

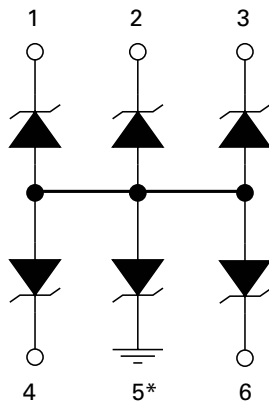
## SP1012 Series 6.5pF, 15kV Bidirectional TVS Array



### Description

The miniature 5 channel bidirectional TVS array provides protection for data lines that may experience destructive electrostatic discharges (ESD). These robust diodes can safely absorb repetitive ESD strikes at the maximum level specified in the IEC61000-4-2 international standard without performance degradation. The bidirectional configuration provides symmetrical ESD protection for data lines when AC signals are present.

### Functional Block Diagram

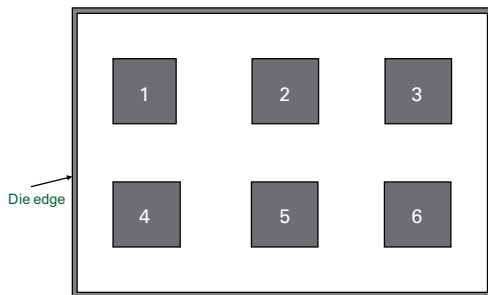


\*Any pin can be used as GND.

### Features

- ESD, IEC61000-4-2,  $\pm 15\text{kV}$  contact,  $\pm 30\text{kV}$  air
- EFT, IEC61000-4-4, 40A (5/50ns)
- Lightning protection, IEC61000-4-5, 3.0A ( $t_p = 8/20\mu\text{s}$ )
- Highest density TVS array available today
- 5 channels of protection in a 0.94x0.61mm footprint (i.e. a discrete 0402)

### Pinout



### Applications

- Smart Phones
- Mobile Phones
- Wearable Technology

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 ( $t_p=8/20\mu s$ )	3.0	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 device. 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.

### Thermal Information

Parameter	Rating	Units
Storage Temperature Range	-55 to 150	°C
Maximum Junction Temperature	150	°C
Maximum Lead Temperature (Soldering 20-40s)	260	°C

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

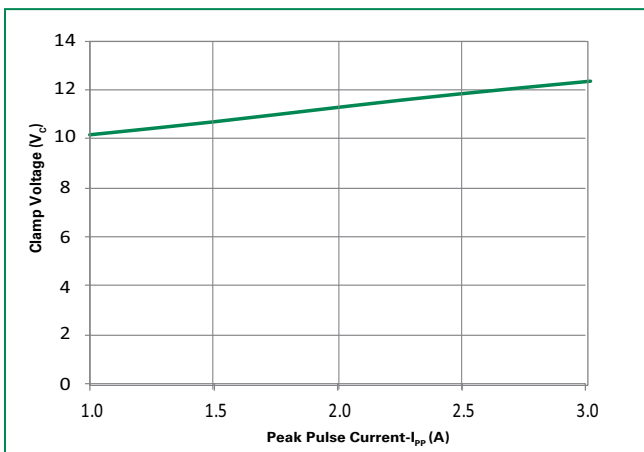
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	$V_{RWM}$				5.0	V
Reverse Breakdown Voltage	$V_{BD}$	$I_R=1mA$	6.0			V
Leakage Current	$I_R$	$V_R=5V$			1.0	$\mu A$
Clamp Voltage <sup>1</sup>	$V_C$	$I_{PP}=1A, t_p=8/20\mu s, Fwd$		10.2		V
		$I_{PP}=3A, t_p=8/20\mu s, Fwd$		12.3		V
Dynamic Resistance <sup>2</sup>	$R_{DYN}$	TLP, $t_p=100ns, I/O$ to GND		0.48		$\Omega$
ESD Withstand Voltage <sup>1</sup>	$V_{ESD}$	IEC61000-4-2 (Contact Discharge)	$\pm 15$			kV
		IEC61000-4-2 (Air Discharge)	$\pm 30$			kV
Diode Capacitance <sup>1</sup>	$C_D$	Reverse Bias=0V (I/O to GND)		6.5		pF

Note:

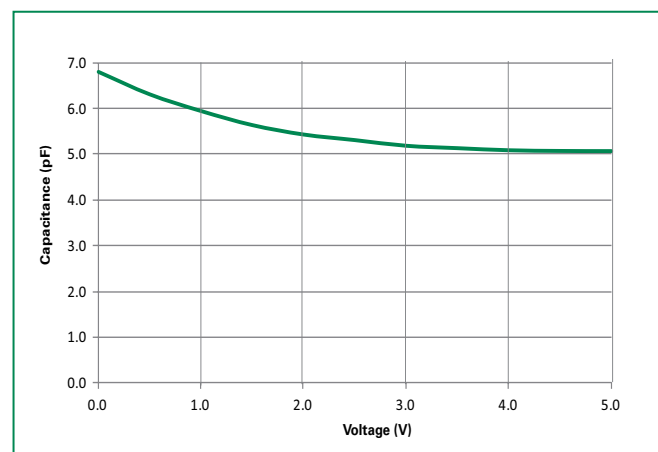
<sup>1</sup> Parameter is guaranteed by design and/or device characterization.

