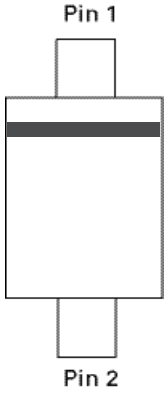
# SP4024 Series 1.3pF, 7A Discrete TVS Diode

AUTOMOTIVE GRADE | RoHS | Pb | GREEN

## Description

The SP4024 series integrates low capacitance steering diodes with one or two avalanche breakdown diodes for unidirectional or bidirectional protection, respectively, to protect against ESD and lightning induced surge events. These devices can safely absorb up to 7A per IEC 61000-4-5 2nd Edition ($t_p$=8/20µs) without performance degradation and a minimum ±30kV ESD per IEC 61000-4-2 International Standard. The low loading capacitance and high surge capability make it ideal for protecting telecommunication ports such as xDSL and other high voltage, high speed legacy interfaces.

## Pinout

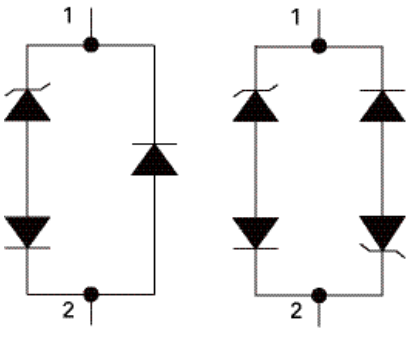



Cathode polarity for unidirectional only

## Features

- ESD, IEC 61000-4-2, ±30kV contact, ±30kV air
- EFT, IEC 61000-4-4, 40A (5/50ns)
- Lightning, IEC 61000-4-5 2nd Edition, 7A ($t_p$=8/20µs)
- Low capacitance of 1.3pF (@ $V_R$=0V)
- Low leakage current
- Unidirectional and Bidirectional configuration
- Small SOD323 package fits 0805 footprints
- AEC-Q101 qualified
- Halogen free, Lead free, and RoHS Compliant
- Moisture Sensitivity Level (MSL-1)

## Functional Block Diagram




Unidirectional
SP4024-01FTG

Bidirectional
SP4024-01FTG-C

## Applications

- xDSL Interfaces
- RS-232
- RS-485
- Power Ports
- Security Equipment
- Instrumentation
- Medical Equipment
- Computers and Peripherals

## 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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## Absolute Maximum Ratings

| Symbol | Parameter | Value | Units |
|---|---|---|---|
| $I_{PP}$ | Peak Current ($t_p$=8/20µs) | 7 | A |
| $P_{Pk}$ | Peak Pulse Power ($t_p$=8/20µs) | 350 | W |
| $T_{OP}$ | Operating Temperature | -40 to 150 | °C |
| $T_{STOR}$ | Storage Temperature | -55 to 150 | °C |

Note:

*CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the component. 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.*

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

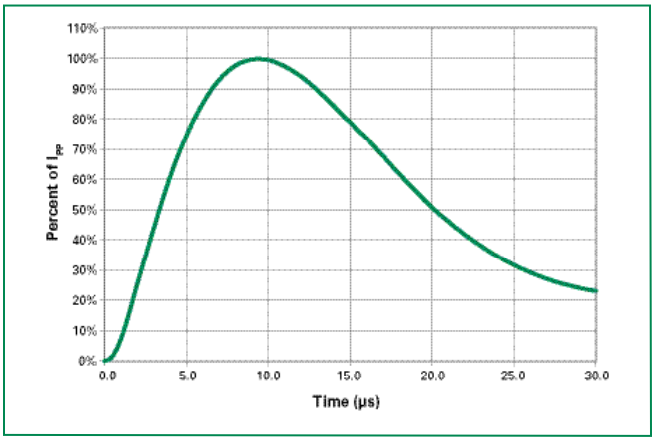
| Parameter | Symbol | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| Reverse Standoff Voltage | $V_{RWM}$ | $I_R$≤1µA with Pin 1 to Pin 2 | | | 24 | V |
| Breakdown Voltage | $V_{BD}$ | $I_T$=1mA with Pin 1 to Pin 2 | 26 | | | V |
| Leakage Current | $I_{LEAK}$ | $V_R$=24V with Pin 1 to Pin 2 | | | 0.5 | µA |
| Clamp Voltage[1] | $V_C$ | $I_{PP}$=1A, $t_p$=8/20µs, Fwd | | 34 | | V |
| | | $I_{PP}$=2A, $t_p$=8/20µs, Fwd | | 36 | | V |
| | | $I_{PP}$=5A, $t_p$=8/20µs, Fwd | | 43 | | V |
| | | $I_{PP}$=7A, $t_p$=8/20µs, Fwd | | 48 | 50 | V |
| Dynamic Resistance[2] | $R_{DYN}$ | TLP $t_p$=100ns, Pin 1 to Pin 2 | | 0.7 | | Ω |
| ESD Withstand Voltage[1] | $V_{ESD}$ | IEC61000-4-2 (Contact Discharge) | ±30 | | | kV |
| | | IEC61000-4-2 (Air Discharge) | ±30 | | | kV |
| Diode Capacitance[1] | $C_D$ | Reverse Bias=0V, f=1MHz, Pin 1 to Pin 2 | | 1.3 | 2 | pF |

