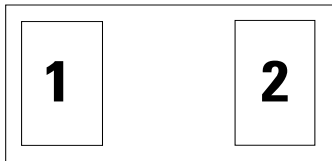


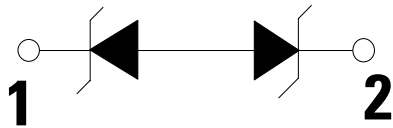
# SP1333 8pF 30kV Bidirectional Discrete TVS



## Pinout



## Functional Block Diagram



## Description

The SP1333 back-to-back diodes are fabricated in a proprietary silicon avalanche technology. These diodes provide a high ESD (electrostatic discharge) protection level for electronic equipment. The SP1333 TVS can safely absorb repetitive ESD strikes above the maximum contact discharge level specified in the IEC 61000-4-2 international standard (Level 4, ±8kV contact discharge) without performance degradation. The back-to-back configuration provides symmetrical ESD protection for data lines. Additionally, the SP1333 offers up to 5A 8/20 surge rating with low clamping voltages.

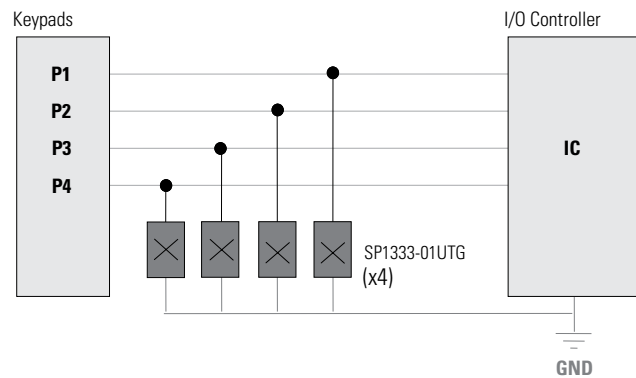
## Features

- ESD, IEC 61000-4-2, ±30kV contact, ±30kV air
- EFT, IEC 61000-4-4, 40A (5/50ns)
- Lightning, 5A (8/20µs as defined in IEC 61000-4-5 2<sup>nd</sup> edition)
- Low capacitance of 8pF (TYP @ V<sub>R</sub>=0V)
- Low leakage current of 1nA (TYP) at 3.3V
- Space efficient 0201
- Halogen free, Lead free and RoHS compliant
- Moisture Sensitivity Level (MSL -1)
- AEC-Q101 qualified

## Applications

- Mobile Phones
- Smart Phones
- Portable Medical
- MP3/PMP
- Portable Navigation Components
- Tablets
- Small Size Panel
- Point of Sale Terminals

## Application Example



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 ( $t_p=8/20\mu s$ )	5	A
$T_{OP}$	Operating Temperature	-40 to 125	°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.

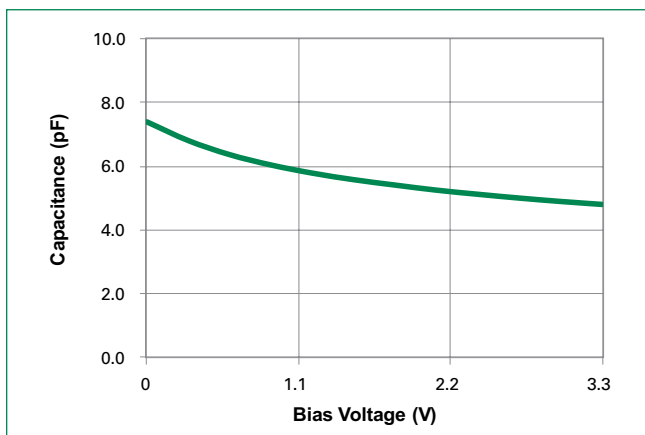
### Electrical Characteristics ( $T_{OP}=25^\circ C$ )

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	$V_{RWM}$	$I_R=1\mu A$			3.3	V
Breakdown Voltage	$V_{BR}$	$I_R=1mA$	3.5	4.5		V
Reverse Leakage Current	$I_{LEAK}$	$V_R=3.3V$		1	50	nA
Clamp Voltage <sup>1</sup>	$V_C$	$I_{PP}=1A, t_p=8/20\mu s, I/O$ to I/O		5	7	V
		$I_{PP}=5A, t_p=8/20\mu s, I/O$ to I/O		7.5	9	V
Dynamic Resistance <sup>2</sup>	$R_{DYN}$	TLP, $t_p=100ns, I/O$ to I/O		0.3		$\Omega$
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>	$C_{I/O-I/O}$	Reverse Bias=0V		8	10	pF

