

**SP3022 Series**

0.35pF 20kV Bidirectional Discrete TVS

**Description**

The SP3022 includes back-to-back TVS diodes fabricated in a proprietary silicon avalanche technology to provide protection for electronic equipment that may experience destructive electrostatic discharges (ESD). These robust diodes can safely absorb repetitive ESD strikes above the maximum level specified in the international standard IEC 61000-4-2, without performance degradation. The back-to-back configuration provides symmetrical ESD protection for data lines when AC signals are present and the low loading capacitance makes it ideal for protecting high speed data lines such as HDMI, USB2.0, USB3.0 and eSATA.

**Features & Benefits**

- Lead-Free and RoHS-Compliant
- ESD, IEC 61000-4-2, ±20kV contact discharge, ±30kV air discharge
- EFT, IEC 61000-4-4, 40A (5/50ns)
- Lightning, 3A (8/20µs per IEC 61000-4-5 2nd Edition)
- Low capacitance of 0.35pF @ VR=0V (TYP)
- Low leakage current of 100nA at 5.3V (MAX)
- Space efficient SOD882 footprint
- Extremely low dynamic resistance (0.7Ω TYP)
- AEC-Q101 qualified

**Additional Information**

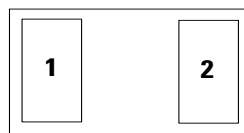
Resources



Accessories



Samples

**Pinout**

(AEC-Q101 qualified)

**Functional Block Diagram****Applications**

- USB 3.0/USB 2.0/MHL
- MIPI Camera and Display
- HDMI 2.0, DisplayPort 1.3, eSATA
- Set Top Boxes, Game Consoles
- Smart Phones
- External Storage
- Ultrabooks, Notebooks
- Tablets, eReaders
- Automotive Electronics

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.

# SP3022 Series

## 0.35pF 20kV Bidirectional Discrete TVS

### Absolute Maximum Ratings

Symbol	Parameter	Value	Units
$P_{PK}$	Peak Pulse Power ( $t_p=8/20\mu s$ )	20	W
$I_{PP}$	Peak Current ( $t_p=8/20\mu s$ )	3.0	A
$T_{OP}$	Operating Temperature	-40 to 125	$^{\circ}C$

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

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

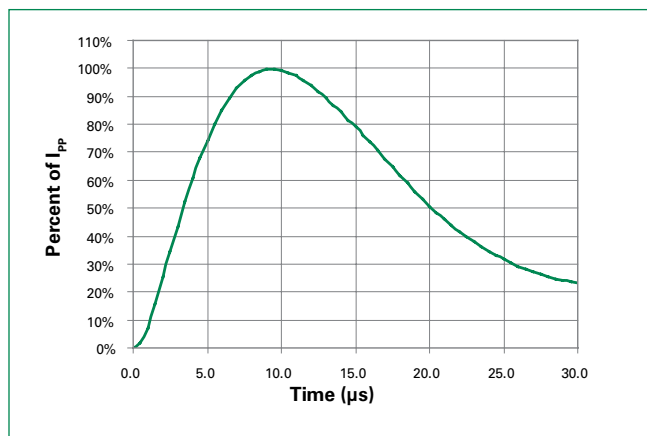
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	$V_{RWM}$	$I_R=1\mu A$			5.3	V
Breakdown Voltage	$V_{BR}$	$I_R=1mA$	6.8	7.8	9.1	V
Reverse Leakage Current	$I_{LEAK}$	$V_R=5.3V$		<10	100	nA
Clamp Voltage <sup>1</sup>	$V_C$	$I_{PP}=1A, t_p=8/20\mu s, Fwd$			12.0	V
Dynamic Resistance <sup>2</sup>	$R_{DYN}$	TLP, $t_p=100ns, I/O$ to GND		0.7		$\Omega$
ESD Withstand Voltage <sup>1</sup>	$V_{ESD}$	IEC 61000-4-2 (Contact)	$\pm 20$			kV
		IEC 61000-4-2 (Air)	$\pm 30$			kV
Diode Capacitance <sup>1</sup>	$C_{I/O-I/O}$	Reverse Bias=0V, $f=1MHz$		0.35	0.5	pF

