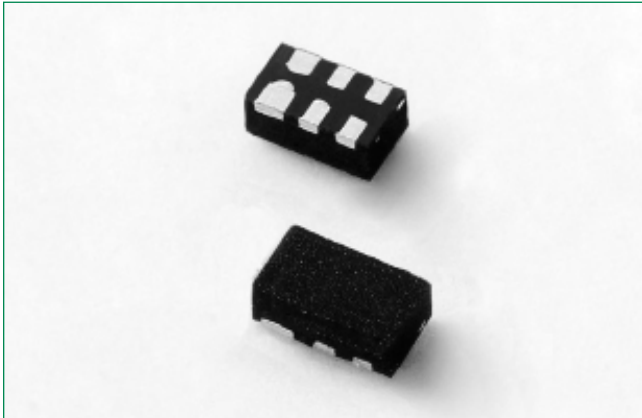


# SP3014 Series 1.0pF, 15kV Diode Array



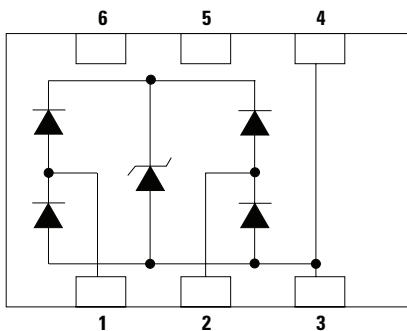
**OBSOLETE** DATE: 12/18/2021 PCN/ECN# ESU270-68  
REPLACED BY: SP3400-02UTG or SP3401-02UTG



## Pinout

I/O1	1	6	NC
I/O2	2	5	NC
GND	3	4	GND

## Functional Block Diagram



## Additional Information



Datasheet



Resources



Samples

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.

## Description

The SP3014 series integrates two channels of low capacitance steering diodes and an additional zener diode to provide protection for electronic equipment that may experience destructive electrostatic discharges (ESD). The SP3014 can safely absorb repetitive ESD strikes above the maximum level specified in the IEC 61000-4-2 international standard ( $\pm 8\text{kV}$  contact discharge) without performance degradation.

The low loading capacitance makes it ideal for protecting high-speed signal lines such as USB2.0 and 1Gb Ethernet with an extremely low dynamic resistance to protect the most sensitive, state of the art chipsets against ESD transients.

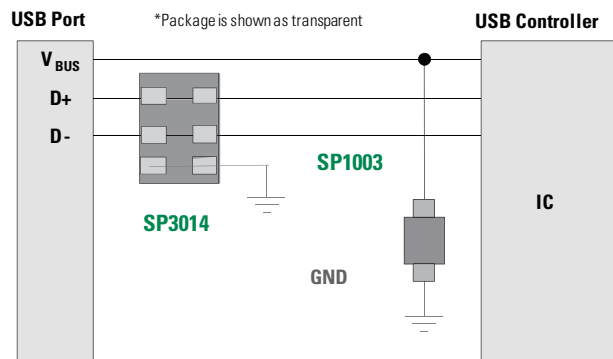
## Features

- RoHS compliant and lead-free
- ESD, IEC 61000-4-2,  $\pm 15\text{kV}$  contact,  $\pm 25\text{kV}$  air
- EFT, IEC 61000-4-4, 80A ( $t_p=5/50\text{ns}$ )
- Lightning, IEC 61000-4-5, 8A ( $t_p=8/20\mu\text{s}$ )
- Low capacitance of 1.0pF (TYP) per I/O
- Low leakage current of  $1.0\mu\text{A}$  (MAX) at 5V
- Small form factor  $\mu\text{DFN}$  (JEDEC MO-229) package provides flow through routing to simplify PCB layout
- AEC-Q101 qualified

## Applications

- LCD/PDP TVs
- External Storages
- DVD/Blu-ray Players
- Set Top Boxes
- Smartphones
- Ultrabooks/Notebooks
- Digital Cameras
- Portable Medical
- Automotive Electronics
- Wearable Technology

## USB 2.0 Protection Application Example



### Absolute Maximum Ratings

Symbol	Parameter	Value	Units
$I_{PP}$	Peak Current ( $t_p=8/20\mu s$ )	8.0	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 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.

