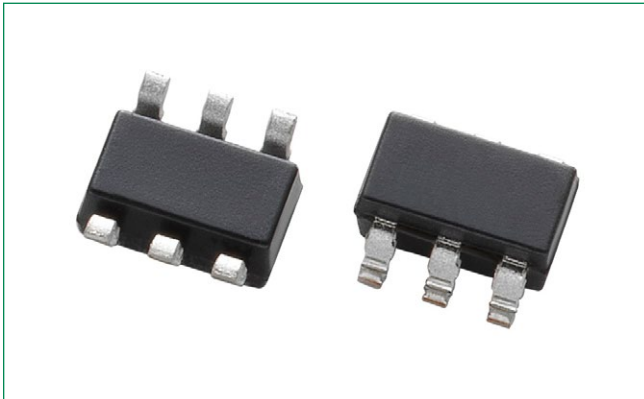


## SP4010 0.48pF Diode Array

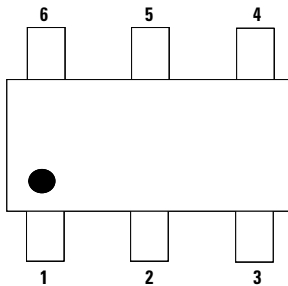


### Description

The SP4010 integrates 2 channels of ultra low capacitance asymmetrical protection for electronic equipment that may experience destructive electrostatic discharges (ESD). These robust components can safely absorb repetitive ESD strikes above the maximum contact level specified in the IEC 61000-4-2 international standard ( $\pm 30\text{kV}$  contact discharge) without performance degradation.

The extremely low off-state capacitance also makes it ideal for protecting high speed signal lines such as USB3.0, HDMI, USB2.0, and eSATA.

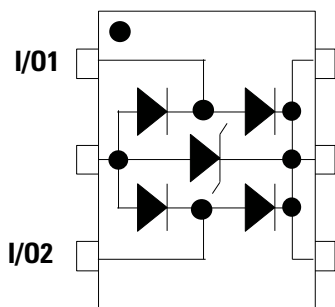
### Pinout



### Features

- ESD, IEC 61000-4-2,  $\pm 30\text{kV}$  contact,  $\pm 30\text{kV}$  air
- EFT, IEC 61000-4-4, 40A ( $t_p=5/50\text{ns}$ )
- Lightning, IEC 61000-4-5 2<sup>nd</sup> edition, 23A ( $t_p=8/20\mu\text{s}$ )
- Low capacitance of 0.48pF @0V, 1MHz (TYP) per I/O
- Low leakage current of 0.2 $\mu\text{A}$  (MAX) at 10V
- Moisture Sensitivity Level (MSL-1)
- Halogen free, lead free and RoHS compliant

### Functional Block Diagram



### Applications

- LCD/PDP TVs
- External Storages
- DVD/Blu-ray Players
- Desktops
- MP3/PMP
- Set Top Boxes
- Smartphones
- Ultrabooks/Notebooks
- Digital Cameras

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 ( $t_p=8/20\mu s$ )	23	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.

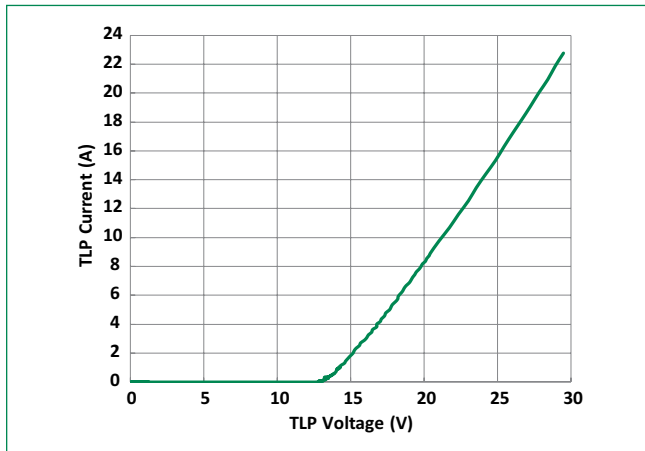
### Electrical Characteristics ( $T_{OP}=25^\circ C$ )