Note:

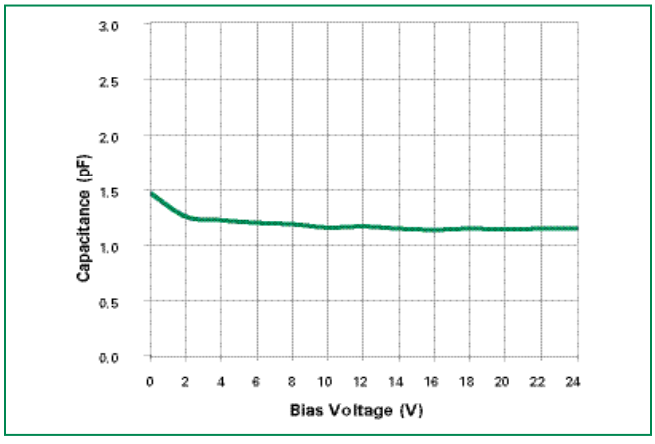
1Parameter is guaranteed by design and/or component characterization.

2 Transmission Line Pulse (TLP) test setting : Std.TDR(50Ω),tp=100ns, tr=0.2ns ITLP and VTLP averaging window: start1=70ns to end t2=80ns

## 8/20 µs Pulse Waveform




## Capacitance vs. Reverse Bias (Pin 1 to Pin 2)





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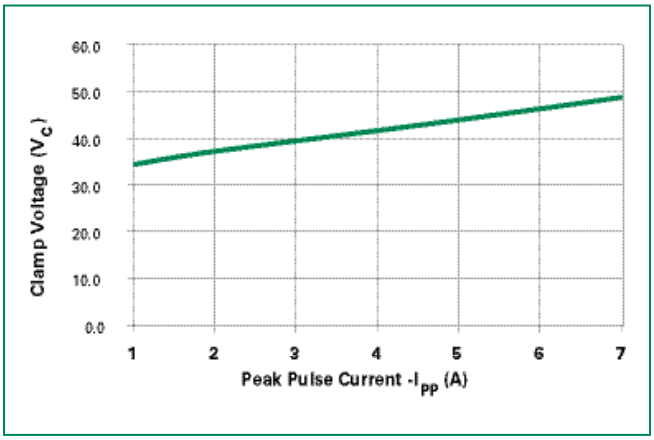
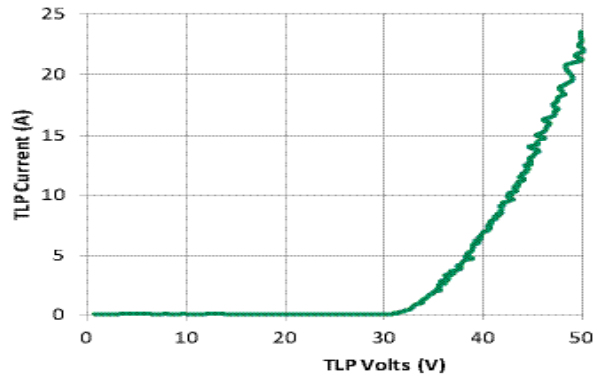
## Clamping Voltage vs. Peak Pulse Current (Pin 1 to Pin 2)

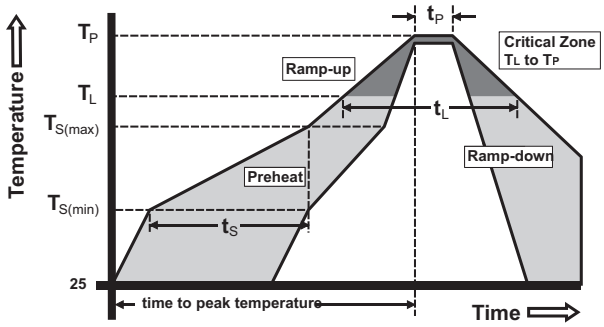



## Transmission Line Pulsing (TLP) Plot (Pin 1 to Pin2)




## 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 |




## Product Characteristics

| | |
|---|---|
| **Lead Plating** | Matte Tin |
| **Lead Material** | Copper Alloy |
| **Lead Coplanarity** | 0.0004 inches (0.102mm) |
| **Substrate material** | Silicon |
| **Body Material** | Molded Compound |
| **Flammability** | UL Recognized compound meeting flammability rating 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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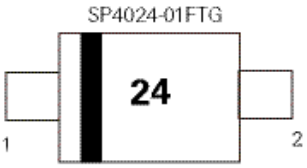
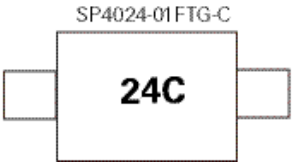
# TVS Diode Arrays (SPA® Diodes)