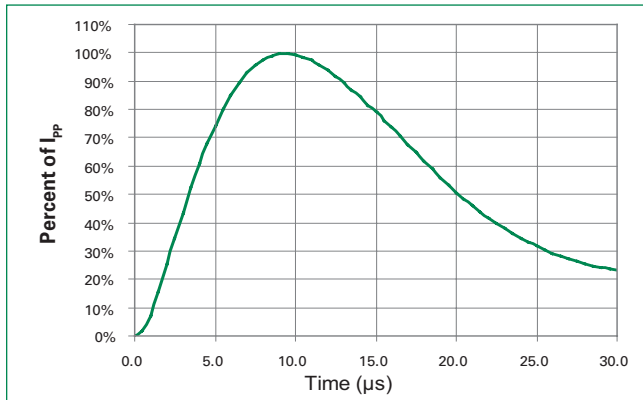
### Thermal Information — $\mu$ DFN-6L

Parameter	Rating	Units
Thermal Resistance Junction to Ambient	124.0	°C/W
Thermal Resistance Junction to Case	190.0	°C/W
Power Dissipation	1	W

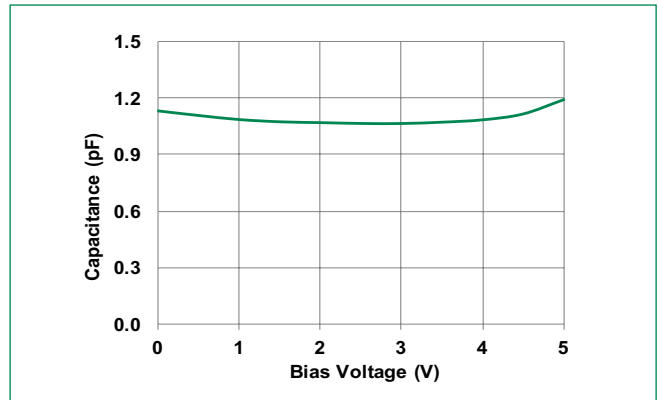
### Electrical Characteristics ( $T_{OP}=25^\circ\text{C}$ )

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	$V_{RWM}$	$I_R \leq 1\mu\text{A}$			5.0	V
Reverse Leakage Current	$I_{LEAK}$	$V_R=5\text{V}$ , Any I/O to GND			1.0	$\mu\text{A}$
Clamp Voltage <sup>1</sup>	$V_C$	$I_{PP}=1\text{A}$ , $t_p=8/20\mu s$ , Fwd		6.6		V
		$I_{PP}=2\text{A}$ , $t_p=8/20\mu s$ , Fwd		6.8		V
Dynamic Resistance <sup>1</sup>	$R_{DYN}$	$(V_{C2} - V_{C1}) / (I_{PP2} - I_{PP1})$		0.2		$\Omega$
Dynamic Resistance <sup>2</sup>	$R_{DYN}$	TLP, $t_p=100\text{ns}$ , I/O to GND		0.04		$\Omega$
ESD Withstand Voltage <sup>1</sup>	$V_{ESD}$	IEC 61000-4-2 (Contact)	$\pm 15$			kV
		IEC 61000-4-2 (Air)	$\pm 25$			kV
Diode Capacitance <sup>1</sup>	$C_{I/O-GND}$	Reverse Bias=0V, f=1 MHz		1.0		pF
Diode Capacitance <sup>1</sup>	$C_{I/O-I/O}$	Reverse Bias=0V, f=1 MHz		0.5		pF

