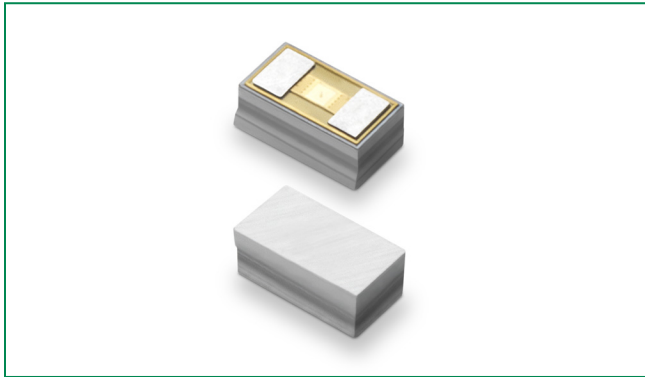


## SP4337 0.18pF 15KV Bidirectional TVS



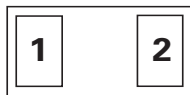
### Description

SP4337 is specifically designed to protect high-speed interfaces against ElectroStatic Discharge (ESD), such as High-Definition Multimedia Interface (HDMI) and DisplayPort interfaces, Thunderbolt and USB 3.1 Gen 1.

The signal line is protected by a TVS diode offering low line capacitance of 0.18 pF typical. SP4337 can safely absorb repetitive ESD strikes up to ±15 kV contact exceeding IEC 61000-4-2, level 4 ( ±8kV contact discharge).

Excellent low capacitance, clamping capability, low leakage, and fast response time make this parts an ideal solution for protecting high speed data lines.

### Pinout



### Features

- ESD, IEC 61000-4-2, ±15kV contact , ±15kV Air
- EFT, IEC 61000-4-4, 40A (5/50ns)
- Lightning, 7A (8/20 as defined in IEC 61000-4-5 2nd edition)
- Low capacitance of 0.18pF (Typ @ VR=0V)
- Space efficient 0201
- Halogen free, lead free and RoHS compliant

### Functional Block Diagram



### Applications

- USB 4.0
- HDMI
- DisplayPort
- Thunderbolt
- S-ATA
- 2.5G/5G/10G Ethernet

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 ( $t_p=8/20\mu s$ )	7.0	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.

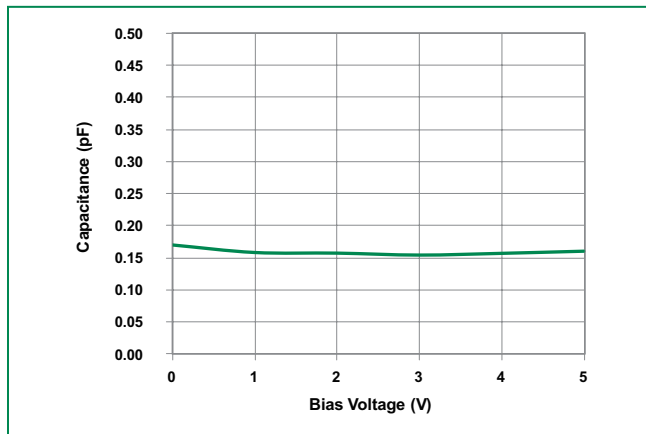
### Electrical Characteristics ( $T_{OP}=25^\circ C$ )

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	$V_{RWM}$	$I_R=1\mu A$			5	V
Breakdown Voltage	$V_{BR}$	$I_R=1mA$		7.8		V
Reverse Leakage Current	$I_{LEAK}$	$V_R=5V$		1	100	nA
Holding Voltage	$V_{HOLD}$	I/O to GND		2.3		V
Clamp Voltage <sup>1</sup>	$V_C$	$I_{PP}=7A, t_p=8/20\mu s, I/O$ to GND		5	7	V
Dynamic Resistance <sup>2</sup>	$R_{DYN}$	TLP, $t_p=100ns, I/O$ to GND		0.23		$\Omega$
ESD Withstand Voltage <sup>1</sup>	$V_{ESD}$	IEC 61000-4-2 (Contact Discharge)	$\pm 15$			kV
		IEC 61000-4-2 (Air Discharge)	$\pm 15$			kV
Diode Capacitance <sup>1</sup>	$C_{IO-GND}$	Reverse Bias=0V, $f=1MHz$		0.18		pF