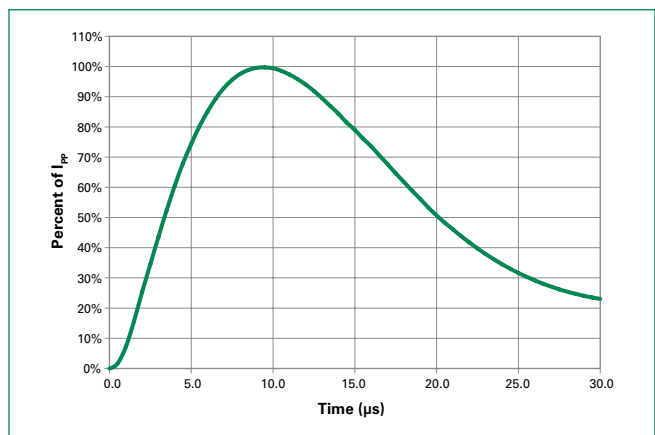
**Note:**

- 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  $t_2=90ns$

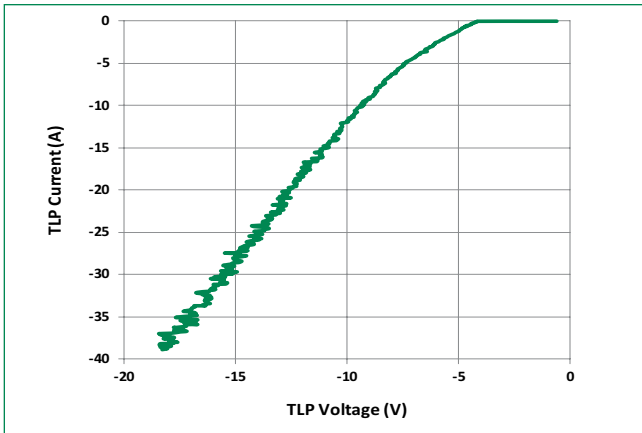
### Capacitance vs. Reverse Bias



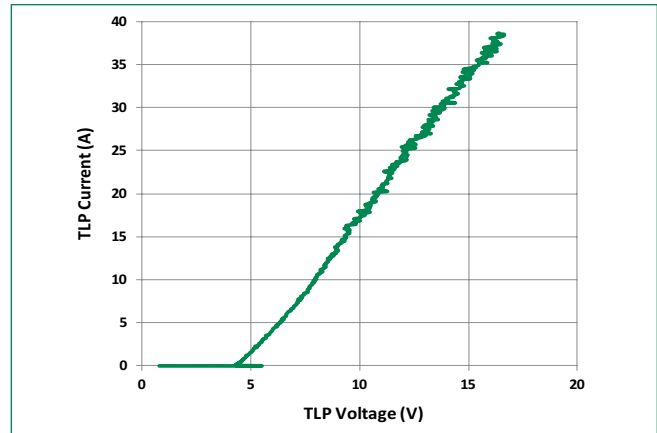
### 8/20µs Pulse Waveform



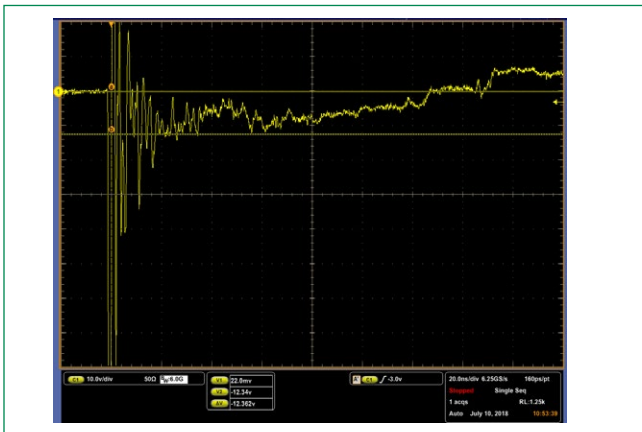
**Negative Transmission Line Pulsing (TLP) Plot**



