

SP4023 Series 1.3pF, 12A Discrete TVS Diode



Description

The SP4023 Series integrate 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 components can safely absorb up to 12A per IEC 61000-4-5 2ND Edition ($t_p=8/20\mu s$) without performance degradation and a minimum $\pm 30kV$ 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

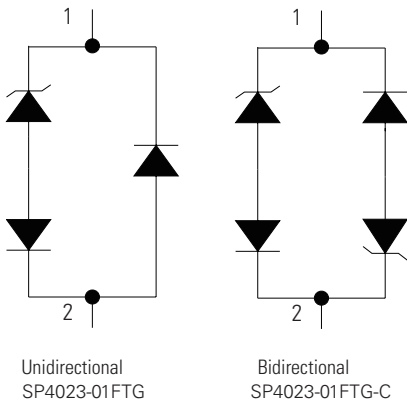


Cathode polarity for unidirectional only

Features

- ESD, IEC 61000-4-2, $\pm 30kV$ contact, $\pm 30kV$ air
- EFT, IEC 61000-4-4, 40A (5/50ns)
- Lightning, 12A (8/20 μs as defined in IEC 61000-4-5 2nd edition)
- 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



Applications

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

Additional Information



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.

Absolute Maximum Ratings

| Symbol | Parameter | Value | Units |
|------------|--------------------------------------|------------|-------|
| I_{PP} | Peak Current ($t_p=8/20\mu s$) | 12 | A |
| P_{PK} | Peak Pulse Power ($t_p=8/20\mu s$) | 450 | W |
| T_{OP} | Operating Temperature | -40 to 150 | °C |
| T_{STOR} | Storage Temperature | -55 to 150 | °C |

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 component at these or any other conditions above those indicated in the operational sections of this specification is not implied.

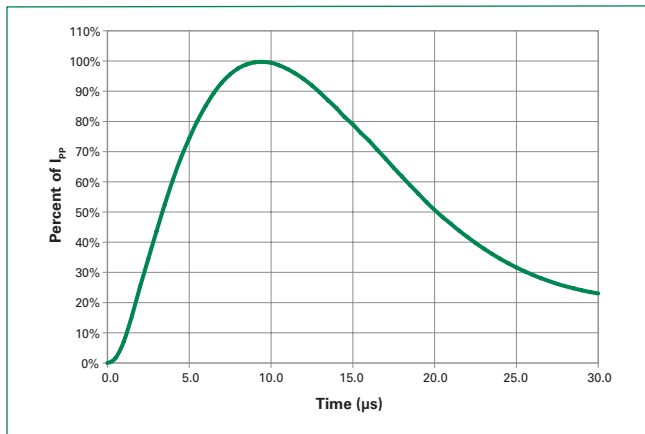
Electrical Characteristics ($T_{OP}=25^\circ C$)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Units |
|------------------------------------|------------|-----------------------------------|----------|------|-----|----------|
| Reverse Standoff Voltage | V_{RWM} | $I_R=1\mu A$ | | | 15 | V |
| Breakdown Voltage | V_{BR} | $I_R=1mA$ | 16 | | | V |
| Reverse Leakage Current | I_{LEAK} | $V_R=15V$ | | | 0.1 | μA |
| Clamp Voltage ¹ | V_C | $I_{PP}=1A, t_p=8/20\mu s$ | | 23 | | V |
| | | $I_{PP}=2A, t_p=8/20\mu s$ | | 24 | | V |
| | | $I_{PP}=10A, t_p=8/20\mu s$ | | 35 | | V |
| | | $I_{PP}=12A, t_p=8/20\mu s$ | | 37.5 | 40 | |
| Dynamic Resistance ² | R_{DYN} | TLP, $t_p=100ns, I/O$ to GND | | 0.55 | | Ω |
| ESD Withstand Voltage ¹ | V_{ESD} | IEC 61000-4-2 (Contact Discharge) | ± 30 | | | kV |
| | | IEC 61000-4-2 (Air Discharge) | ± 30 | | | kV |
| Diode Capacitance ¹ | C_D | Reverse Bias=0V, $f=1MHz$ | | 1.3 | 2 | pF |

