

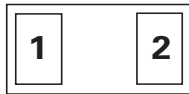
**SP3145 Series 0.35pF 20kV Unidirectional Discrete TVS**



**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, ±20kV contact, ±25kV air
- EFT, IEC 61000-4-4, 40A (5/50ns)
- Lightning, IEC 61000-4-5 2nd edition, 1A (tP=8/20µs)
- Low capacitance of 0.35pF (@ VR=0V)
- 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 Devices
- 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

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

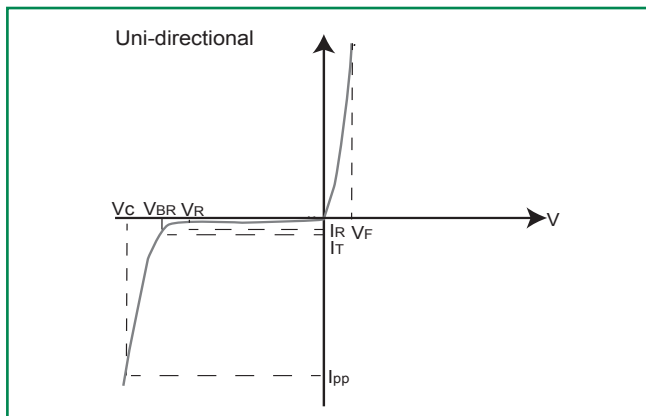
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	$V_{RWM}$				3.3	V
Breakdown Voltage	$V_{BR}$	$I_R=1mA$		7.5		V
Forward Voltage	$V_F$	$I_T=1mA$	0.5	0.7	1.0	V
Leakage Current <sup>1</sup>	$I_{LEAK}$	$V_R=1.5V$ with 1 pin at GND		<1	5	nA
		$V_R=2.8V$ with 1 pin at GND		2.0	20	
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 device 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

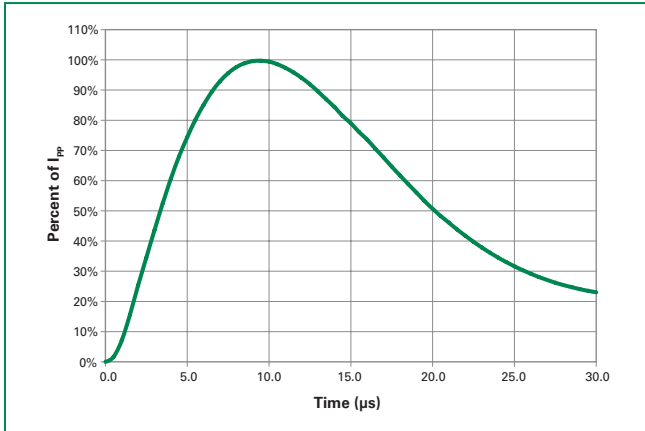
$V_{BR}$  **Breakdown Voltage** – Maximum voltage that flows through the TVS at a specified test current ( $I_T$ )

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

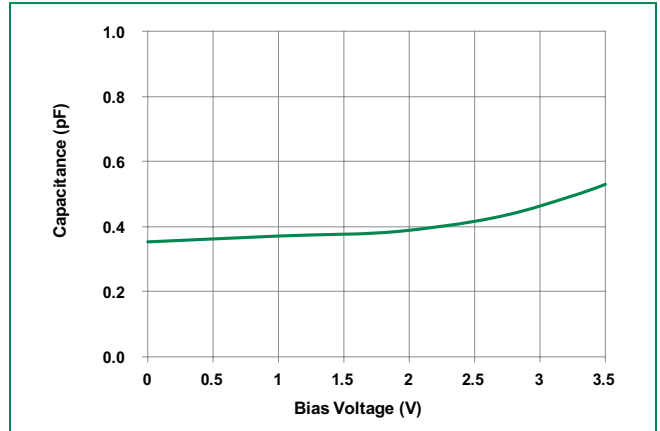
$I_R$  **Reverse Leakage Current** – Current measured at  $V_R$

