

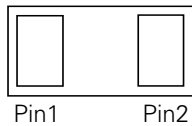
# SP1013 Series 30pF 30kV Bidirectional Discrete TVS



**OBSOLETE** DATE: 6/10/2020 PCN/ECN# ESU270-51  
REPLACED BY: SP1020-01WTG

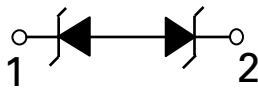


## Pinout



Note: Drawing not to scale

## Functional Block Diagram



## Additional Information



Datasheet



Resources



Samples

## 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 IEC 61000-4-2 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, IEC 61000-4-2, ±30kV contact, ±30kV air
- EFT, IEC 61000-4-4, 40A (5/50ns)
- Lightning, IEC 61000-4-5 2nd edition, 8A (t<sub>p</sub>=8/20µs)
- Low capacitance of 30pF (@ V<sub>R</sub>=0V)
- Low leakage current of 5nA at 1.5V
- RoHS compliant, Lead-free, and Halogen free

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

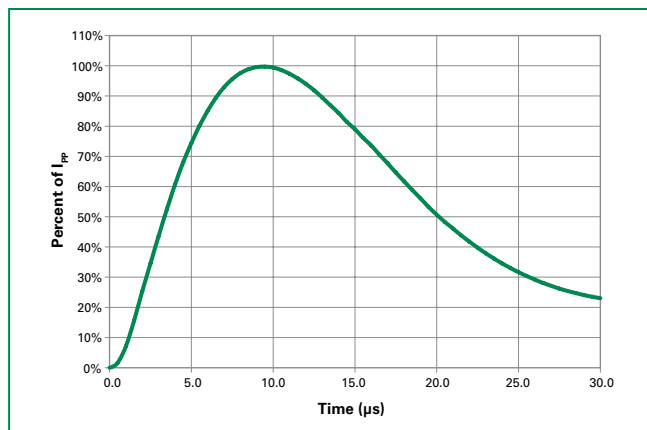
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	$V_{RWM}$	$I_R \leq 1\mu A$ with 1 pin to GND			5.0	V
Reverse Breakdown Voltage	$V_{BR}$	$I_T=1mA$ with 1 pin at GND	7.0			V
Leakage Current	$I_{LEAK}$	$V_R=1.5V$ with 1 pin at GND <sup>1</sup>			5	nA
		$V_R=3.3V$ with 1 pin 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>	$V_{ESD}$	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		30	35	pF

Note:

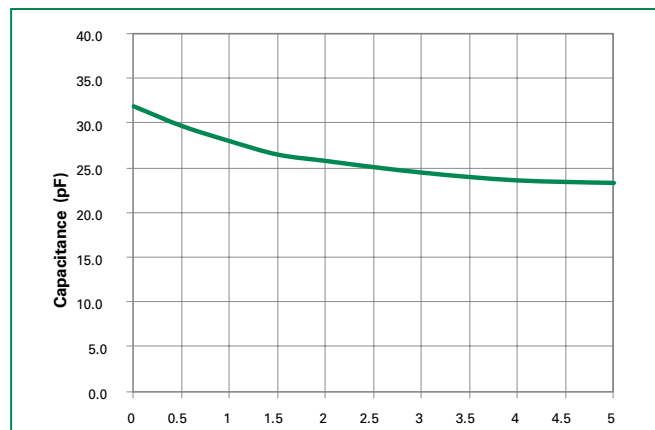
1 Parameter is guaranteed by design and/or component characterization.

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  $t_2=80ns$

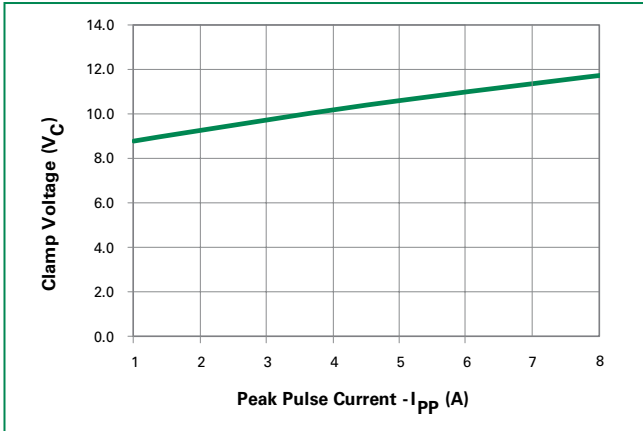
### 8/20 $\mu s$ Pulse Waveform



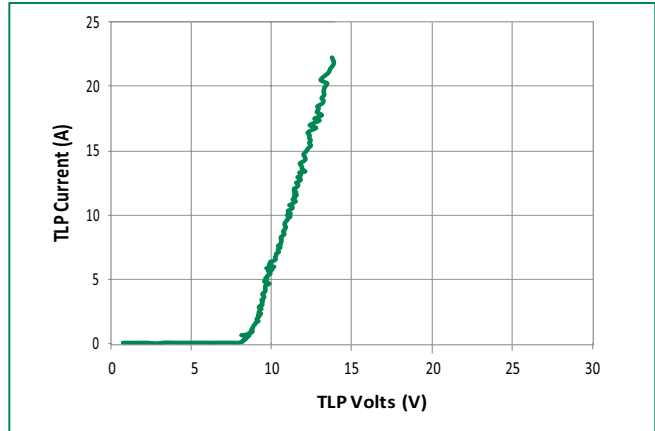
### Capacitance vs. Reverse Bias (1 Pin to GND)