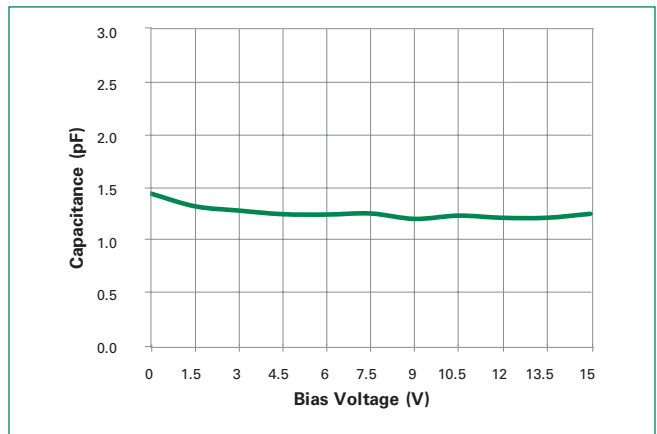
Note:

- Parameter is guaranteed by design and/or component characterization.
- Transmission Line Pulse (TLP) test setting : Std.TDR(50 Ω), $t_p=100ns, t_r=0.2ns$ ITLP and VTLP averaging window: start $t_1=70ns$ to end $t_2=80ns$

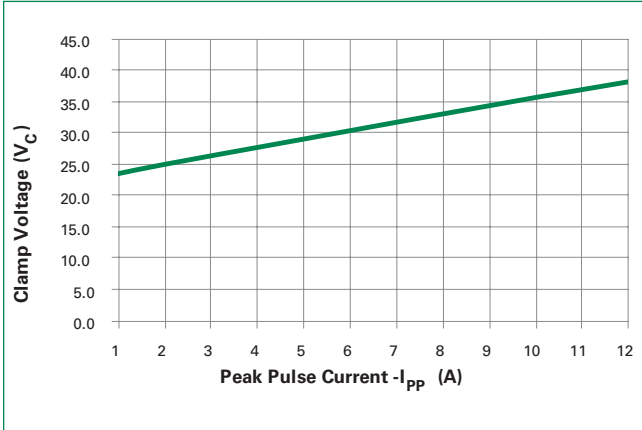
8/20 μs Pulse Waveform



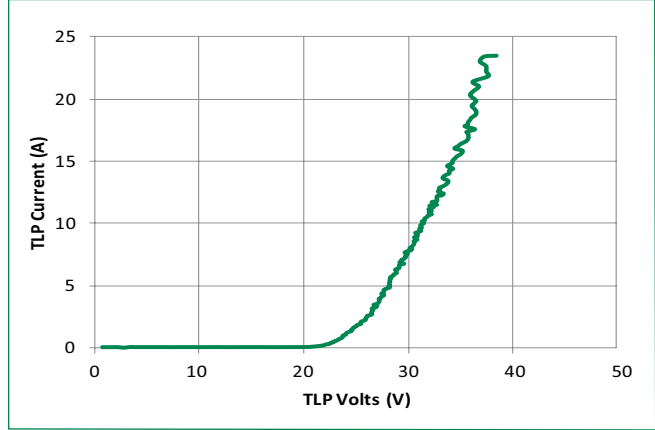
Capacitance vs. Reverse Bias



Clamping Voltage vs. Peak Pulse Current



Transmission Line Pulsing (TLP) Plot

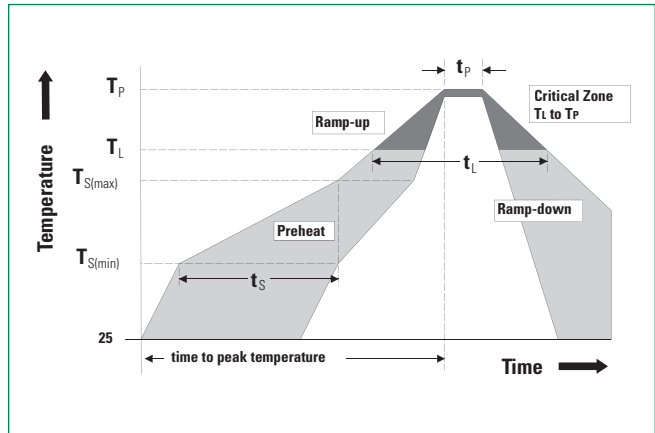


Soldering Parameters

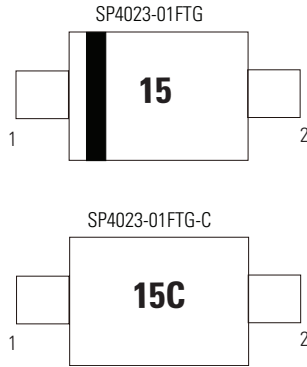
| | | |
|--|------------------------------------|-------------------------|
| Reflow Condition | | Pb – Free assembly |
| Pre Heat | - Temperature Min ($T_{s(min)}$) | 150°C |
| | - Temperature Max ($T_{s(max)}$) | 200°C |
| | - Time (min to max) (t_s) | 60 – 120 secs |
| Average ramp up rate (Liquidus) 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 |
| | - Temperature (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 |
| 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

