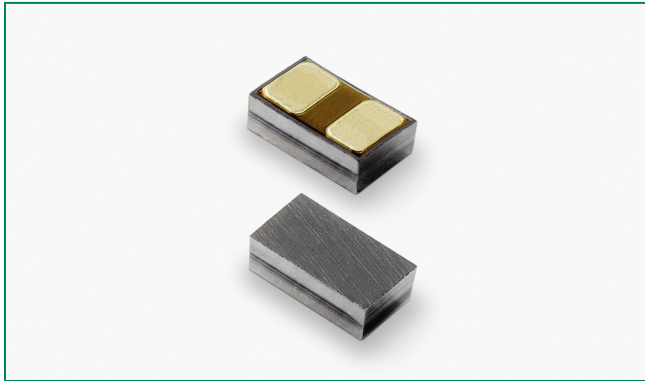
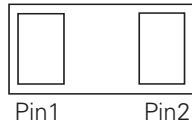


## SP1013 Series 30pF 30kV Bidirectional Discrete TVS



### Pinout



Note: Drawing not to scale

### Functional Block Diagram



### Description

The SP1013 includes back-to-back Zener diodes which provides protection for electronic equipment that may experience destructive electrostatic discharges (ESD). It measures 0.52 x 0.27mm permitting use of the standard 0201 footprints, but offering a 30% reduction in occupied board space. The SP1013 can safely absorb repetitive ESD strikes above the maximum level specified in the IEC61000-4-2 international standard (Level 4, ±8kV contact discharge) without performance degradation, and the back-to-back configuration provides symmetrical standoff voltage which makes the component appropriate for use when AC signals are present on the data or signal line.

### Features

- ESD, IEC61000-4-2, ±30kV contact, ±30kV air
- EFT, IEC61000-4-4, 40A (5/50ns)
- Lightning, IEC61000-4-5, 8A ( $t_p=8/20\mu s$ )
- Low capacitance of 30pF (@  $V_R=0V$ )
- Low leakage current of 5nA at 1.5V

### Applications

- Mobile Phones
- Smart Phones
- Tablets
- Wearable Technology
- Portable Medical
- Digital Cameras
- MP3/PMP
- Portable Navigation Devices
- Point of Sale Terminals

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 ( $t_p=8/20\mu s$ )	8.0 <sup>1</sup>	A
$T_{OP}$	Operating Temperature	-40 to 125	°C
$T_{STOR}$	Storage Temperature	-55 to 150	°C

Notes:

1. 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 ( $T_{OP}=25^\circ C$ )

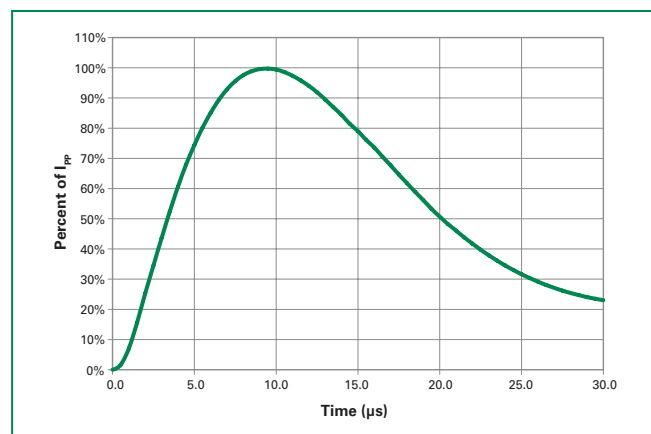
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	$V_{RWM}$	$I_R \leq 1\mu A$ with 1 pin to GND			5.0	V
Reverse Breakdown Voltage	$V_{BR}$	$I_T=1mA$ with 1 pin at GND	7.0			V
Leakage Current	$I_{LEAK}$	$V_R=1.5V$ with 1 pin at GND <sup>1</sup>			5	nA
		$V_R=3.3V$ with 1 pin at GND <sup>1</sup>			10	nA
		$V_R=5V$ with 1 pin at GND <sup>1</sup>			100	nA
Clamp Voltage <sup>1</sup>	$V_C$	$I_{PP}=1A$ , $t_p=8/20\mu s$ , Fwd		9		V
		$I_{PP}=2A$ , $t_p=8/20\mu s$ , Fwd		9.5		V
Dynamic Resistance <sup>2</sup>	$R_{DYN}$	TLP $t_p=100ns$ , 1 Pin to GND		0.2		$\Omega$
ESD Withstand Voltage <sup>1</sup>	$V_{ESD}$	IEC61000-4-2 (Contact Discharge)	$\pm 30$			kV
		IEC61000-4-2 (Air Discharge)	$\pm 30$			kV
Diode Capacitance <sup>1</sup>	$C_D$	Reverse Bias=0V, f=1MHz		30	35	pF

Note:

