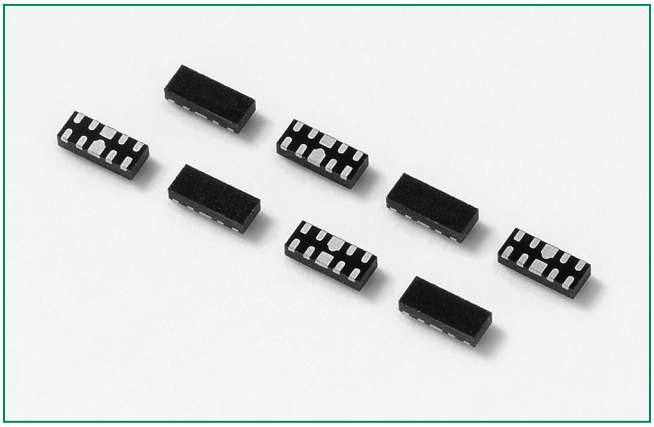
SP0524P Series 0.5pF Diode Array

RoHS Pb GREEN

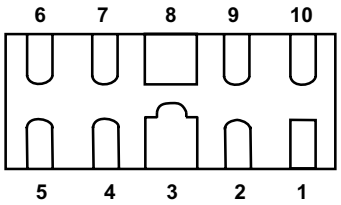


Description

The SP0524P integrates 4 channels of ultra low capacitance rail-to-rail diodes and an additional zener diode to provide protection for electronic equipment that may experience destructive electrostatic discharges (ESD). This robust device can safely absorb repetitive ESD strikes above the maximum level specified in the IEC61000-4-2 international standard (±8kV contact discharge) without performance degradation. The extremely low loading capacitance also makes it ideal for protecting high speed signal pins such as HDMI, USB3.0, USB2.0, and IEEE 1394.

Pinout

(AEC-Q101 qualified)

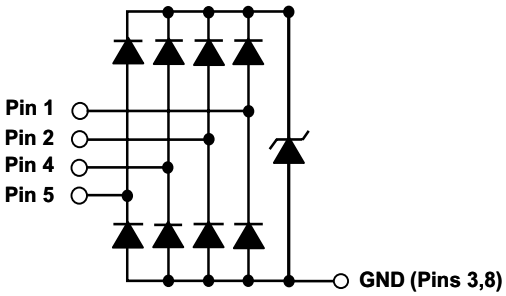


*Pins 6, 7, 9, 10 are not internally connected but should be connected to the trace.

Features

- ESD, IEC61000-4-2, ±12kV contact, ±25kV air
- EFT, IEC61000-4-4, 40A (t_P=5/50ns)
- Lightning, IEC61000-4-5, 4A (t_P=8/20μs)
- Low capacitance of 0.5pF (TYP) per I/O
- Low leakage current of 1.5μA (MAX) at 5V
- Small form factor μDFN (JEDEC MO-229) package saves board space
- AEC-Q101 qualified (μDFN-10 package)

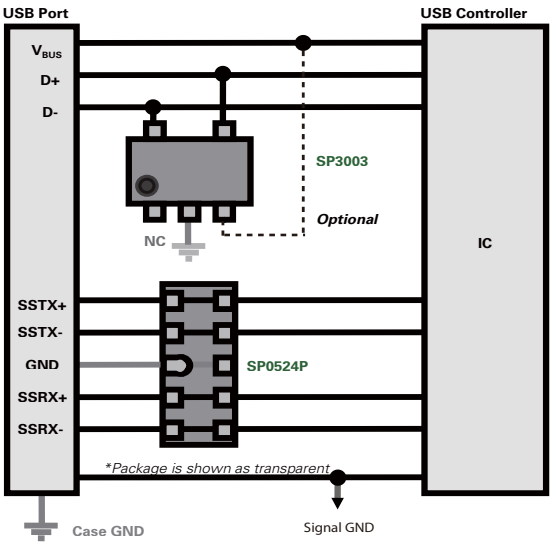
Functional Block Diagram



Applications

- LCD/PDP TVs
- External Storages
- DVD/ Blue-Ray Players
- Desktops
- MP3/PMP
- Set Top Boxes
- Mobile Phones
- Notebooks
- Digital Cameras

Application Example for USB3.0



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.

