# SP4020 Series 2.5pF, 30A Discrete TVS Diode

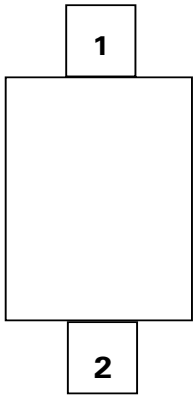
RoHS Pb GREEN



## Description

The SP4020 devices integrate low capacitance steering diodes with one or two zener diodes for unidirectional or bidirectional protection, respectively, to protect against ESD and lightning induced surge events. These devices can safely absorb up to 30A per IEC 61000-4-5 (tp=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 Ethernet and other high speed data interfaces.

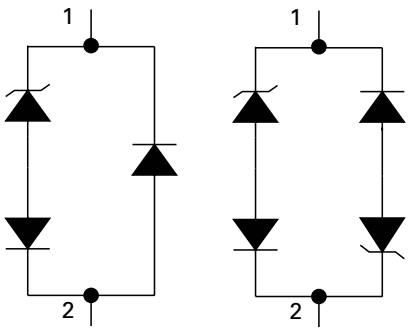
## Pinout




## Features

- ESD, IEC 61000-4-2, ±30kV contact, ±30kV air
- EFT, IEC 61000-4-4, 40A (5/50ns)
- Lightning, IEC 61000-4-5, 30A ($t_p$=8/20µs)
- Low capacitance of 2.5pF (@ $V_R$=0V)
- Low leakage current of 0.1µA at 3.3V
- Unidirectional and Bidirectional configuration
- Small SOD323 package fits 0805 footprints

## Functional Block Diagram




Unidirectional
SP4020-01FTG

Bidirectional
SP4020-01FTG-C

## Applications

- 10/100/1000 Ethernet
- T1/E1/T3/E3
- USB 1.1/2.0
- Power Ports
- Computers and Peripherals
- Instrumentation
- Medical Equipment

## 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) | 30 | A |
| $P_{Pk}$ | Peak Pulse Power ($t_p$=8/20µs) | 750 | W |
| $T_{OP}$ | Operating Temperature | -40 to 125 | °C |
| $T_{STOR}$ | Storage Temperature | -55 to 150 | °C |

Notes:

*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)

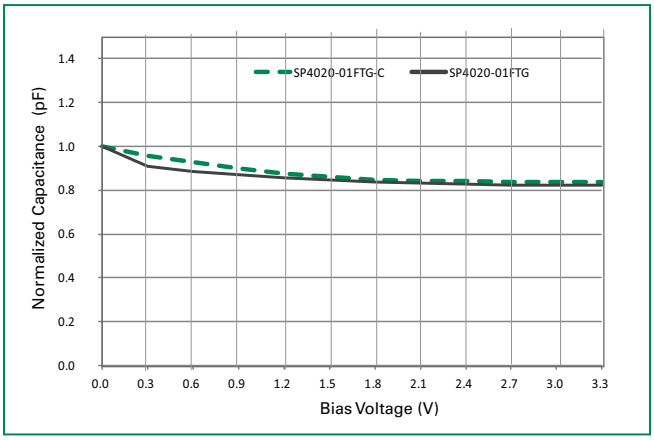
| Parameter | Symbol | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| Breakdown Voltage | $V_{BD}$ | $I_R$=2uA | 3.5 | | | V |
| Reverse Standoff Voltage | $V_{RWM}$ | $I_R$≤1µA | | | 3.3 | V |
| Leakage Current | $I_{LEAK}$ | $V_R$=3.3V | | 0.1 | 0.5 | µA |
| Clamp Voltage[1] | $V_C$ | $I_{PP}$=1A, $t_p$=8/20µs, Fwd | | 6.6 | | V |
| | | $I_{PP}$=10A, $t_p$=8/20µs, Fwd | | 14.2 | | V |
| | | $I_{PP}$=24A, $t_p$=8/20µs, Fwd | | 21.8 | | V |
| Dynamic Resistance[2] | $R_{DYN}$ | TLP, $t_p$ =100ns, I/O to GND | | 0.40 | | 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 | | 2.5 | | pF |

Note:

