

## SP3145 Series 0.35pF 20kV Unidirectional Discrete TVS

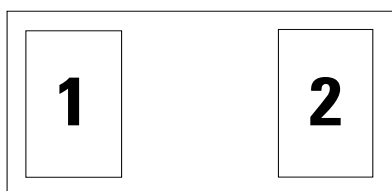
HF RoHS Pb GREEN



### Description

The SP3145 represents an industry first: unidirectional ESD protection in a 01005 type package. Unidirectional protection should be favored over bi directional performance, particularly on logic and data lines, which typically do not transit zero volts during standard operation. Fast-acting, semiconductor based technology can withstand multiple ESD events, without wear-out or degradation. Low nominal capacitance makes this product meaningful for interfaces running at high data rates, approaching 5 GHz clock speeds.

### Pinout

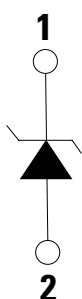


**Note:** Drawing not to scale

### Features

- ESD, IEC 61000-4-2,  $\pm 20\text{kV}$  contact,  $\pm 25\text{kV}$  air
- EFT, IEC 61000-4-4, 40A (5/50ns)
- Lightning, IEC 61000-4-5 2nd edition, 1A ( $t_P=8/20\mu\text{s}$ )
- Low capacitance of 0.35pF (@  $V_R=0\text{V}$ )
- Low leakage current of 20nA (MAX) at 2.8V
- Industry-first unidirectional protection, critical for data line protection, and any interface which does not transit zero volts
- Industry's smallest single channel form factor, nominally 01005
- Halogen free, Lead free and RoHS compliant

### Functional Block Diagram



### Applications

- Mobile Phones
- Smart Phones
- Camcorders
- Portable Medical
- Digital Cameras
- Wearable Technology
- Portable Navigation Components
- Tablets
- 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 ( $t_p=8/20\mu s$ )	1.0 <sup>1</sup>	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 ( $T_{OP}=25^{\circ}C$ )

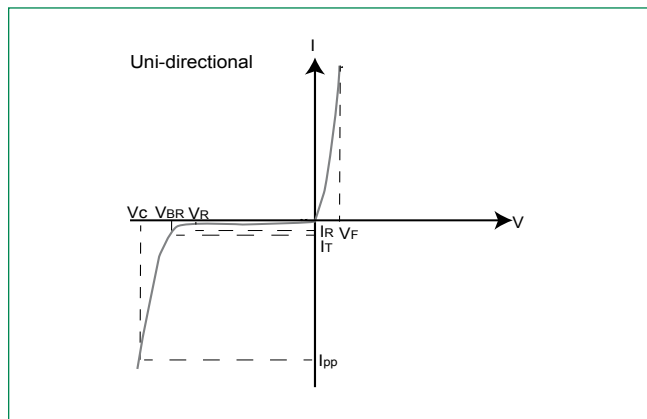
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	$V_{RWM}$	-	-	-	3.3	V
Breakdown Voltage	$V_{BR}$	$I_R=1mA$	-	7.5	-	V
Forward Voltage	$V_F$	$I_T=1mA$	0.5	0.7	1.0	V
Leakage Current <sup>1</sup>	$I_{LEAK}$	$V_R=1.5V$ with 1 pin at GND	-	<1	5	nA
		$V_R=2.8V$ with 1 pin at GND	-	2.0	20	
Clamp Voltage <sup>1</sup>	$V_C$	$I_{PP}=1A$ , $t_p=8/20\mu s$ , Fwd	-	11.5	-	V
Dynamic Resistance <sup>2</sup>	$R_{DYN}$	TLP, $t_p=100ns$ , I/O to GND	-	3.5	-	$\Omega$
ESD Withstand Voltage <sup>1</sup>	$V_{ESD}$	IEC 61000-4-2 (Contact Discharge)	$\pm 20$	-	-	kV
		IEC 61000-4-2 (Air Discharge)	$\pm 25$	-	-	kV
Diode Capacitance <sup>1</sup>	$C_D$	Reverse Bias=0V	-	0.35	-	pF

**Note:**

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

2. Transmission Line Pulse (TLP) with 100ns width, 2ns rise time, and average window  $t_1=70ns$  to  $t_2=90ns$

## I-V Curve Characteristics



**$V_R$  Stand-off Voltage** – Maximum voltage that can be applied to the TVS without operation

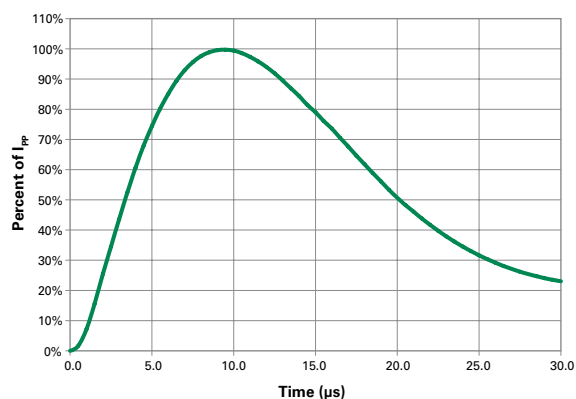
**$V_{BR}$  Breakdown Voltage** – Maximum voltage that flows though the TVS at a specified test current ( $I_T$ )

