

# 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 2<sup>ND</sup> 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

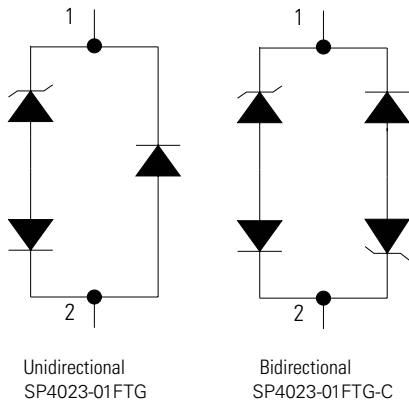


Cathode polarity for unidirectional only

## Features

- ESD, IEC 61000-4-2,  $\pm 30kV$  contact,  $\pm 30kV$  air
- EFT, IEC 61000-4-4, 40A (5/50ns)
- Lightning, 12A (8/20 $\mu s$  as defined in IEC 61000-4-5 2<sup>nd</sup> 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.

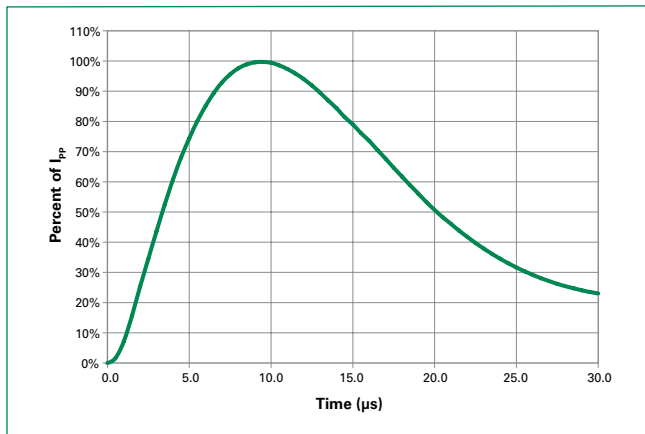
### Electrical Characteristics ( $T_{OP}=25^{\circ}C$ )

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	$\mu A$
Clamp Voltage <sup>1</sup>	$V_C$	$I_{PP}=1A, t_p=8/20\mu s, Fwd$		23		V
		$I_{PP}=2A, t_p=8/20\mu s, Fwd$		24		V
		$I_{PP}=10A, t_p=8/20\mu s, Fwd$		35		V
		$I_{PP}=12A, t_p=8/20\mu s, Fwd$		37.5	40	V
Dynamic Resistance <sup>2</sup>	$R_{DYN}$	TLP, $t_p=100ns, I/O$ to GND		0.55		$\Omega$
ESD Withstand Voltage <sup>1</sup>	$V_{ESD}$	IEC 61000-4-2 (Contact Discharge)	$\pm 30$			kV
		IEC 61000-4-2 (Air Discharge)	$\pm 30$			kV
Diode Capacitance <sup>1</sup>	$C_D$	Reverse Bias=0V, $f=1MHz$		1.3	2	pF