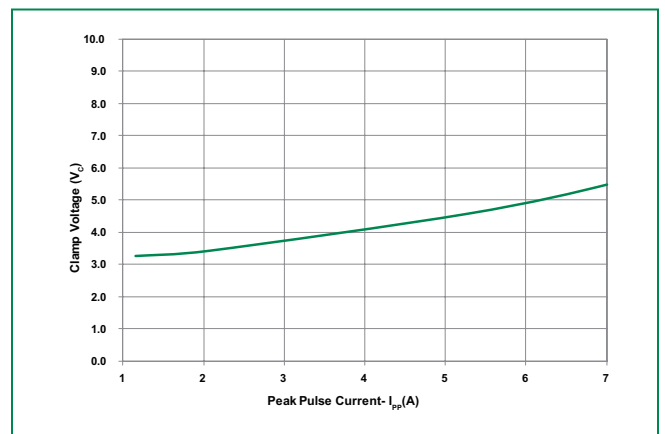
Note:

- Parameter is guaranteed by design and/or component characterization.
- Transmission Line Pulse (TLP) with 100ns width, 0.2ns rise time, and average window  $t1=70ns$  to  $t2=90ns$

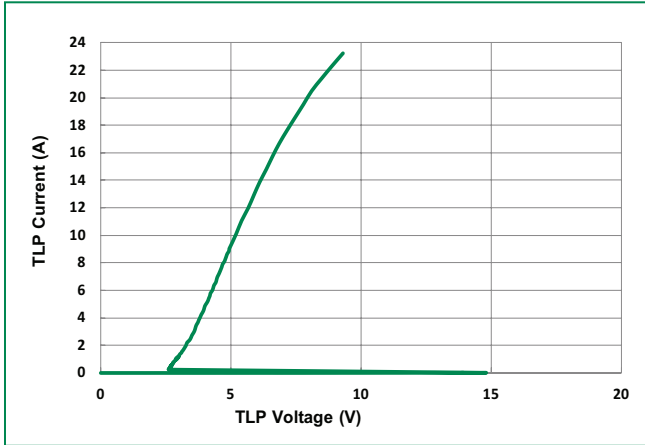
### Capacitance vs Reverse Bias



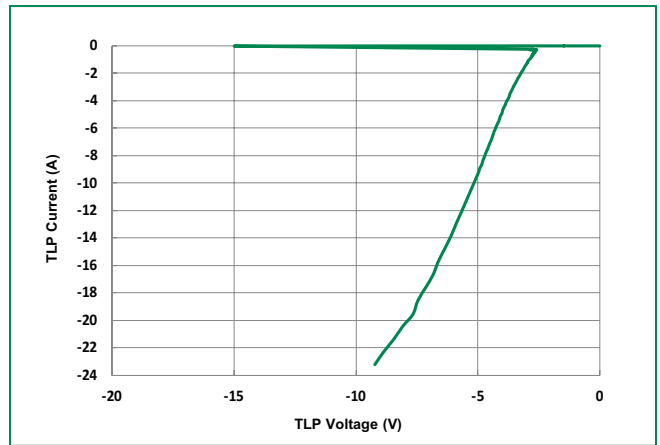
### Clamping Voltage vs $I_{PP}$



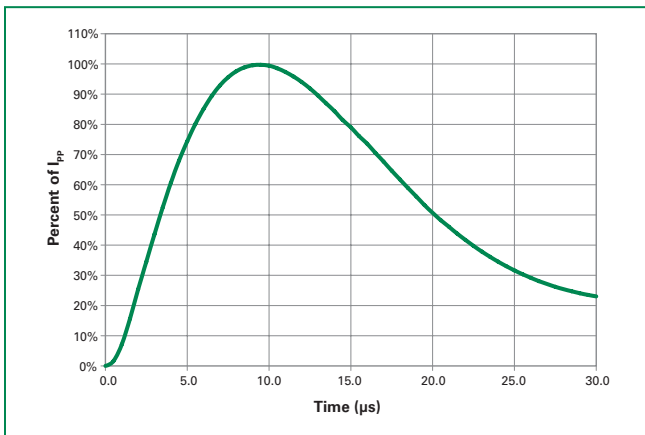
**Positive Transmission Line Pulsing (TLP) Plot**