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	$V_{RWM}$	$I_R = 1\mu A$			10	V
Breakdown Voltage	$V_{BR}$	$I_R = 1\text{ mA}$ , I/O to I/O	10.5	12.5		V
Reverse Leakage Current	$I_{LEAK}$	$V_R=10V$ , I/O to I/O		0.01	0.2	$\mu A$
Clamp Voltage <sup>1</sup>	$V_C$	$I_{PP}=16A$ , $t_p=8/20\mu s$ , I/O to I/O		27.5	29	V
		$I_{PP}=23A$ , $t_p=8/20\mu s$ , I/O to I/O		39	43	V
Dynamic Resistance <sup>2</sup>	$R_{DYN}$	TLP, $t_p=100ns$ , I/O to I/O		0.7		$\Omega$
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>	$C_{I/O-I/O}$	Reverse Bias=0V, $f=1MHz$ , I/O to I/O		0.48	1	pF

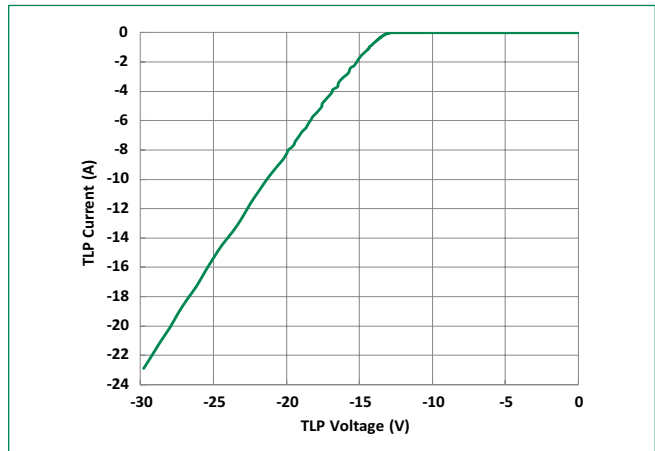
**Note:**

- Parameter is guaranteed by design and/or component characterization.
- Transmission Line Pulse (TLP) with 100ns width, 2ns rise time, and average window  $t_1=70ns$  to  $t_2=90ns$

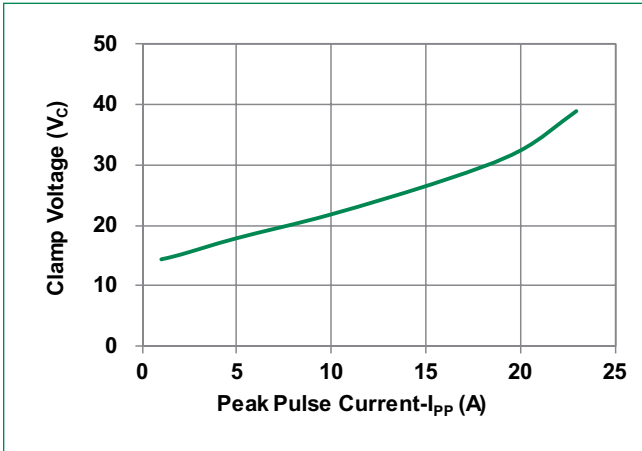
### Positive Transmission Line Pulsing (TLP) Plot



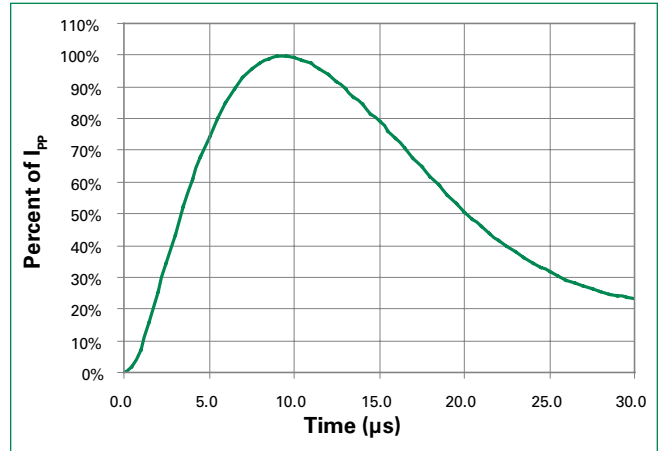
### Negative Transmission Line Pulsing (TLP) Plot