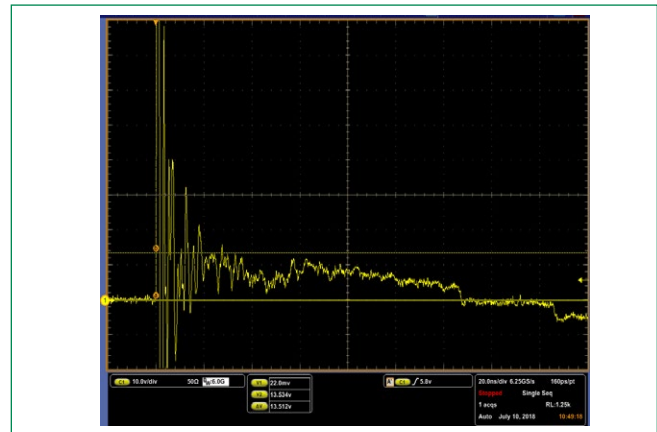
**Positive Transmission Line Pulsing (TLP) Plot**



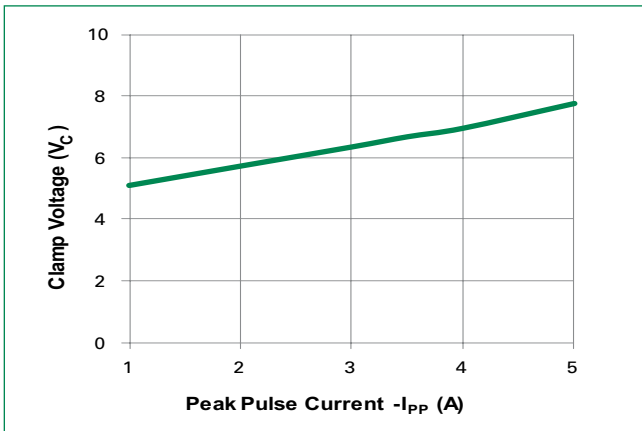
**IEC 61000-4-2 -8 kV Contact ESD Clamping Voltage**



