.094 |
| L | 0.26 | 0.46 | 0.010 | 0.018 |

## Product Characteristics

| | |
|---|---|
| **Lead Plating** | Matte Tin |
| **Lead Material** | Copper Alloy |
| **Lead Coplanarity** | 0.0004 inches (0.102mm) |
| **Substitute Material** | Silicon |
| **Body Material** | Molded Epoxy |
| **Flammability** | UL 94 V-0 |

**Notes :**
1. All dimensions are in millimeters
2. Dimensions include solder plating.
3. Dimensions are exclusive of mold flash & metal burr.
4. Blo is facing up for mold and facing down for trim/form, i.e. reverse trim/form.
5. Package surface matte finish VDI 11-13.

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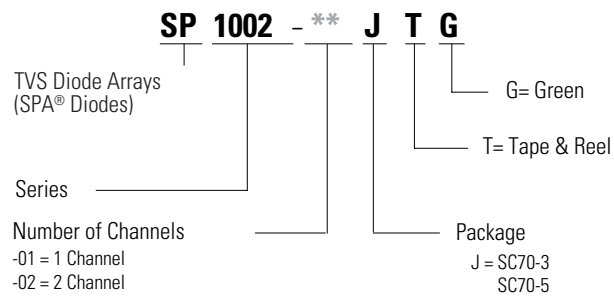
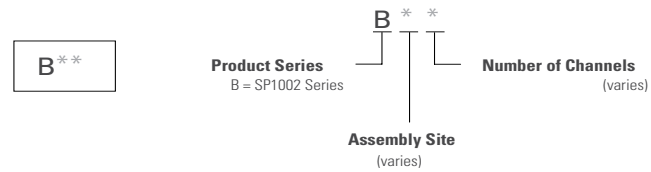
## Part Numbering System



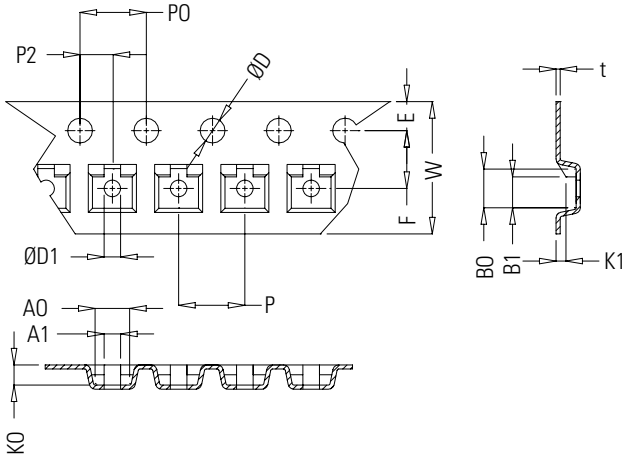

## Part Marking System




## Ordering Information

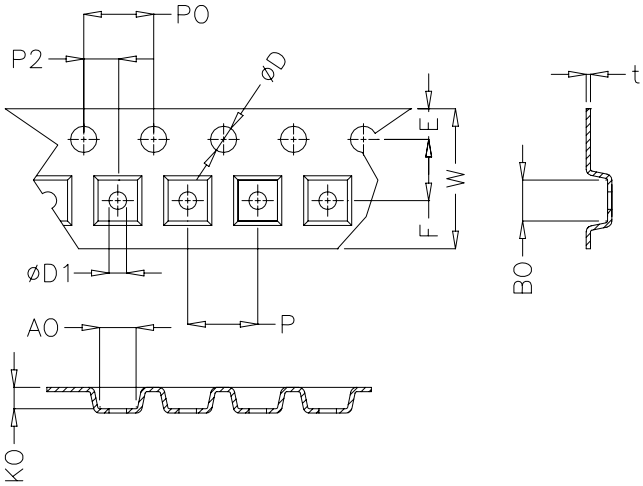
| Part Number | Package | Marking | Min. Order Qty. |
|---|---|---|---|
| SP1002-01JTG | SC70-3 | B*1 | 3000 |
| SP1002-02JTG | SC70-5 | B*2 | 3000 |

## Embossed Carrier Tape & Reel Specification — SC70-3




| Symbol | Millimetres | | Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| **E** | 1.65 | 1.85 | 0.065 | 0.073 |
| **F** | 3.45 | 3.55 | 0.135 | 0.139 |
| **P2** | 1.95 | 2.05 | 0.077 | 0.081 |
| **D** | 1.40 | 1.60 | 0.055 | 0.063 |
| **D1** | 1.00 | 1.25 | 0.039 | 0.049 |
| **P0** | 3.90 | 4.10 | 0.154 | 0.161 |
| **10P0** | 40.0 ± 0.20 | | 1.574 ± 0.008 | |
| **W** | 7.70 | 8.10 | 0.303 | 0.318 |
| **P** | 3.90 | 4.10 | 0.153 | 0.161 |
| **A0** | 2.30 | 2.50 | 0.090 | 0.098 |
| **A1** | 1.00 Ref | | 0.039 Ref | |
| **B0** | 2.30 | 2.50 | 0.090 | 0.098 |
| **B1** | 1.90 Ref | | 0.074 | |
| **K0** | 1.10 | 1.30 | 0.043 | 0.051 |
| **K1** | 0.60 Ref | | 0.023 Ref | |
| **t** | 0.27 max | | 0.010 | |

## Embossed Carrier Tape & Reel Specification — SC70-5 and SC70-6




| Symbol | Millimetres | | Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| **E** | 1.65 | 1.85 | 0.065 | 0.073 |
| **F** | 3.45 | 3.55 | 0.135 | 0.139 |
| **P2** | 1.95 | 2.05 | 0.077 | 0.081 |
| **D** | 1.40 | 1.60 | 0.055 | 0.063 |
| **D1** | 1.00 | 1.25 | 0.039 | 0.049 |
| **P0** | 3.90 | 4.10 | 0.154 | 0.161 |
| **10P0** | 40.0 ± 0.20 | | 1.574 ± 0.008 | |
| **W** | 7.70 | 8.10 | 0.303 | 0.318 |
| **P** | 3.90 | 4.10 | 0.153 | 0.161 |
| **A0** | 2.14 | 2.34 | 0.084 | 0.092 |
| **B0** | 2.24 | 2.44 | 0.088 | 0.096 |
| **K0** | 1.12 | 1.32 | 0.044 | 0.052 |
| **t** | 0.27 max | | 0.010 max | |

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