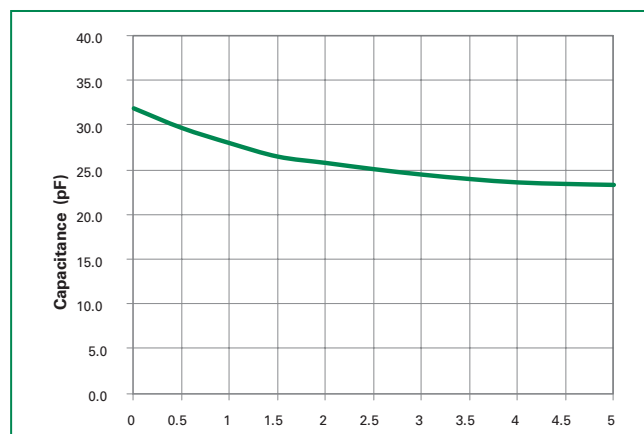
1 Parameter is guaranteed by design and/or device characterization.

2 Transmission Line Pulse (TLP) test setting : Std.TDR(50 $\Omega$ ),  $t_p=100ns$ ,  $t_r=0.2ns$  ITLP and VTLP averaging window: star  $t_1=70ns$  to end  $t_2=80ns$

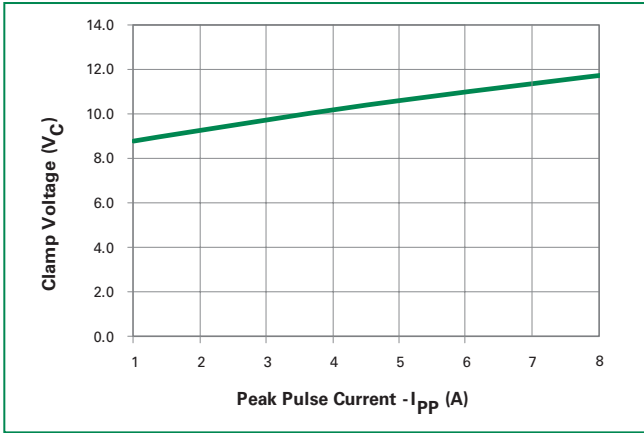
### Pulse Waveform



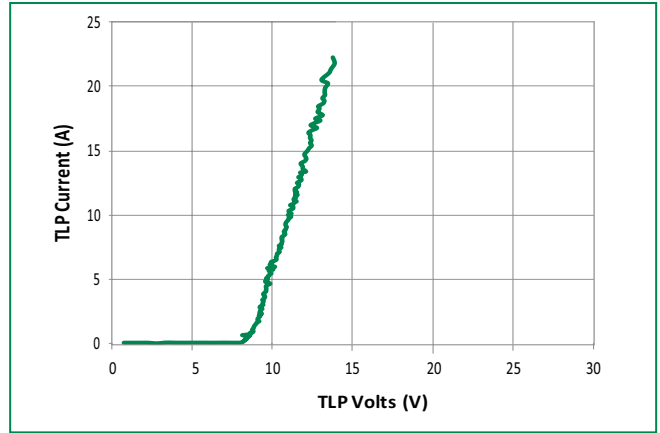
### Capacitance vs. Reverse Bias (1 Pin to GND)