**Note:**

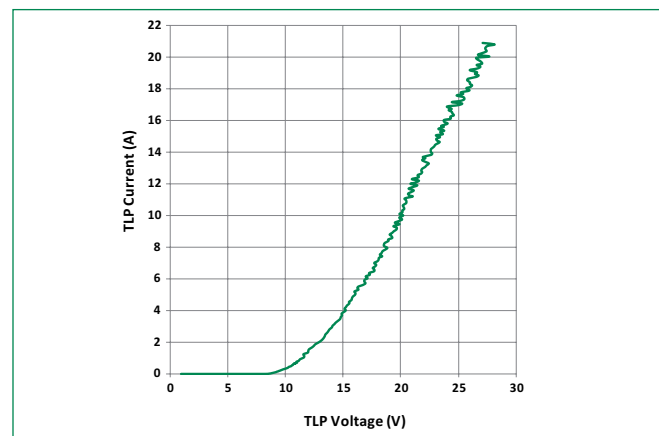
<sup>1</sup> Parameter is guaranteed by design and/or component characterization.

<sup>2</sup> Transmission Line Pulse (TLP) with 100ns width and 200ps rise time.

#### 8/20 Pulse Waveform



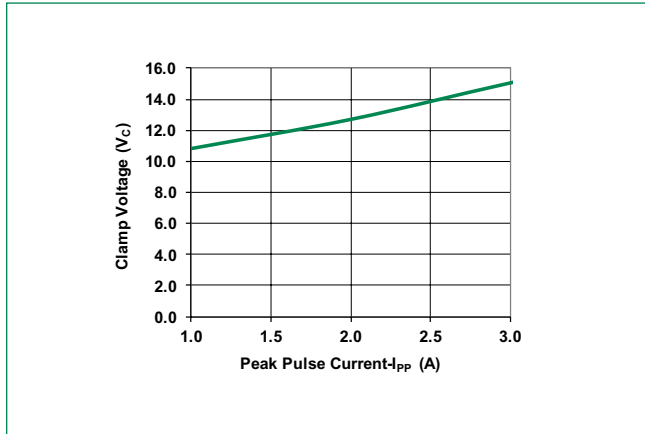
#### Transmission Line Pulsing (TLP) Plot



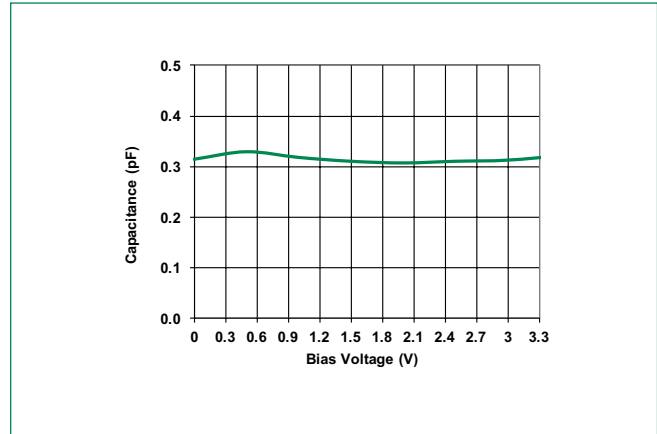
# SP3022 Series

## 0.35pF 20kV Bidirectional Discrete TVS

Clamping Voltage vs IPP

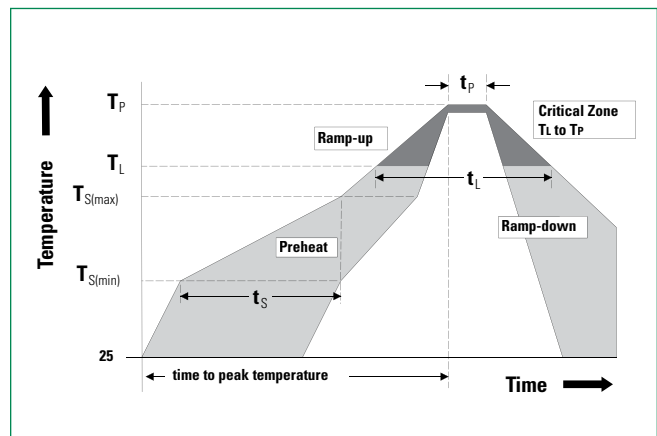


Capacitance vs. Reverse Bias



## 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 of SOD882

<b>Lead Plating</b>	Pre-Plated Frame
<b>Lead Material</b>	Copper Alloy
<b>Substrate material</b>	Silicon
<b>Body Material</b>	Molded Compound
<b>Flammability</b>	UL Recognized compound meeting flammability rating V-0.