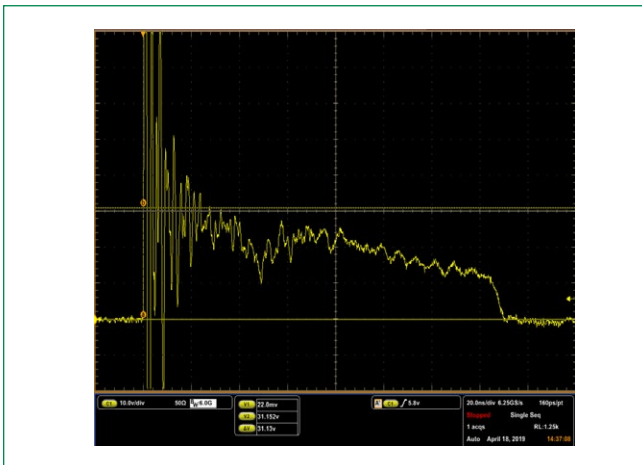
**Clamping Voltage vs.  $I_{PP}$  for 8/20  $\mu$ s waveshape**



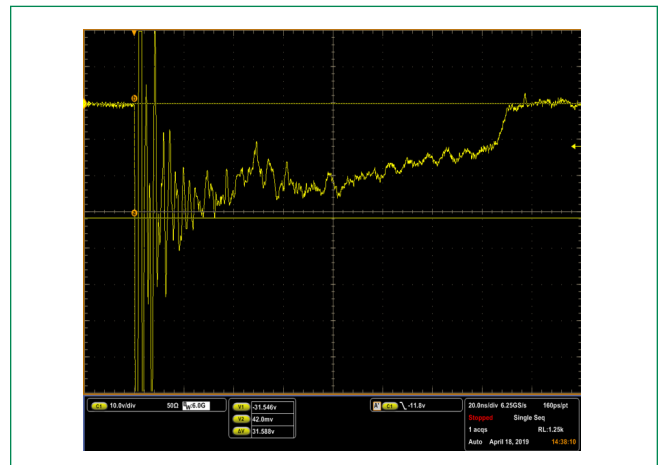
**8/20  $\mu$ s Pulse Waveform**



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

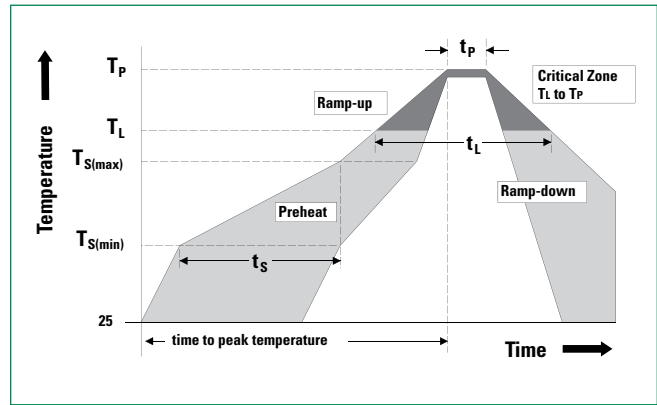


**IEC 61000-4-2 -8 kV Contact ESD Clamping Voltage**



### 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



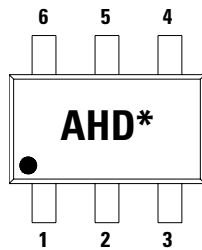
### Ordering Information

Part Number	Package	Min. Order Qty.
SP4010-02HTG	SOT23-6L	3000

### Product Characteristics

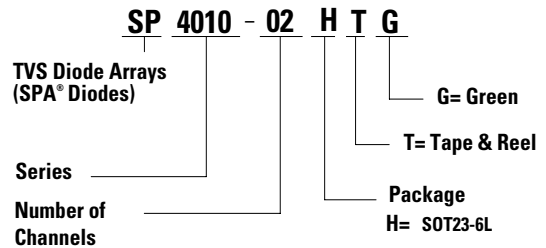
<b>Lead Plating</b>	Matte tin
<b>Lead Material</b>	Copper Alloy
<b>Lead Coplanarity</b>	0.0004 inches (0.102mm)
<b>Substrate Material</b>	Silicon
<b>Body Material</b>	Molded Compound