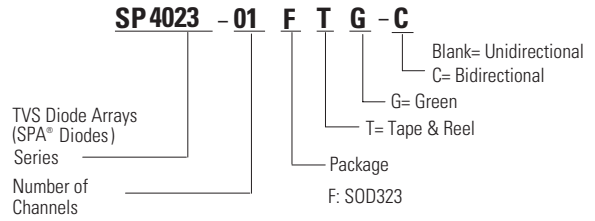
| | |
|---------------------------|--|
| Lead Plating | Matte Tin |
| Lead Material | Alloy 42 |
| Lead Coplanarity | 0.0004 inches (0.102mm) |
| Substrate Material | Silicon |
| Body Material | Molded Compound |
| Flammability | UL Recognized compound meeting flammability rating V-0 |



Part Marking System



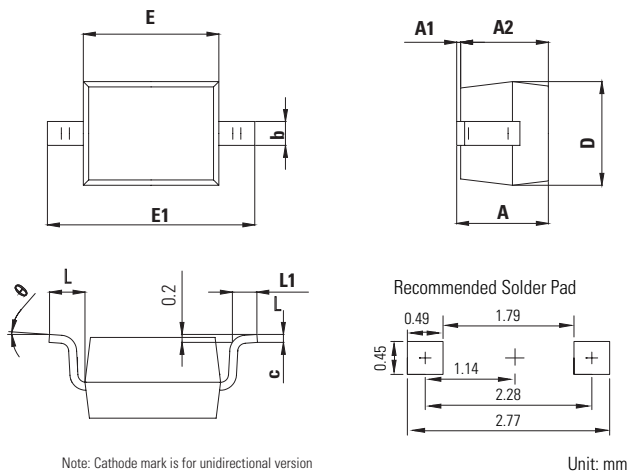
Part Numbering System



Ordering Information

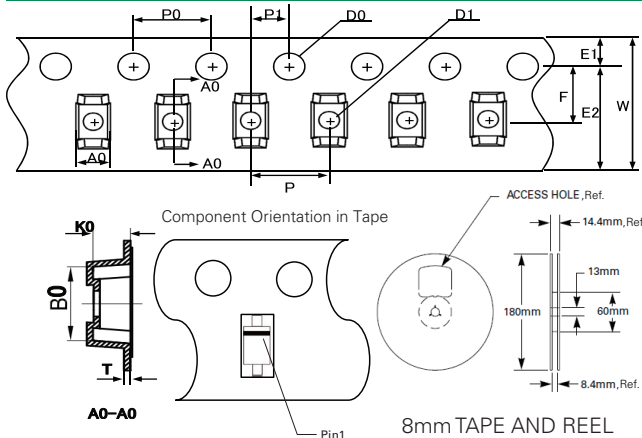
| Part Number | Package | Min. Order Qty. |
|----------------|---------|-----------------|
| SP4023-01FTG | SOD323 | 3000 |
| SP4023-01FTG-C | SOD323 | 3000 |

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 | 0.9 | 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 | 0.075 |
| E1 | 2.50 | 2.70 | 0.098 | 0.106 |
| L1 | 0.25 | 0.40 | 0.010 | 0.016 |

Embossed Carrier Tape & Reel Specification – SOD323



| Symbol | Millimeters |
|--------|-----------------|
| A0 | 1.46+/-0.10 |
| B0 | 2.90+/-0.10 |
| W | 8.0+0.3/-0.10 |
| D0 | 1.50+0.10 |
| D1 | 0.45min/1.15max |
| E1 | 1.75+/-0.10 |
| E2 | - |
| F | 3.50+/-0.10 |
| P0 | 4.00+/-0.10 |
| P | 4.00+/-0.10 |
| P1 | 2.00+/-0.05 |
| K0 | 1.25+/-0.10 |
| T | 0.254+/-0.02 |

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