**Clamping Voltage vs. Peak Pulse Current (1 Pin to GND)**

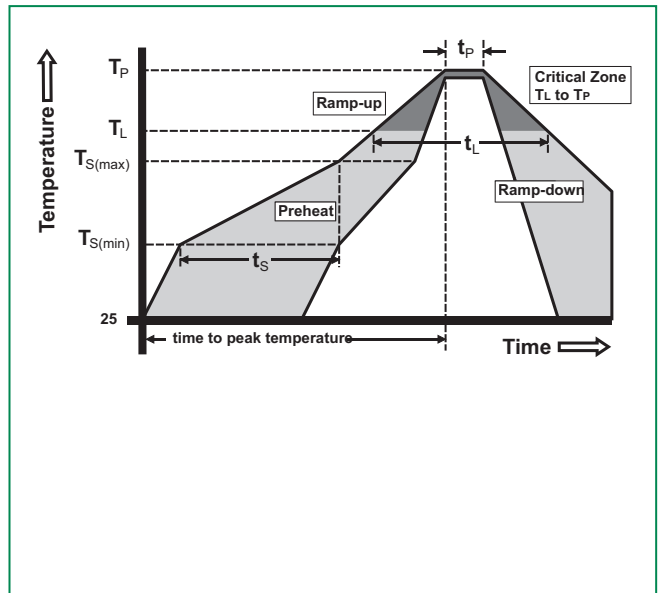


**Transmission Line Pulsing(TLP) Plot(1 Pin to GND)**



**Soldering Parameters**

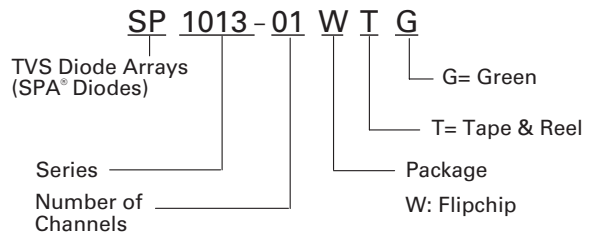
Reflow Condition	Pb – Free assembly	
Pre Heat	- Temperature Min ( $T_{s(min)}$ )	150°C
	- Temperature Max ( $T_{s(max)}$ )	200°C
	- Time (min to max) ( $t_s$ )	60 – 180 secs
Average ramp up rate (Liquidus) Temp ( $T_L$ ) to peak		3°C/second max
$T_{s(max)}$ to $T_L$ - Ramp-up Rate		3°C/second max
Reflow	- 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**



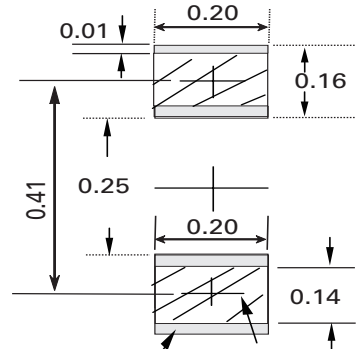
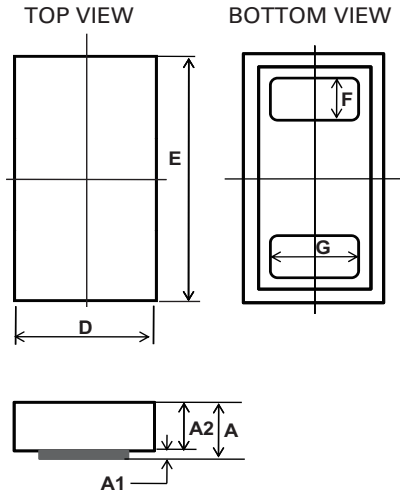
**Part Numbering System**



**Ordering Information**

Part Number	Package	Marking	Min. Order Qty.
SP1013-01WTG	Flipchip	•	15000

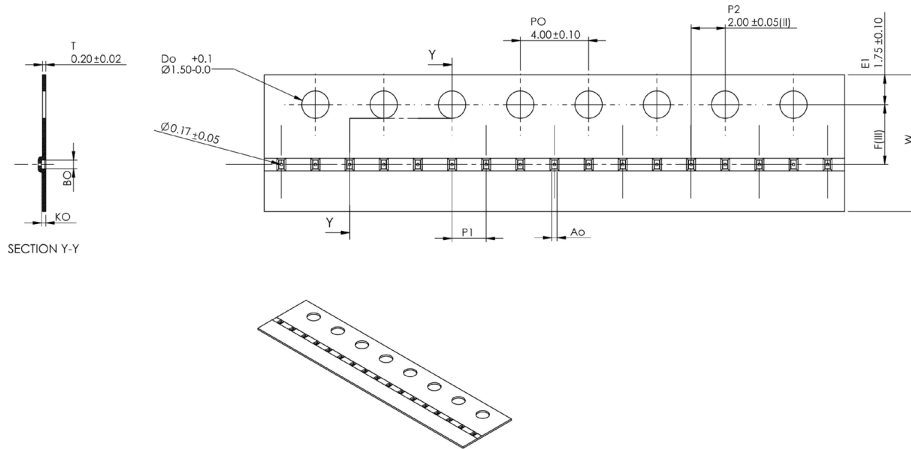
**Package Dimensions – Flipchip**



**Stencil opening (0.20x0.16)**  
**Solder Pad (0.20x0.14)**  
**Recommended Solder Pad Footprint and Stencil opening**  
**Thickness of Stencil opening is 0.08mm**  
**\*Sizes in mm**

Symbol	Flipchip					
	Millimeters			Inches		
	Min	Typ	Max	Min	Typ	Max
<b>A</b>	0.183	0.211	0.239	0.0072	0.0083	0.0094
<b>A1</b>	0.008	0.011	0.014	0.0003	0.0004	0.0006
<b>A2</b>	0.175	0.200	0.225	0.0069	0.0079	0.0089
<b>D</b>	0.280	0.290	0.300	0.0110	0.0114	0.0118
<b>E</b>	0.530	0.540	0.550	0.0209	0.0213	0.0217
<b>F</b>	-	0.100	-	-	0.0039	-
<b>G</b>	-	0.200	-	-	0.0079	-

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



Symbol	Millimeters
<b>A0</b>	0.34+/-0.03
<b>B0</b>	0.60+/-0.03
<b>K0</b>	0.25 + 0.03
<b>F</b>	3.50 +/- 0.05
<b>P1</b>	2.00+/-0.10
<b>W</b>	8.00+/-0.10