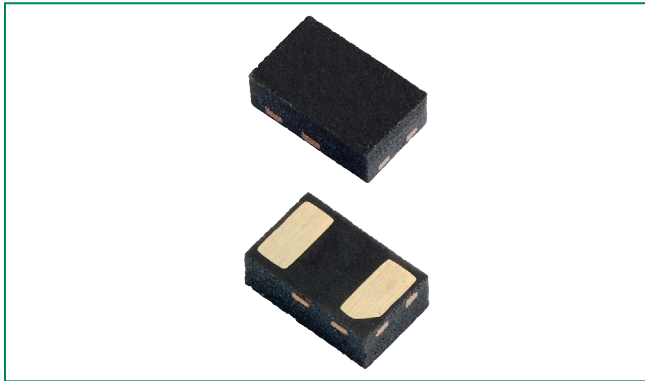


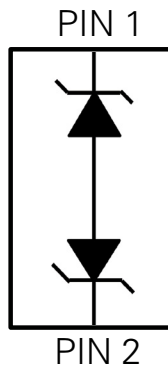
## SP1233 20A Discrete Bidirectional TVS Diode



### Description

The SP1233 includes TVS diodes fabricated in a proprietary silicon avalanche technology to protect each I/O pin and provide a high level of protection for electronic equipment that may experience destructive electrostatic discharges (ESD). These robust diodes can safely absorb repetitive ESD strikes at  $\pm 30\text{kV}$  (contact discharge, IEC61000-4-2) without performance degradation. Additionally, the SP1233 offers up to 20A 8/20 surge rating with low clamping voltages

### Pinout and Functional Block Diagram



### Features

- ESD, IEC 61000-4-2,  $\pm 30\text{kV}$  contact,  $\pm 30\text{kV}$  air
- EFT, IEC 61000-4-4, 40A (5/50ns)
- Lightning, 20A (8/20 as defined in IEC 61000-4-5 2<sup>nd</sup> edition)
- Low clamping voltage
- Low leakage current
- AEC-Q101 qualified
- Moisture Sensitivity Level (MSL -1)
- Halogen free, lead free and RoHS compliant

### Applications

- Switches / Buttons
- Test Equipment / Instrumentation
- Point-of-Sale Terminals
- Medical Equipment
- Notebooks / Desktops / Servers
- Computer Peripherals

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 Pulse Current ( $t_p=8/20\mu s$ )	20	A
$P_{pk}$	Peak Pulse Power ( $t_p=8/20\mu s$ )	180	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 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.

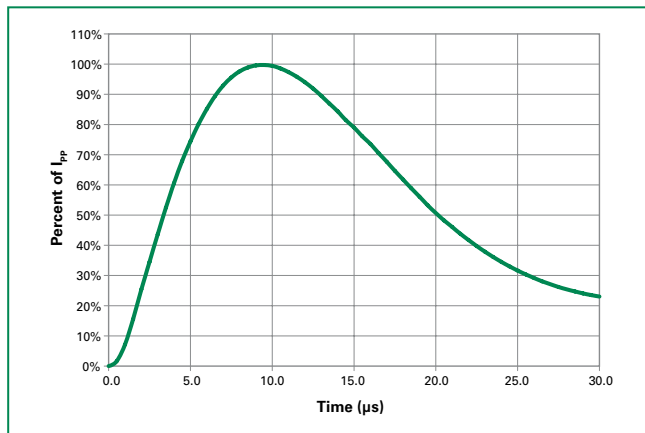
### Electrical Characteristics ( $T_{OP}=25^\circ C$ )

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	$V_{RWM}$	$I_R \leq 1\mu A$			3.3	V
Breakdown Voltage	$V_{BR}$	$I_R = 1mA$		4.2		V
Leakage Current	$I_{LEAK}$	$V_R = 3.3V$		0.02	0.5	$\mu A$
Clamp Voltage <sup>1</sup>	$V_C$	$I_{PP} = 10A, t_p = 8/20\mu s, Fwd$		6.1		V
		$I_{PP} = 20A, t_p = 8/20\mu s, Fwd$		8.5		V
Dynamic Resistance <sup>2</sup>	$R_{DYN}$	TLP, $t_p = 100ns, I/O$ to GND		0.07		$\Omega$
Peak Pulse Current	$I_{pp}$	$t_p = 8/20\mu s$			20	A
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		35		pF