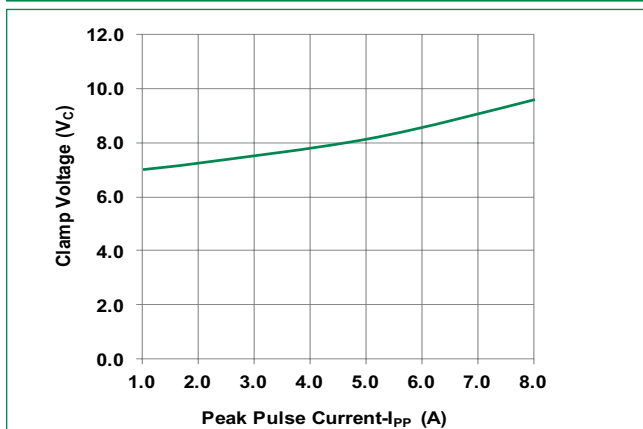
### Pulse Waveform



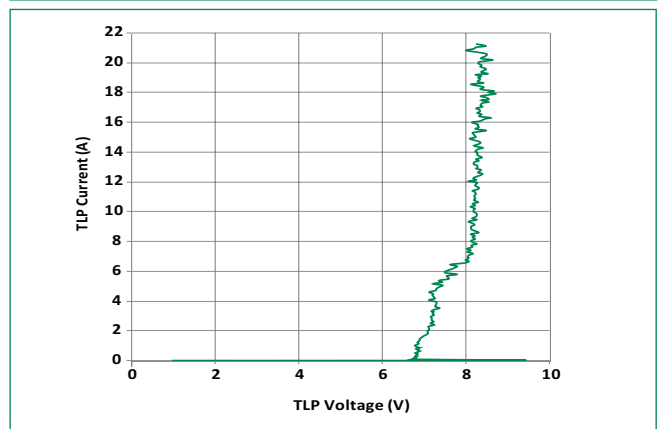
### Capacitance vs. Reverse Bias



### Clamping Voltage vs. $I_{PP}$

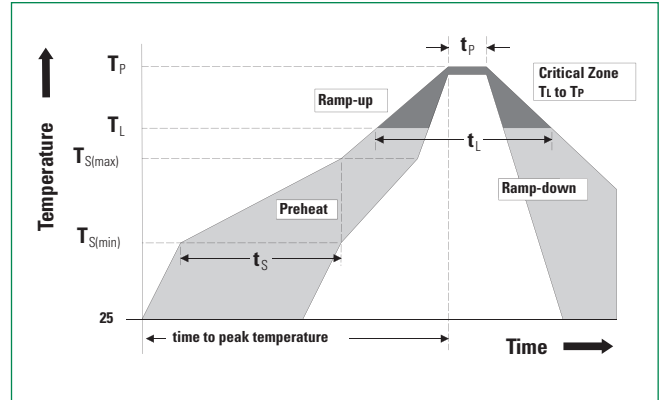


### Transmission Line Pulse (TLP)



### 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.
SP3014-02UTG	μDFN-6L	3000

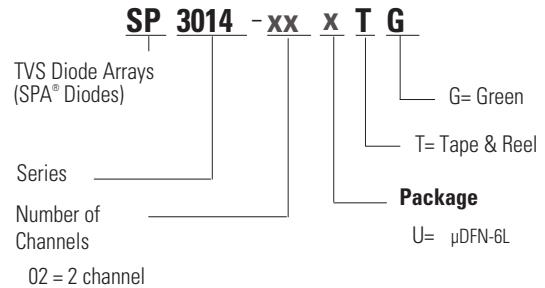
### Product Characteristics

<b>Lead Plating</b>	Pre-Plated Frame (μDFN)
<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 Epoxy
<b>Flammability</b>	UL 94 V-0

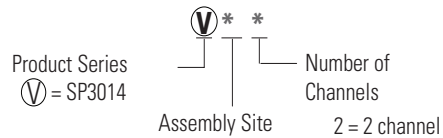
**Notes :**

- All dimensions are in millimeters
- Dimensions include solder plating.
- Dimensions are exclusive of mold flash & metal burr.
- Blo is facing up for mold and facing down for trim/form, i.e. reverse trim/form.
- Package surface matte finish VDI 11-13.