**$V_C$  Clamping Voltage** – Peak voltage measured across the TVS at a specified  $I_{PP}$  (peak impulse current)

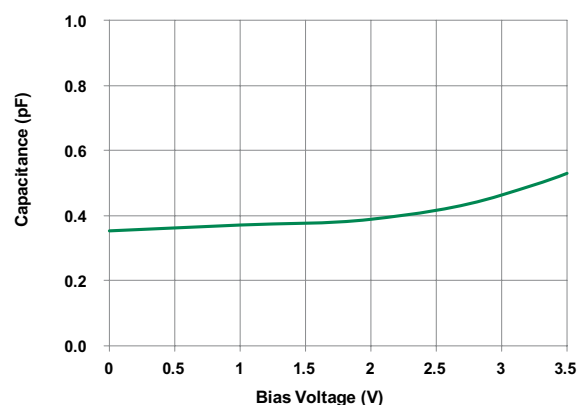
**$I_R$  Reverse Leakage Current** – Current measured at  $V_R$

**$V_F$  Forward Voltage Drop for Uni-directional**

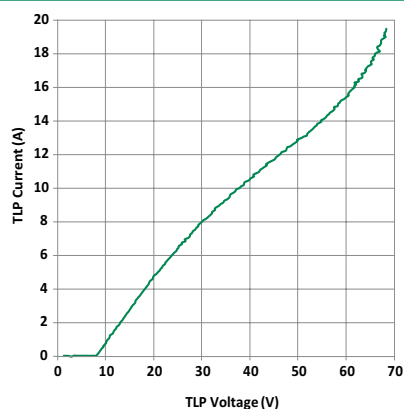
### 8/20μs Pulse Waveform



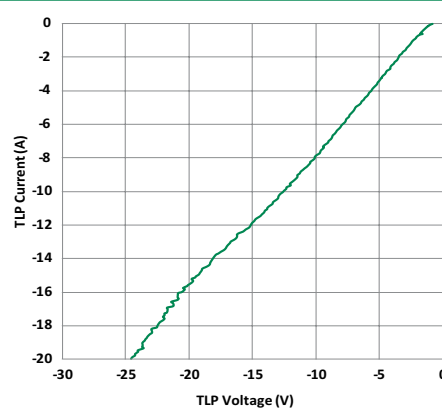
### Capacitance vs Reverse Bias



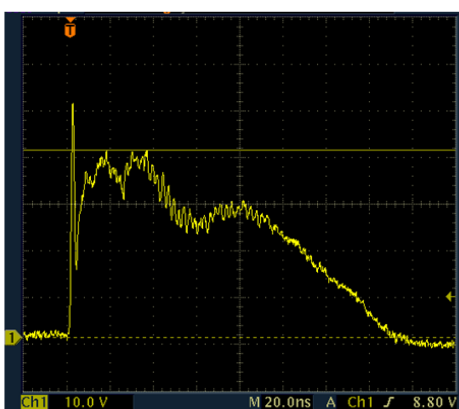
### Positive Transmission Line Pulsing (TLP) Plot



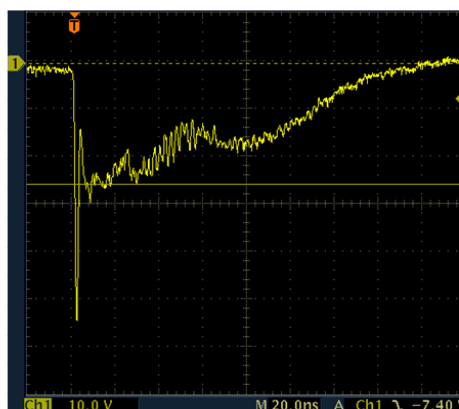
### Negative Transmission Line Pulsing (TLP) Plot