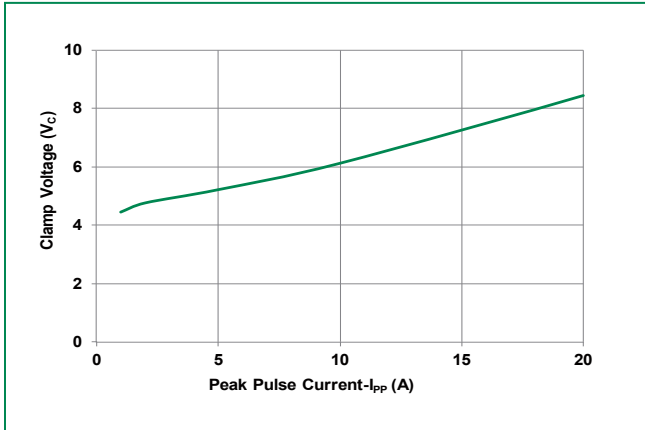
Note:

- Parameter is guaranteed by design and/or component characterization.
- Transmission Line Pulse (TLP) with 100ns width, 2ns rise time, and average window  $t_1=70ns$  to  $t_2=90ns$

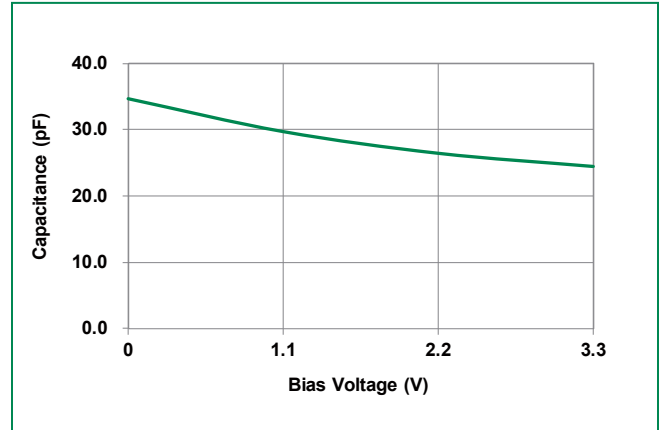
### 8/20 $\mu s$ Pulse Waveform



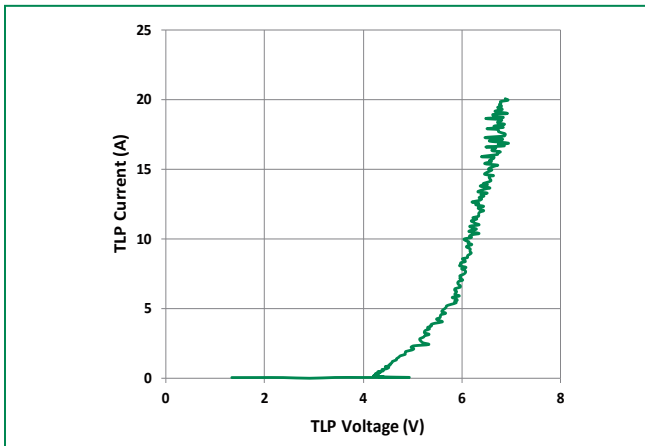
**Clamping voltage vs.  $I_{pp}$  for 8/20 $\mu$ S waveshape**