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

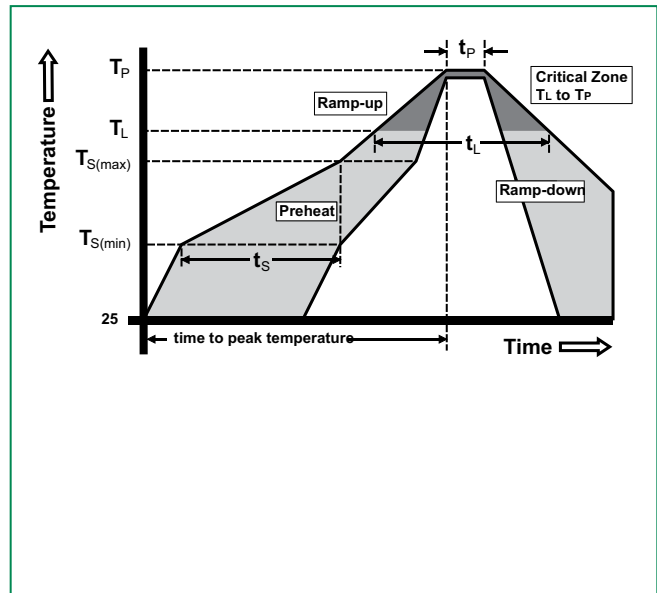


**Transmission Line Pulsing (TLP) Plot (1 Pin to GND)**



**Soldering Parameters**

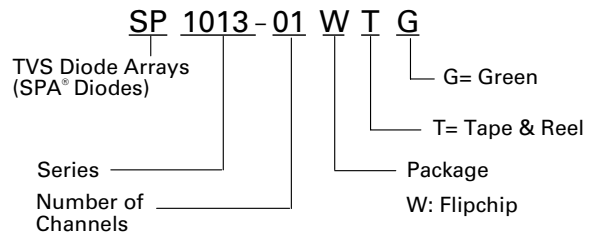
Reflow Condition		Pb – Free assembly
Pre Heat	- Temperature Min ( $T_{s(min)}$ )	150°C
	- Temperature Max ( $T_{s(max)}$ )	200°C
	- Time (min to max) ( $t_s$ )	60 – 180 secs
Average ramp up rate (Liquidus) Temp ( $T_L$ ) to peak		3°C/second max
$T_{s(max)}$ to $T_L$ - Ramp-up Rate		3°C/second max
Reflow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



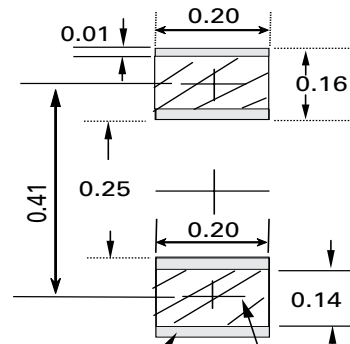
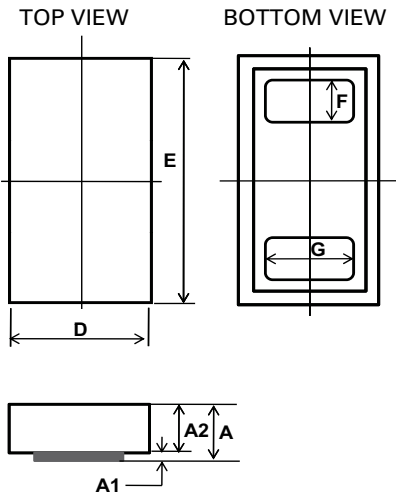
**Part Numbering System**



**Ordering Information**

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

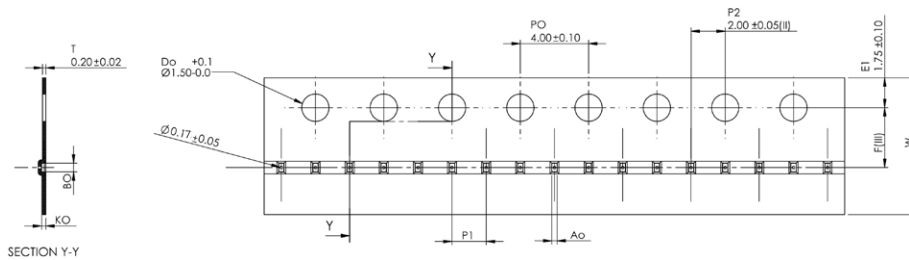
**Package Dimensions – Flipchip**



**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