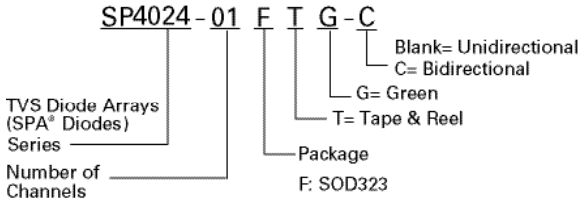
## Lightning Surge Protection- SP4024 Series

## Part Marking System



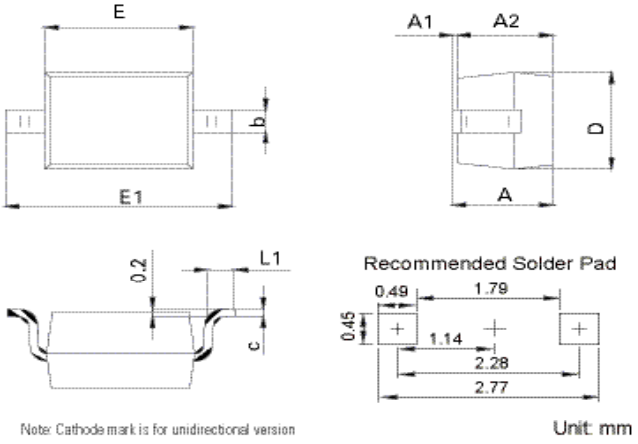

## Part Numbering System




## Ordering Information

| Part Number | Package | Marking | Min. Order Qty. |
|---|---|---|---|
| SP4024-01FTG | SOD323 | 24 | 3000 |
| SP4024-01FTG-C | SOD323 | 24C | 3000 |

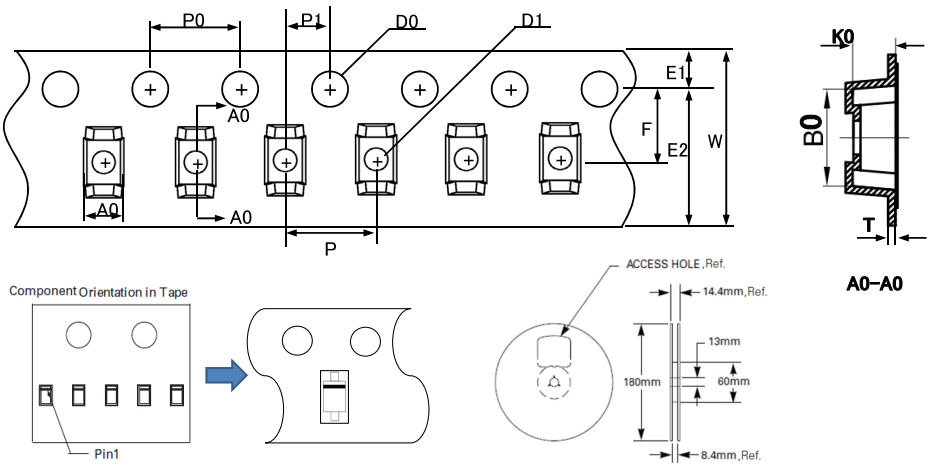
## Package Dimensions -SOD323




| Symbol | SOD323 | | | |
|---|---|---|---|---|
| | Millimeters | | Inches | |
| | Min | Max | Min | Max |
| **A** | 0.80 | 1.00 | 0.031 | 0.039 |
| **A1** | 0.00 | 0.10 | 0.000 | 0.004 |
| **A2** | 0.80 | 0.90 | 0.031 | 0.035 |
| **b** | 0.25 | 0.35 | 0.010 | 0.014 |
| **c** | 0.08 | 0.15 | 0.003 | 0.006 |
| **D** | 1.20 | 1.40 | 0.047 | 0.055 |
| **E** | 1.60 | 1.80 | 0.063 | 0.071 |
| **E1** | 2.50 | 2.75 | 0.098 | 0.108 |
| **L1** | 0.22 | 0.40 | 0.009 | 0.016 |

## Embossed Carrier Tape & Reel Specification — SOD323

| Symbol | Dimensions (mm) |
|---|---|
| **A0** | 1.46 +/– 0.1 |
| **B0** | 2.90 +/– 0.1 |
| **W** | 8.0 +0.3/– 0.10 |
| **D0** | 1.50 +0.1 |
| **D1** | 0.45~1.15 |
| **E1** | 1.75 +/– 0.10 |
| **E2** | – |
| **F** | 3.50 +/– 0.10 |
| **P0** | 4.0 +/– 0.10 |
| **P** | 4.0 +/– 0.10 |
| **P1** | 2.0 +/– 0.05 |
| **K0** | 1.25 +/– 0.1 |
| **T** | 0.254 +/– 0.02 |





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