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

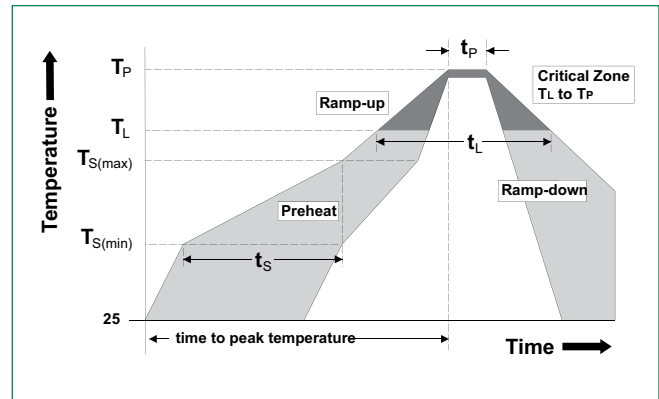


**Clamping voltage vs.  $I_{PP}$  for 8/20µs waveshape**



### 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



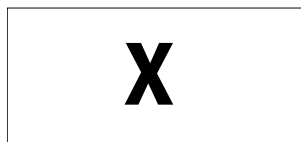
### Ordering Information

Part Number	Package	Min. Order Qty.
SP1333-01UTG	0201 DFN	15,000

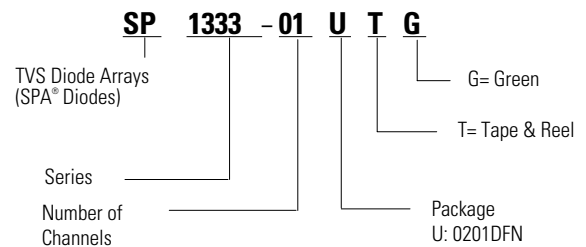
### Product Characteristics

<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

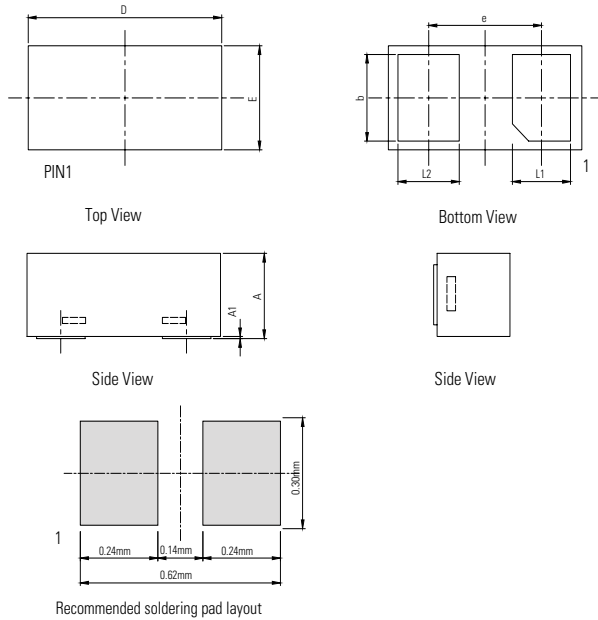
### Part Marking System



### Part Numbering System



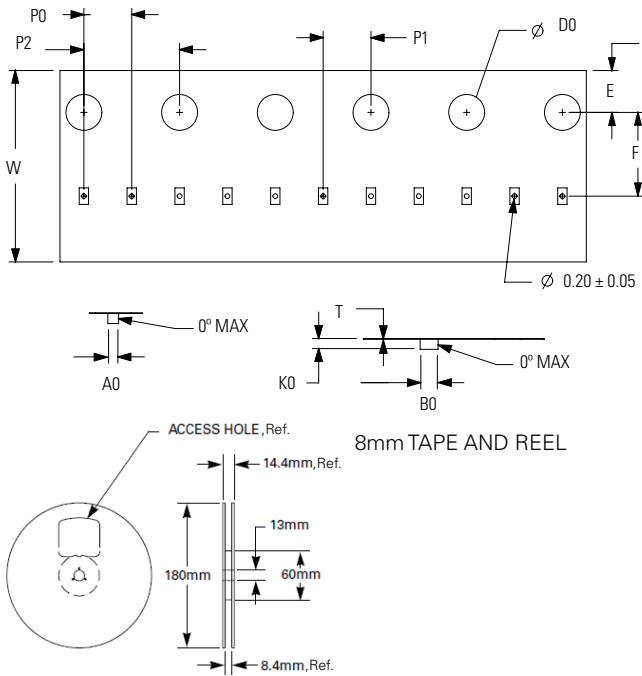
**Package Dimensions — 0201 DFN**



Drawing#: U01-A

Symbol	0201 DFN					
	Millimeters			Inches		
	Min	Typ	Max	Min	Typ	Max
<b>A</b>	0.30	0.31	0.32	0.012	0.012	0.013
<b>A1</b>	0.00	0.02	0.50	0.000	0.001	0.020
<b>b</b>	0.18	0.23	0.28	0.007	0.009	0.011
<b>L1</b>	0.12	0.17	0.22	0.005	0.007	0.009
<b>L2</b>	0.13	0.18	0.23	0.005	0.007	0.009
<b>D</b>	0.55	0.60	0.65	0.022	0.024	0.026
<b>E</b>	0.25	0.30	0.35	0.010	0.012	0.014
<b>e</b>	0.35 BSC			0.014 BSC		

**Embossed Carrier Tape & Reel Specification — 0201 DFN**



Symbol	Millimeters		Inches	
	Min	Max	Min	Max
<b>A0</b>	0.33	0.40	0.013	0.016
<b>B0</b>	0.63	0.70	0.025	0.028
<b>D0</b>	1.40	1.60	0.055	0.063
<b>E</b>	1.65	1.85	0.065	0.073
<b>F</b>	3.45	3.55	0.136	0.140
<b>K0</b>	0.30	0.39	0.012	0.015
<b>P0</b>	1.90	2.10	0.075	0.083
<b>P1</b>	1.95	2.05	0.077	0.081
<b>P2</b>	3.90	4.10	0.154	0.161
<b>T</b>	0.13	0.25	0.005	0.010
<b>W</b>	7.90	8.30	0.311	0.327

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