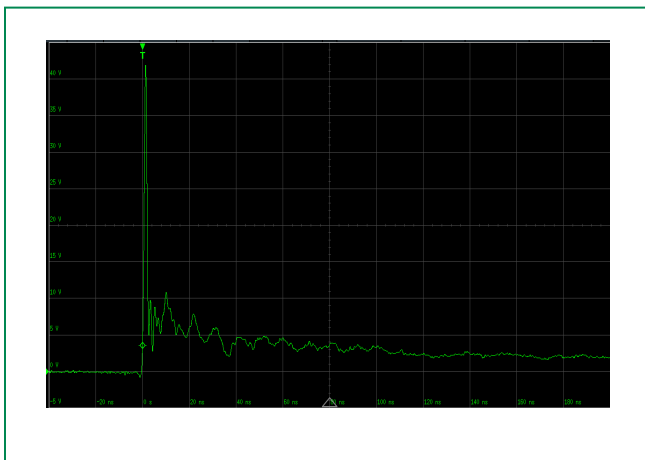
**Negative Transmission Line Pulsing (TLP) Plot**



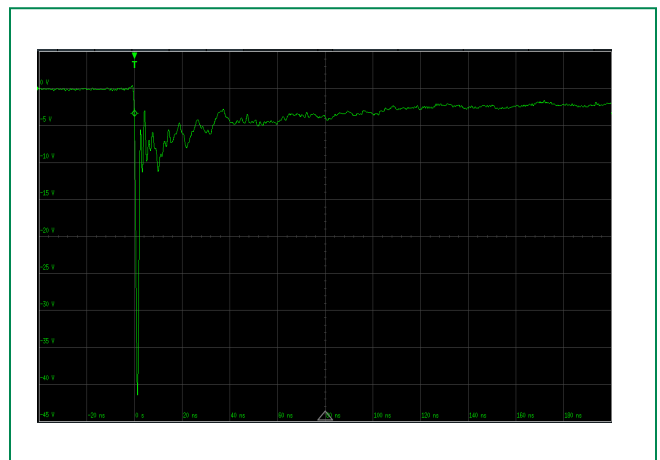
**8/20µs Pulse Waveform**



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



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

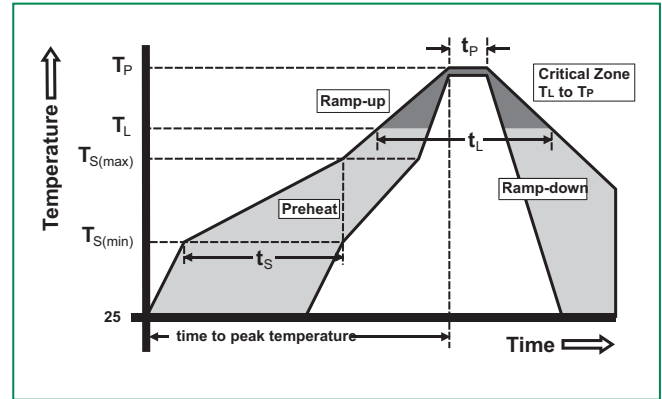


**Soldering Parameters**

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

**Ordering Information**

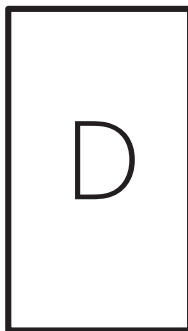
Part Number	Package	Min. Order Qty.
SP4337-01WTG	Flipchip	10000