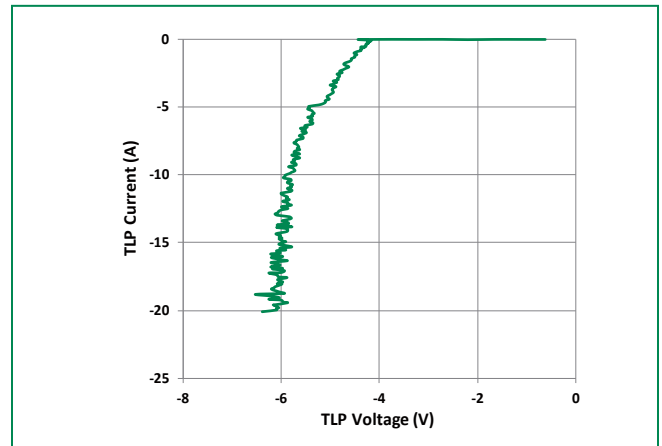
**Capacitance vs. Reverse Bias**



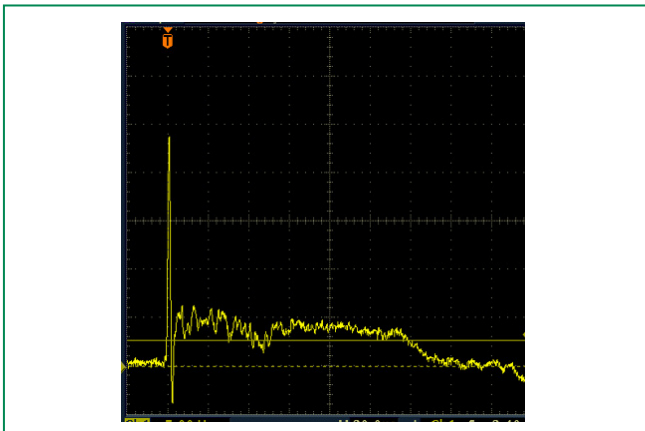
**Positive Transmission Line Pulsing (TLP) Plot**



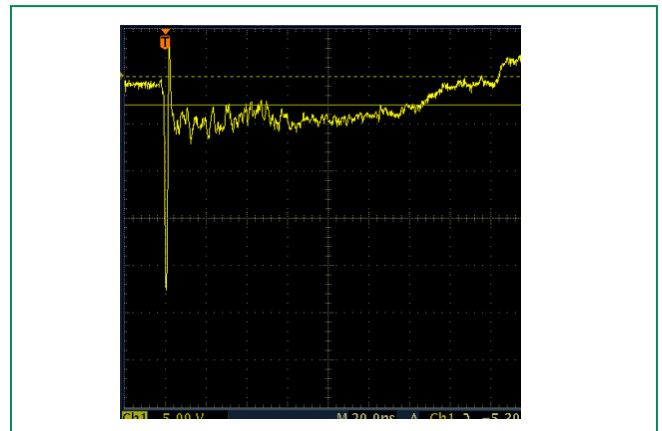
**Negative Transmission Line Pulsing (TLP) Plot**



**IEC 61000-4-2 +8 kV Contact ESD Clamping Voltage**

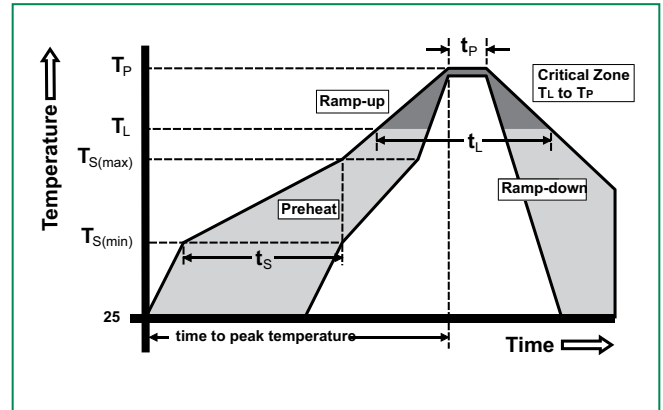


**IEC 61000-4-2 -8 kV Contact ESD Clamping Voltage**

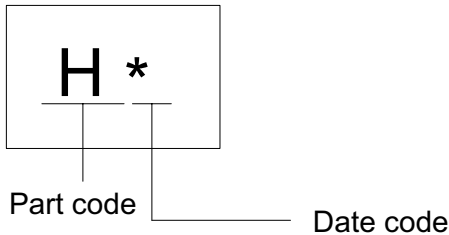


**Soldering Parameters**

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 <sup>+0/-5</sup> °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



**Part Marking System**

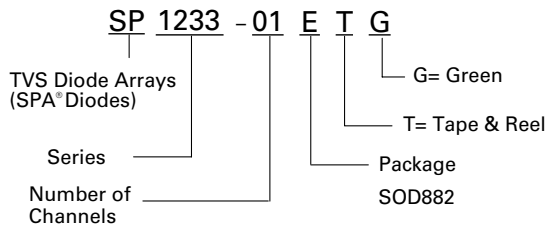


**Product Characteristics**

<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.

- Notes :
1. All dimensions are in millimeters
  2. Dimensions include solder plating.
  3. Dimensions are exclusive of mold flash & metal burr.