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

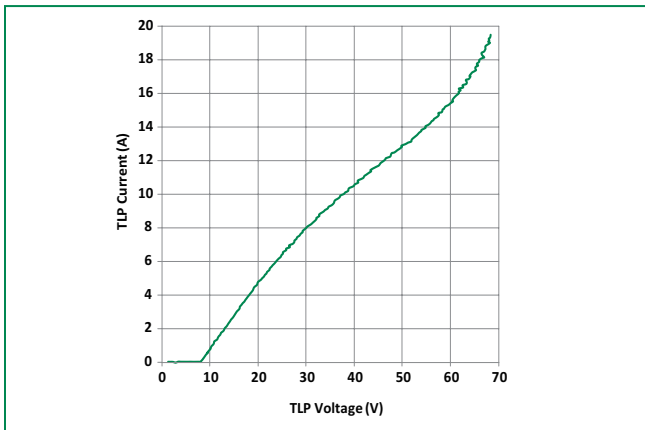
**8/20µs Pulse Waveform**



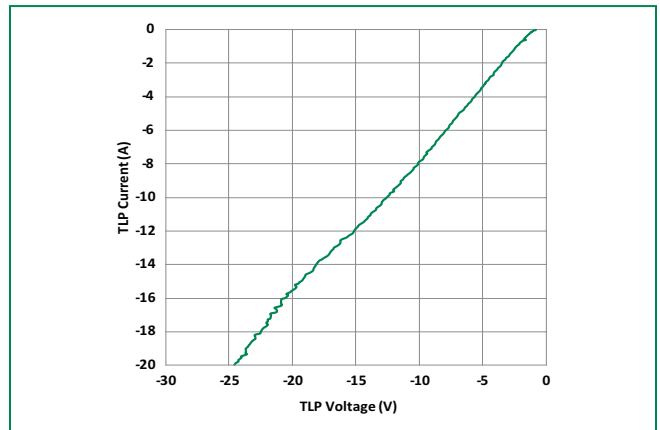
**Capacitance vs Reverse Bias**



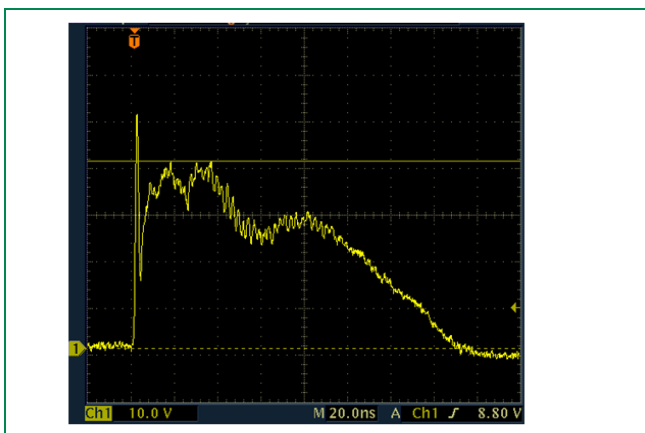
**Positive Transmission Line Pulsing (TLP) Plot**



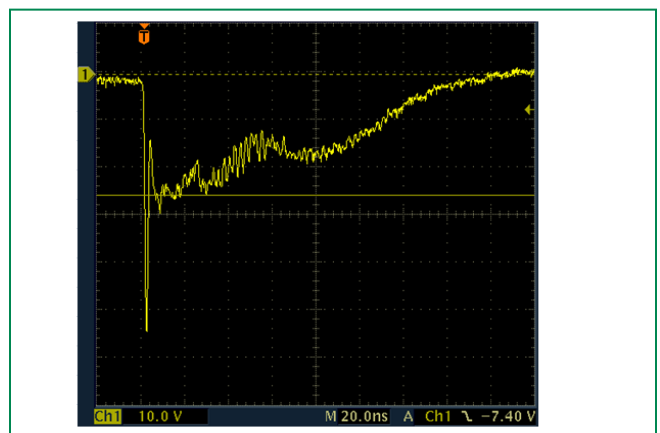
**Negative Transmission Line Pulsing (TLP) Plot**



**IEC61000-4-2 +8 KV Contact ESD Clamping Voltage**

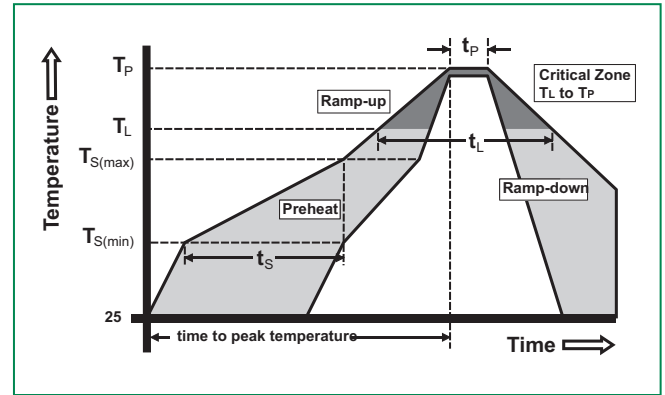


**IEC61000-4-2 -8 KV Contact ESD Clamping Voltage**



**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



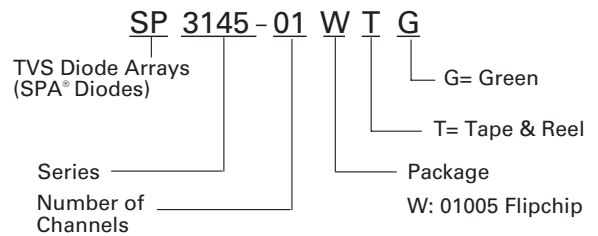
**Part Marking System**



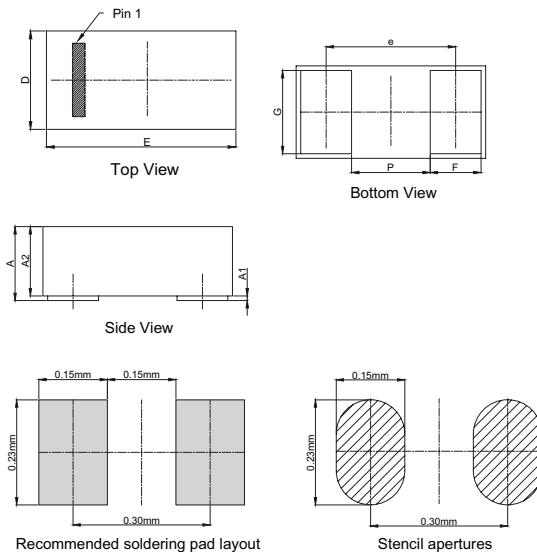
**Ordering Information**

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
A	0.168	0.181	0.194	0.007	0.007	0.008
A1	0.008	0.011	0.014	0.000	0.000	0.001
A2	0.160	0.170	0.180	0.006	0.007	0.007
e	0.280 BSC			0.011 BSC		
D	0.200	0.230	0.260	0.008	0.009	0.010
E	0.400	0.430	0.460	0.016	0.017	0.018
F	0.110	0.130	0.150	0.004	0.005	0.006
G	0.180	0.200	0.220	0.007	0.008	0.009
P	0.130	0.150	0.170	0.005	0.006	0.007

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