<b>Flammability</b>	UL Recognized compound meeting flammability rating V-0

### Part Marking System

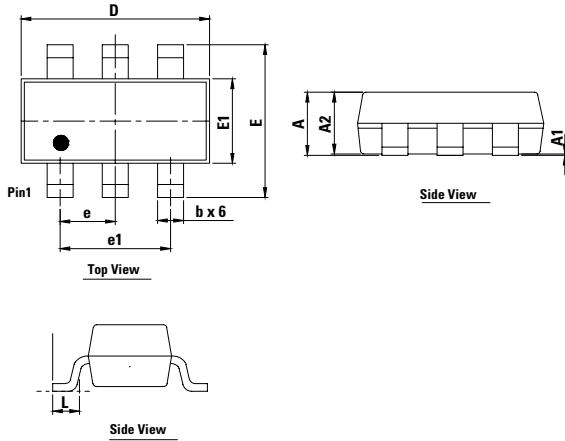


AH : Part code  
 D : Assembly code  
 \* : Date code

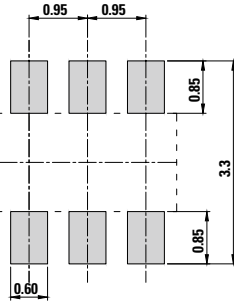
### Part Numbering System



**Package Dimensions — SOT23-6L**



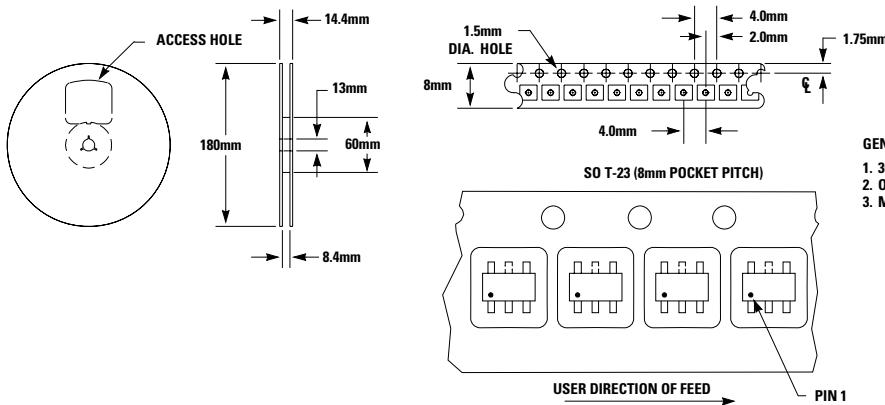
Symbol	Millimeters		
	Min	Nom	Max
A	-	-	1.45
A1	0.00	-	0.15
A2	0.90	1.15	1.30
D	2.75	2.90	3.05
E	2.60	2.80	3.00
E1	1.45	1.60	1.75
e	0.95 BSC		
e1	1.90 BSC		
L	0.30	0.50	0.60
Ø	0°	4°	8°



Recommended soldering pad layout (unit :mm)

**Embossed Carrier Tape & Reel Specification — SOT23-6L**

**8mm TAPE AND REEL**



- GENERAL INFORMATION**
- 3000 PIECES PER REEL.
  - ORDER IN MULTIPLES OF FULL REELS ONLY.
  - MEETS EIA-481 REVISION "A" SPECIFICATIONS.