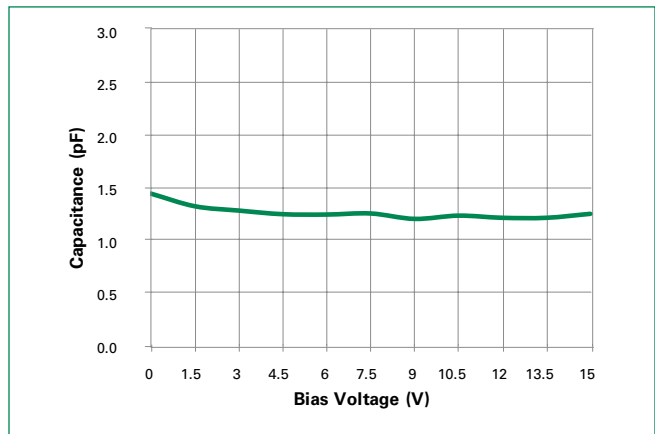
**Note:**

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

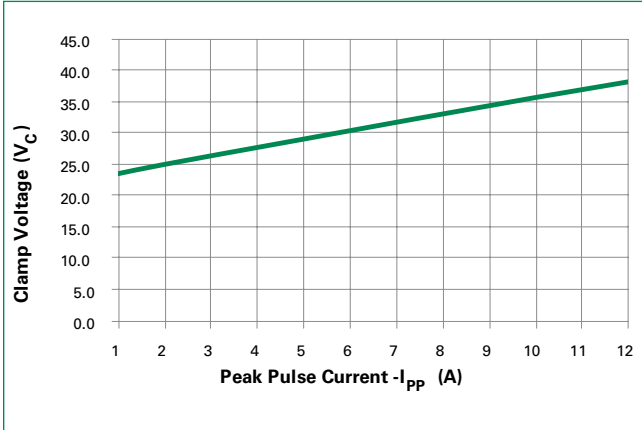
### 8/20 $\mu s$ Pulse Waveform



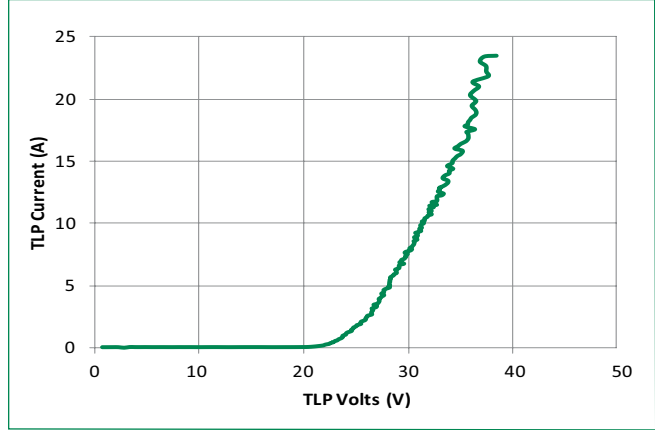
### Capacitance vs. Reverse Bias



**Clamping Voltage vs. Peak Pulse Current**



**Transmission Line Pulsing (TLP) Plot**

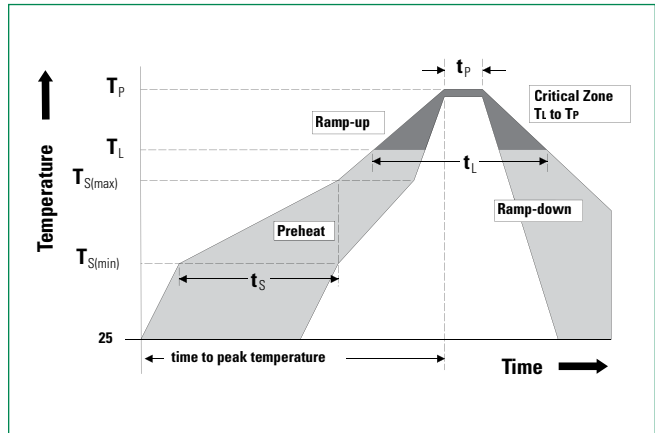


**Soldering Parameters**

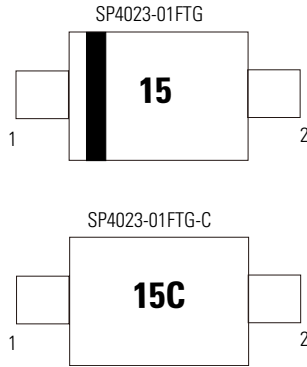
<b>Reflow Condition</b>		Pb – Free assembly
<b>Pre Heat</b>	- Temperature Min ( $T_{s(min)}$ )	150°C
	- Temperature Max ( $T_{s(max)}$ )	200°C
	- Time (min to max) ( $t_s$ )	60 – 180 secs
<b>Average ramp up rate (Liquidus) Temp (<math>T_L</math>) to peak</b>		3°C/second max
<b><math>T_{S(max)}</math> to <math>T_L</math> - Ramp-up Rate</b>		3°C/second max
<b>Reflow</b>	- Temperature ( $T_L$ ) (Liquidus)	217°C
	- Temperature ( $t_L$ )	60 – 150 seconds
<b>Peak Temperature (<math>T_p</math>)</b>		260 <sup>+0/-5</sup> °C
<b>Time within 5°C of actual peak Temperature (<math>t_p</math>)</b>		20 – 40 seconds
<b>Ramp-down Rate</b>		6°C/second max
<b>Time 25°C to peak Temperature (<math>T_p</math>)</b>		8 minutes Max.
<b>Do not exceed</b>		260°C

**Product Characteristics**

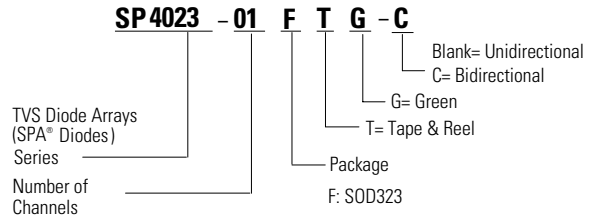
<b>Lead Plating</b>	Matte Tin
<b>Lead Material</b>	Alloy 42
<b>Lead Coplanarity</b>	0.0004 inches (0.102mm)
<b>Substrate Material</b>	Silicon
<b>Body Material</b>	Molded Compound
<b>Flammability</b>	UL Recognized compound meeting flammability rating V-0



**Part Marking System**



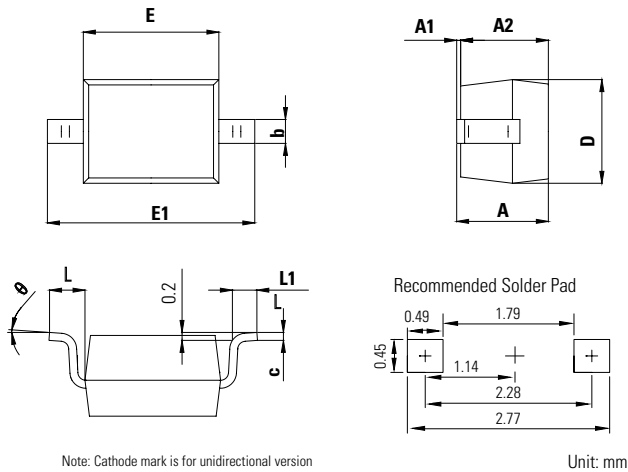
**Part Numbering System**



**Ordering Information**

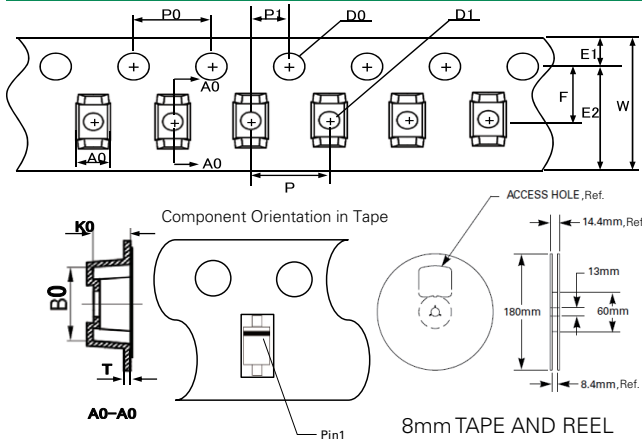
Part Number	Package	Min. Order Qty.
SP4023-01FTG	SOD323	3000
SP4023-01FTG-C	SOD323	3000

**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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