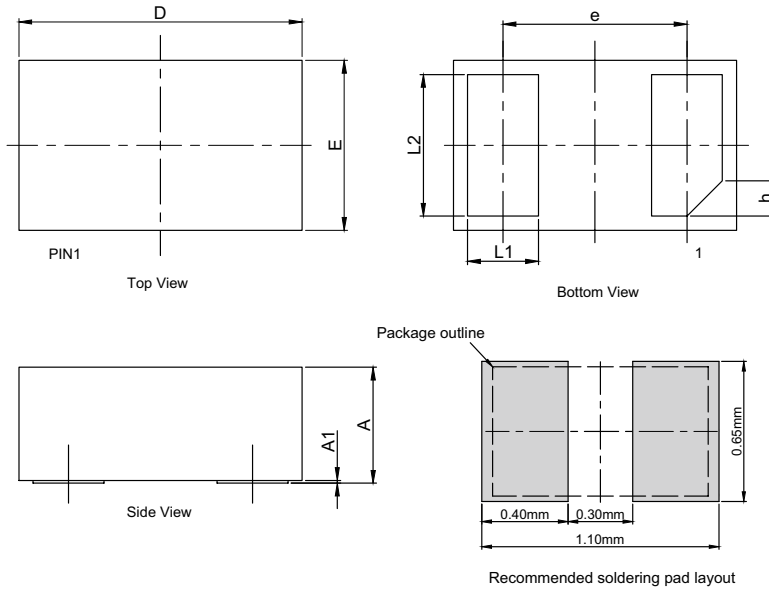
**Part Numbering System**



**Ordering Information**

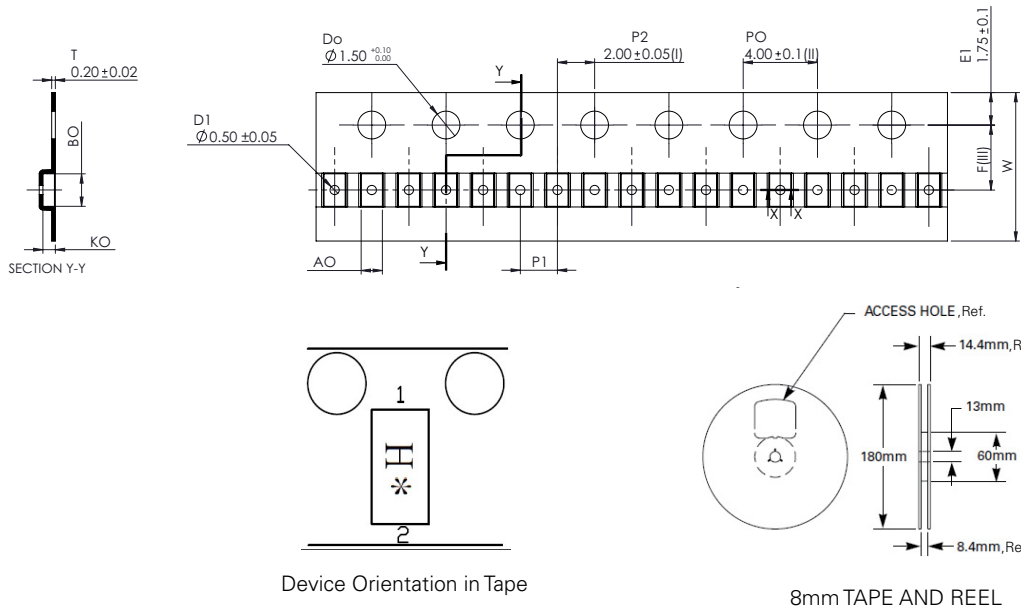
Part Number	Package	Marking	Min. Order Qty.
SP1233-01ETG	SOD882	H*	10,000

**Package Dimensions**



Symbol	SOD882		
	Millimeters		
	Min	Nor	Max
<b>A</b>	0.40	0.45	0.55
<b>A1</b>	-	0.02	0.05
<b>L1</b>	0.20	0.25	0.30
<b>L2</b>	0.45	0.50	0.55
<b>D</b>	0.90	1.00	1.10
<b>E</b>	0.50	0.60	0.70
<b>e</b>	0.65 BSC		
<b>h</b>	0.125 (x 45°)		

**Embossed Carrier Tape & Reel Specification**



Symbol	Millimeters
<b>A0</b>	1.14 +/- 0.03
<b>B0</b>	1.75 +/- 0.03
<b>K0</b>	0.67 +/- 0.05
<b>F</b>	3.50 +/- 0.05
<b>P1</b>	2.00 +/- 0.10
<b>W</b>	8.00 +/- 0.10

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