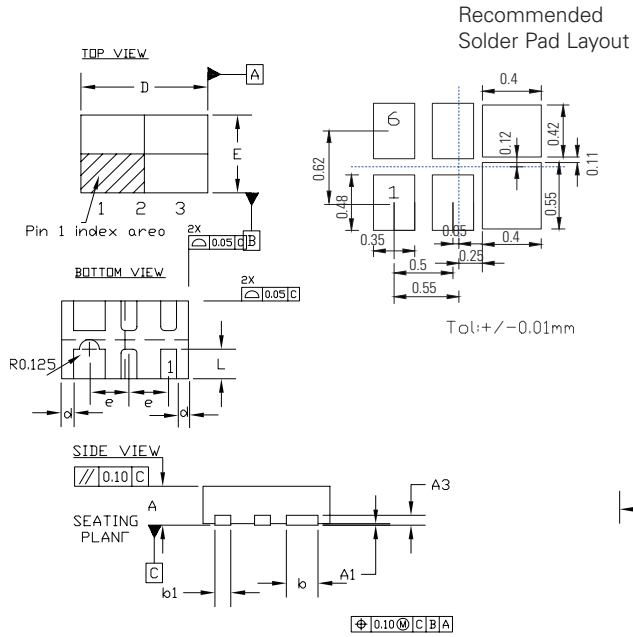
### Part Numbering System



### Part Marking System

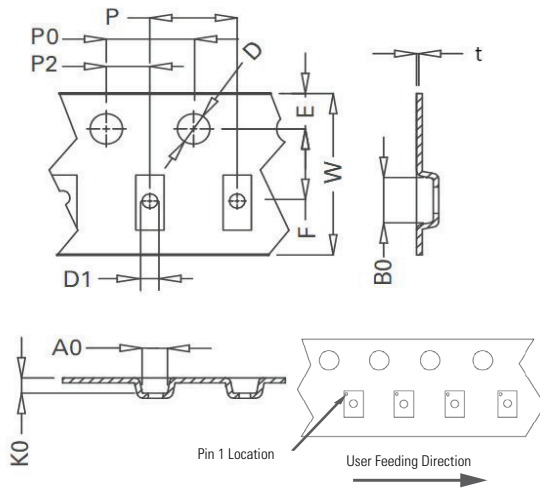


**Package Dimensions – μDFN-6L**



Package	μDFN-6L			
JEDEC	MO-229			
Pins	6			
Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A	0.45	0.55	0.018	0.022
A1	0.00	0.05	0.000	0.002
A3	0.125 REF		0.005 REF	
b	0.35	0.45	0.014	0.018
b1	0.15	0.25	0.006	0.010
D	1.55	1.65	0.062	0.065
d	0.10	0.20	0.004	0.008
E	0.95	1.05	0.038	0.042
e	0.50 REF		0.020 REF	
L	0.33	0.43	0.013	0.017

**Embossed Carrier Tape & Reel Specification – μDFN-6L**



Symbol	Millimetres		Inches	
	Min	Max	Min	Max
E	1.65	1.85	0.064	0.073
F	3.45	3.55	0.135	0.139
P2	1.95	2.05	0.076	0.081
D	1.40	1.60	0.055	0.063
D1	0.45	0.55	0.017	0.021
P0	3.90	4.10	0.154	0.161
10P0	40.0+/-0.20		1.574+/-0.008	
W	7.90	8.30	0.311	0.319
P0	3.90	4.10	0.154	0.161
A0	1.15	1.25	0.045	0.049
B0	1.75	1.85	0.069	0.073
K0	0.65	0.75	0.026	0.03
t	0.22 max		0.009 max	