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

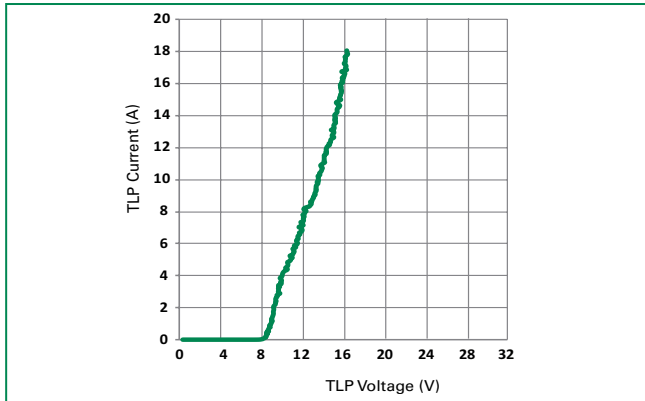
### Clamping Voltage vs. $I_{PP}$



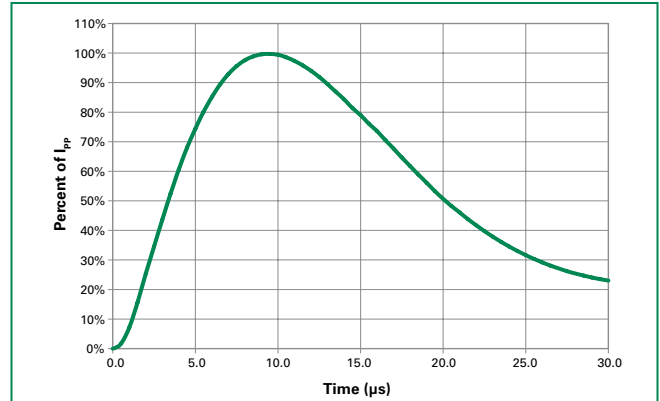
### Capacitance vs. Reverse Bias



**Transmission Line Pulsing(TLP) Plot**

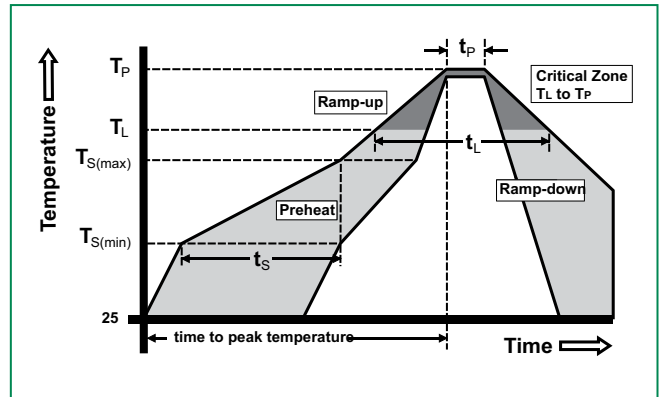


**Pulse Waveform**

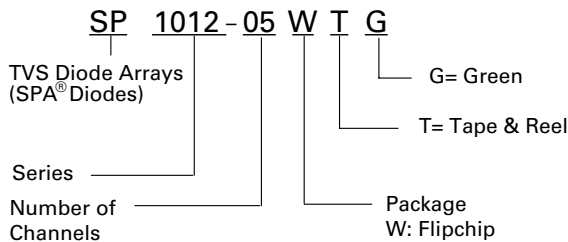


**Soldering Parameters**

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



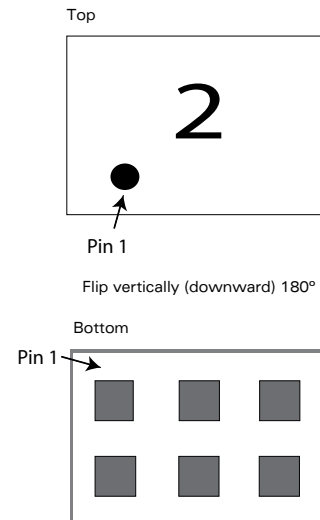
**Part Numbering System**



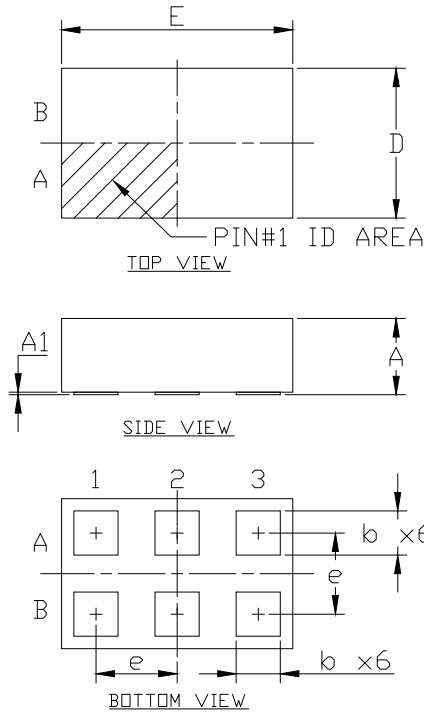
**Ordering Information**

Part Number	Package	Marking	Min. Order Qty.
SP1012-05WTG	0.94x0.61mm Flip Chip	2	5000

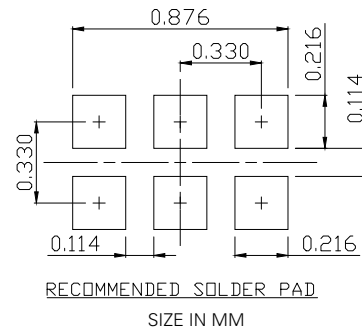
**Part Marking System**



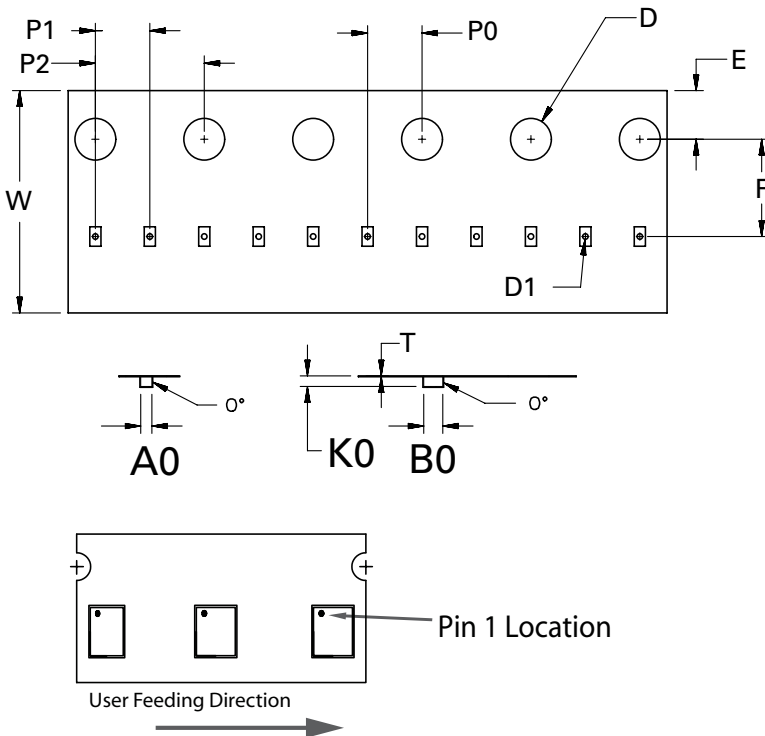