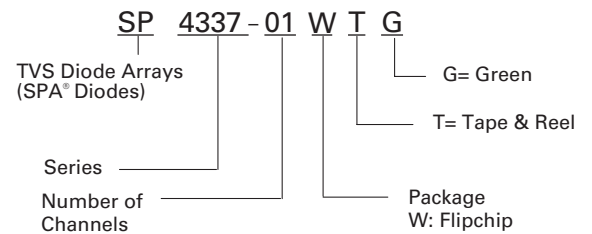
**Product Characteristics**

<b>Lead Plating</b>	Tin plating
<b>Lead Material</b>	Copper bump
<b>Substrate Material</b>	Silicon
<b>Flammability</b>	UL Recognized compound meeting flammability rating V-0

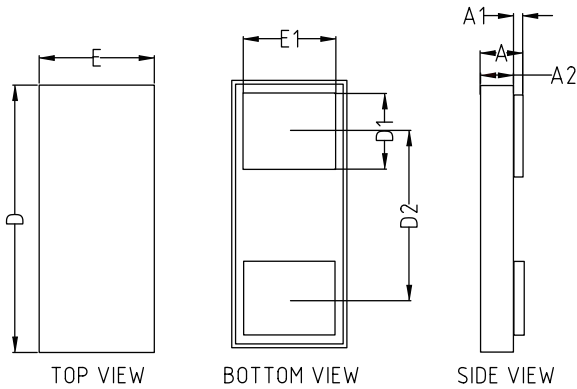
**Part Marking System**



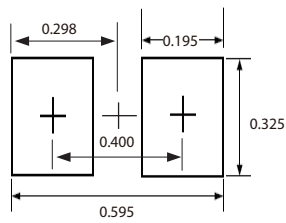
**Part Numbering System**



### Package Dimensions – FLIPCHIP

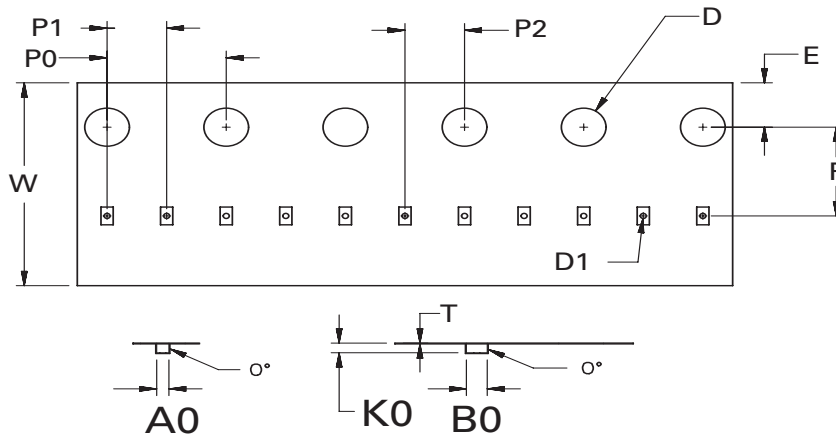


Symbol	0201 Flipchip			
	Millimeters		Inches	
	Min	Max	Min	Max
<b>D</b>	0.605	0.655	0.0238	0.0258
<b>E</b>	0.305	0.355	0.0120	0.0140
<b>D1</b>	0.145	0.155	0.0057	0.0061
<b>E1</b>	0.245	0.255	0.0096	0.0100
<b>D2</b>	0.400 BSC		0.0157 BSC	
<b>A</b>	0.273	0.329	0.0107	0.0130
<b>A2</b>	0.265	0.315	0.0104	0.0124
<b>A1</b>	0.008	0.014	0.0003	0.0006



Recommended Soldering Pad Layout (mm)

### Embossed Carrier Tape & Reel Specification – FLIPCHIP



Symbol	Millimeters
<b>A0</b>	0.41 +/- 0.03
<b>B0</b>	0.70 +/- 0.03
<b>D</b>	ø 1.50 + 0.10
<b>D1</b>	ø 0.20 +/- 0.05
<b>E</b>	1.75 +/- 0.10
<b>F</b>	3.50 +/- 0.05
<b>K0</b>	0.38 +/- 0.03
<b>P0</b>	4.00 +/- 0.10
<b>P1</b>	2.00 +/- 0.05
<b>P2</b>	2.00 +/- 0.05
<b>W</b>	8.00 +/- 0.30/-0.10
<b>T</b>	0.23 +/- 0.02

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