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

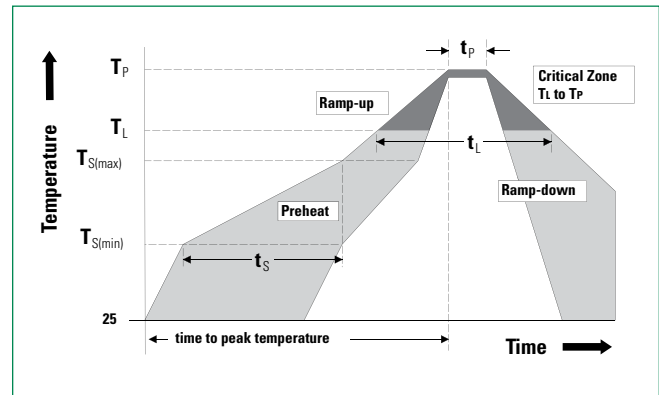


### IEC 61000-4-2 -8 kV Contact ESD Clamping Voltage

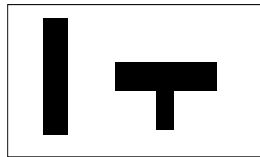


## Soldering Parameters

<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



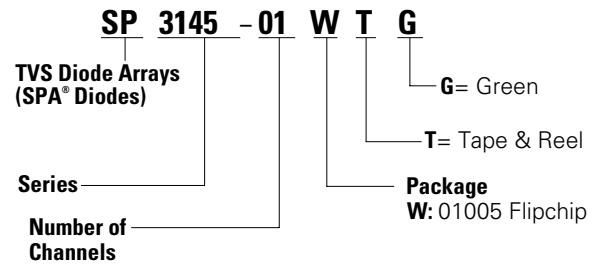
## Part Marking System



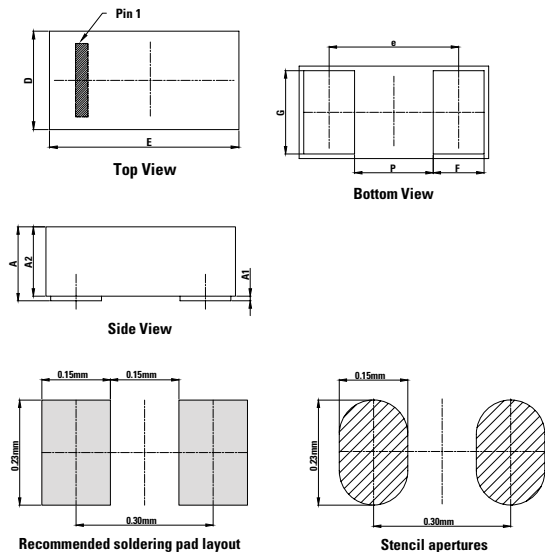
## Ordering Information

Part Number	Package	Min. Order Qty.
SP3145-01WTG	01005 Flipchip	15000

## Part Numbering System

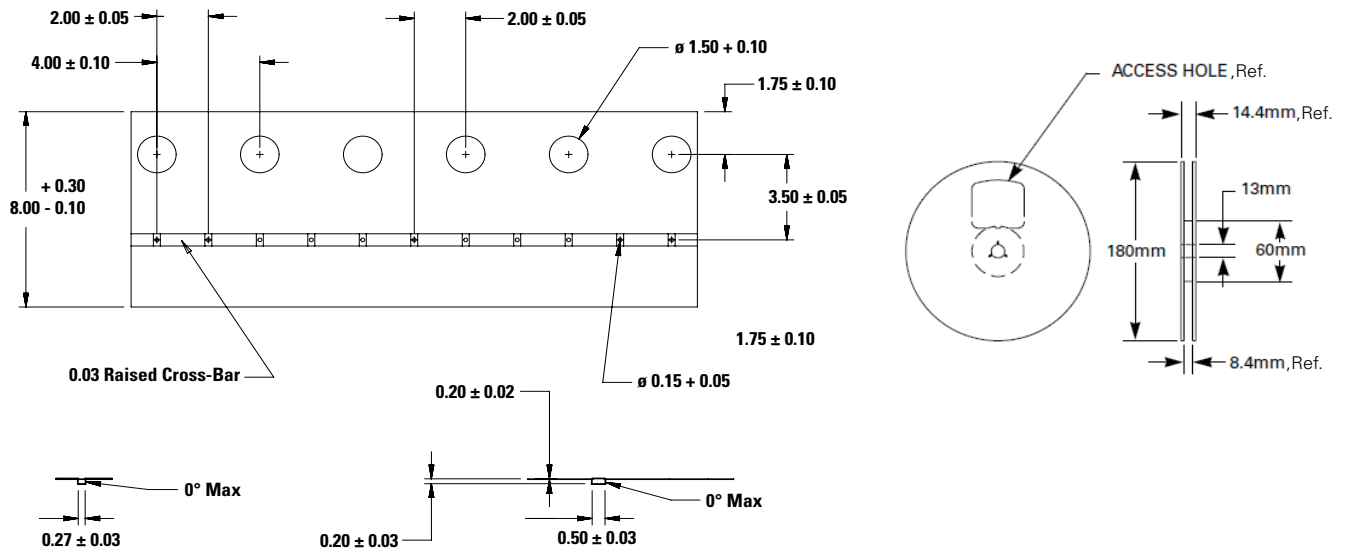


## Package Dimensions — 01005 Flipchip



Symbol	01005 Flipchip					
	Millimeters			Inches		
	Min	Typ	Max	Min	Typ	Max
<b>A</b>	0.168	0.181	0.194	0.007	0.007	0.008
<b>A1</b>	0.008	0.011	0.014	0.000	0.000	0.001
<b>A2</b>	0.160	0.170	0.180	0.006	0.007	0.007
<b>e</b>	0.280 BSC			0.011 BSC		
<b>D</b>	0.200	0.230	0.260	0.008	0.009	0.010
<b>E</b>	0.400	0.430	0.460	0.016	0.017	0.018
<b>F</b>	0.110	0.130	0.150	0.004	0.005	0.006
<b>G</b>	0.180	0.200	0.220	0.007	0.008	0.009
<b>P</b>	0.130	0.150	0.170	0.005	0.006	0.007

**Embossed Carrier Tape & Reel Specification — 01005 Flipchip**



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