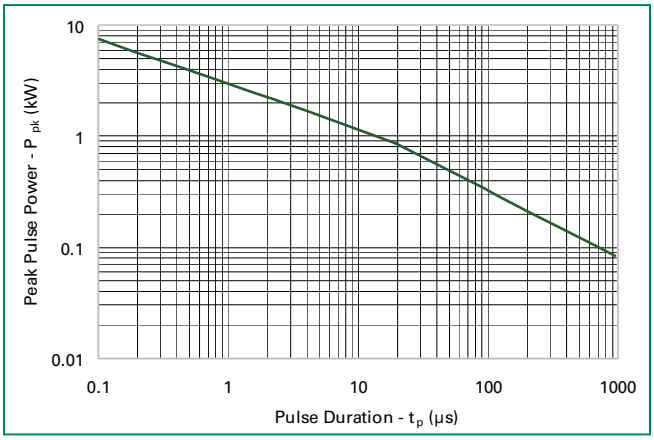
[1]Parameter is guaranteed by design and/or device characterization.

[2]Transmission Line Pulse (TLP) with 100ns width and 200ps rise time.

## Normalized Capacitance vs. Bias Voltage

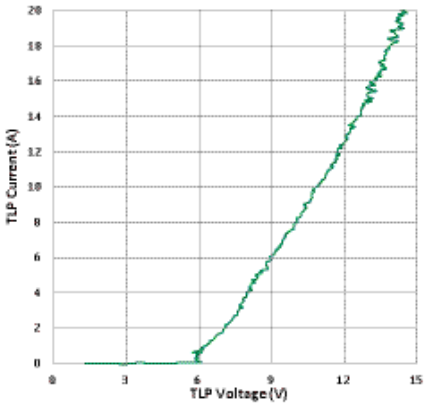



## Non-Repetitive Peak Pulse Power vs. Pulse Time

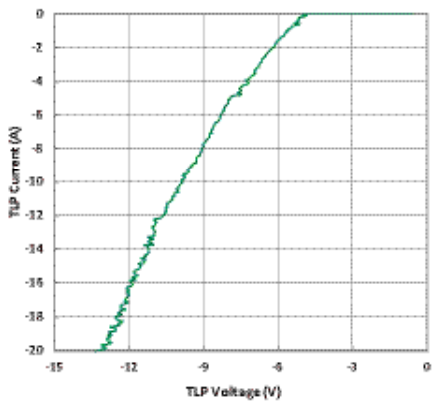



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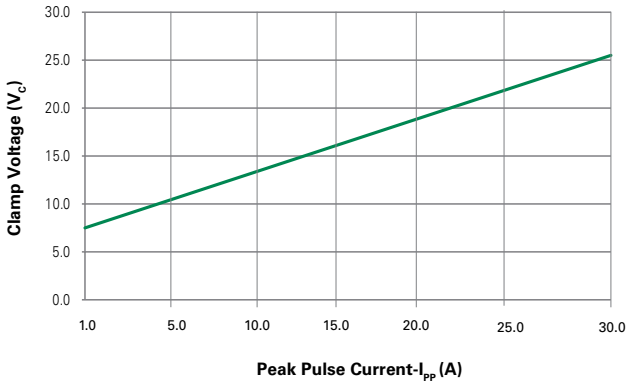
## Positive Transmission Line Pulsing (TLP) Plot



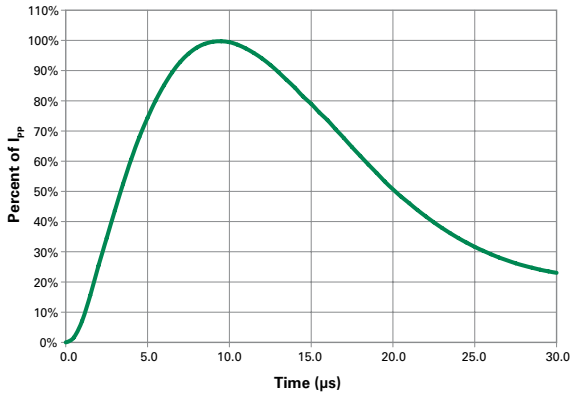

## Negative Transmission Line Pulsing (TLP) Plot




## Clamping Voltage vs. $I_{PP}$



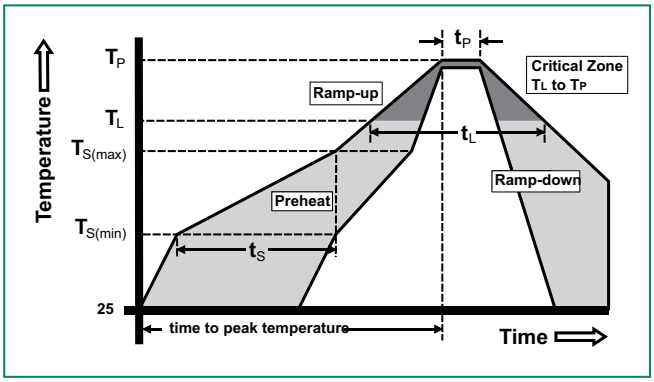

## Pulse Waveform




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## 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 |