**Package Dimensions**



Symbol	0.94x0.61mm Flip Chip					
	Millimeters			Inches		
	Min	Typ	Max	Min	Typ	Max
<b>A</b>	0.280	0.310	0.340	0.0110	0.0122	0.0134
<b>A1</b>	0.005	0.010	0.015	0.0002	0.0004	0.0006
<b>b</b>	0.175	0.180	0.185	0.0069	0.0071	0.0073
<b>D</b>	0.585	0.610	0.635	0.0230	0.0240	0.0250
<b>E</b>	0.915	0.940	0.965	0.0360	0.0370	0.0380
<b>e</b>	0.330			0.0130		



**Embossed Carrier Tape & Reel Specification – Flipchip**



Symbol	Millimeters
<b>A0</b>	0.68+/-0.03
<b>B0</b>	1.12+/-0.03
<b>D</b>	∅ 1.50 + 0.10
<b>D1</b>	∅ 0.40 +/- 0.05
<b>E</b>	1.75+/-0.10
<b>F</b>	3.50+/-0.05
<b>K0</b>	0.36+/-0.03
<b>P0</b>	2.00+/-0.05
<b>P1</b>	2.00+/-0.05
<b>P2</b>	4.00+/-0.10
<b>W</b>	8.00 + 0.30 -0.10
<b>T</b>	0.20+/-0.02