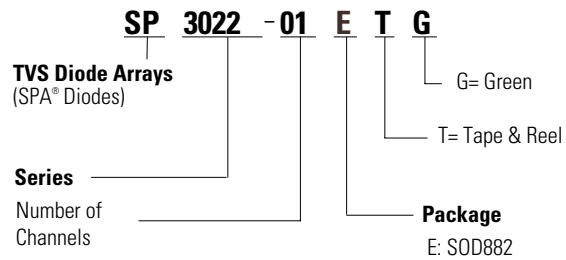
# SP3022 Series

## 0.35pF 20kV Bidirectional Discrete TVS

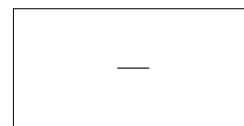
### Ordering Information

Part Number	Package	Min. Order Qty.
SP3022-01ETG	SOD882	10000

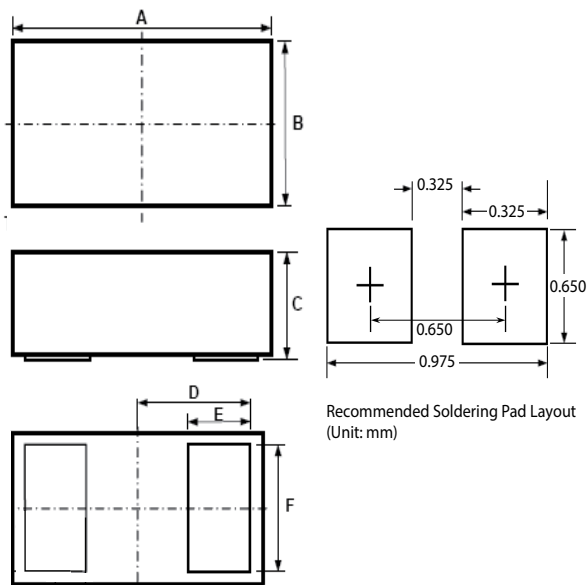
### Part Numbering System



### Part Marking System



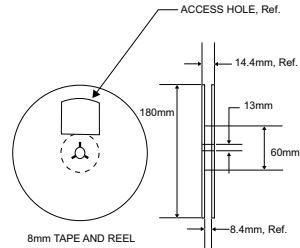
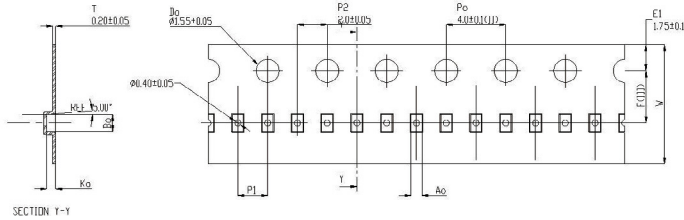
### Package Dimensions – SOD882



Symbol	Package	SOD882					
	JEDEC	MO-236			MO-236		
		Millimeters			Inches		
	Min	Typ	Max	Min	Typ	Max	
<b>A</b>	0.95	1.00	1.10	0.035	0.039	0.043	
<b>B</b>	0.50	0.60	0.70	0.020	0.024	0.028	
<b>C</b>	0.40	0.50	0.60	0.016	0.020	0.024	
<b>D</b>		0.45			0.018		
<b>E</b>	0.20	0.25	0.35	0.008	0.010	0.012	
<b>F</b>	0.45	0.50	0.55	0.018	0.020	0.022	

**SP3022 Series**

0.35pF 20kV Bidirectional Discrete TVS

**Embossed Carrier Tape & Reel Specification — SOD882**

Symbol	Millimeters
<b>A0</b>	0.70+/-0.045
<b>B0</b>	1.10+/-0.045
<b>K0</b>	0.65+/-0.045
<b>F</b>	3.50+/-0.05
<b>P1</b>	2.00+/-0.10
<b>W</b>	8.00 + 0.30 -0.10

**Disclaimer Notice** - Littelfuse products are not designed for, and shall not be used for, any purpose (including, without limitation, automotive, military, aerospace, medical, life-saving, life-sustaining or nuclear facility applications, devices intended for surgical implant into the body, or any other application in which the failure or lack of desired operation of the product may result in personal injury, death, or property damage) other than those expressly set forth in applicable Littelfuse product documentation. Warranties granted by Littelfuse shall be deemed void for products used for any purpose not expressly set forth in applicable Littelfuse documentation. Littelfuse shall not be liable for any claims or damages arising out of products used in applications not expressly intended by Littelfuse as set forth in applicable Littelfuse documentation. The sale and use of Littelfuse products is subject to Littelfuse Terms and Conditions of Sale, unless otherwise agreed by Littelfuse. "Littelfuse" includes Littelfuse, Inc., and all of its affiliate entities. <http://www.littelfuse.com/disclaimer-electronics>.