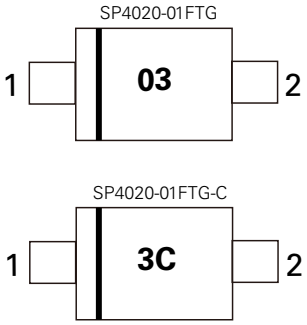

## Product Characteristics

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

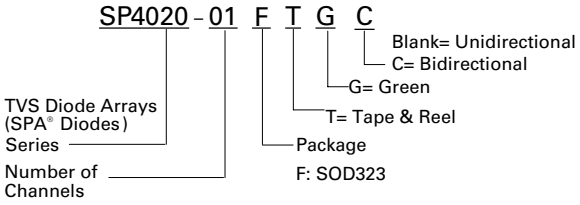
Notes :
1. All dimensions are in millimeters
2. Dimensions include solder plating.
3. Dimensions are exclusive of mold flash & metal burr.
4. Blo is facing up for mold and facing down for trim/form, i.e. reverse trim/form.

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## Part Marking System



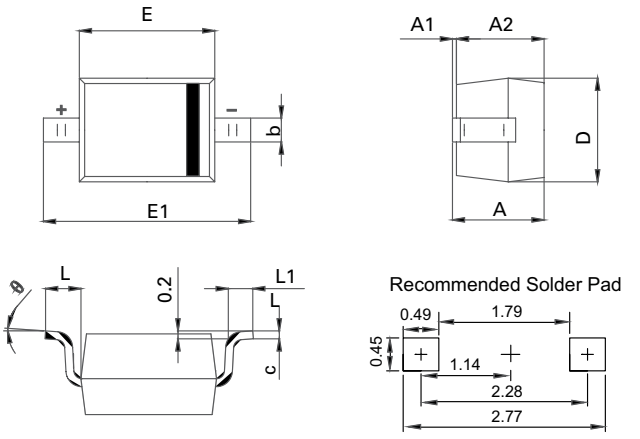

## Part Numbering System




## Ordering Information

| Part Number | Package | Marking | Min. Order Qty. |
|---|---|---|---|
| SP4020-01FTG | SOD323 | 03 | 3000 |
| SP4020-01FTG-C | SOD323 | 3C | 3000 |

## Package Dimensions -SOD323

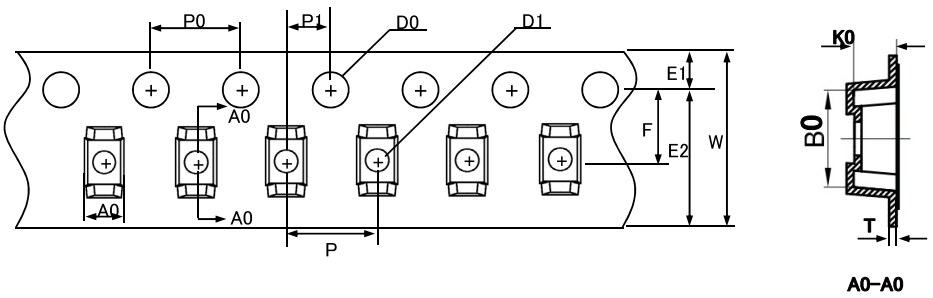



Unit: mm

| Symbol | SOD323 | | | |
|---|---|---|---|---|
| | Millimeters | | Inches | |
| | Min | Max | Min | Max |
| **A** | 0.8 | 1.14 | 0.031 | 0.045 |
| **A1** | 0.00 | 0.10 | 0.000 | 0.004 |
| **A2** | 0.80 | 1.04 | 0.031 | 0.014 |
| **b** | 0.25 | 0.35 | 0.010 | 0.014 |
| **c** | 0.08 | 0.15 | 0.003 | 0.006 |
| **D** | 1.15 | 1.45 | 0.045 | 0.057 |
| **E** | 1.60 | 1.90 | 0.063 | 0.075 |
| **E1** | 2.44 | 2.70 | 0.096 | 0.106 |
| **L1** | 0.25 | 0.45 | 0.010 | 0.018 |

## 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** | 1.24 +/– 0.1 |
| **T** | 0.254 +/– 0.02 |




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