Revised: 09/24/14

Absolute Maximum Ratings

Symbol	Parameter	Value	Units
I_{PP}	Peak Current (t_p=8/20µs)	4.0	A
T_{OP}	Operating Temperature	–40 to 125	°C
T_{STOR}	Storage Temperature	–55 to 150	°C

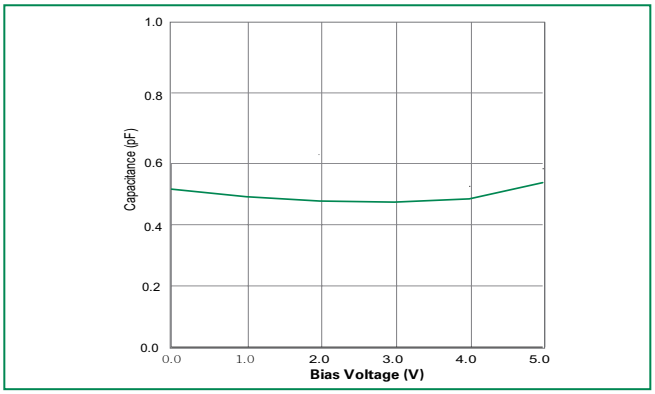
CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

Electrical Characteristics (T_{OP}=25°C)

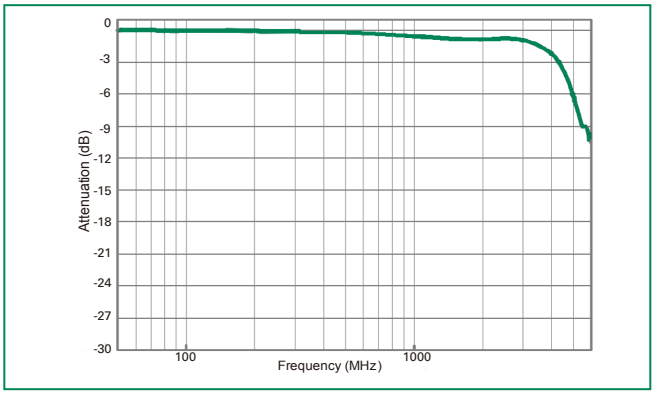
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	V_{RWM}	$I_R \leq 1\mu A$			5.0	V
Reverse Breakdown Voltage	V_{BR}	I_R = 1mA	6	6.5		V
Reverse Leakage Current	I_{LEAK}	V_R=5V, Any I/O to GND			1.5	µA
Clamp Voltage[1]	V_C	I_{PP}=1A, t_p=8/20µs, Fwd		6.6		V
		I_{PP}=2A, t_p=8/20µs, Fwd		7.0		V
Dynamic Resistance	R_{DYN}	$(V_{C2} - V_{C1}) / (I_{PP2} - I_{PP1})$		0.4		Ω
ESD Withstand Voltage[1]	V_{ESD}	IEC61000-4-2 (Contact)	±12			kV
		IEC61000-4-2 (Air)	±25			kV
Diode Capacitance[1]	$C_{I/O-GND}$	Reverse Bias=0V, f=1 MHz		0.5	0.55	pF
Diode Capacitance[1]	$C_{I/O-/O}$	Reverse Bias=0V, f=1 MHz		0.3		pF

Note: [1] Parameter is guaranteed by design and/or device characterization.

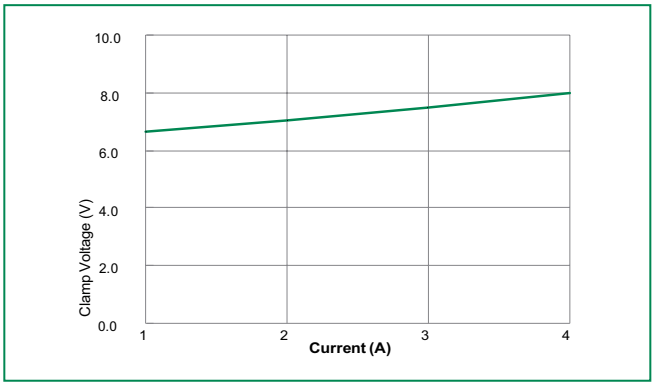
Capacitance vs. Bias Voltage



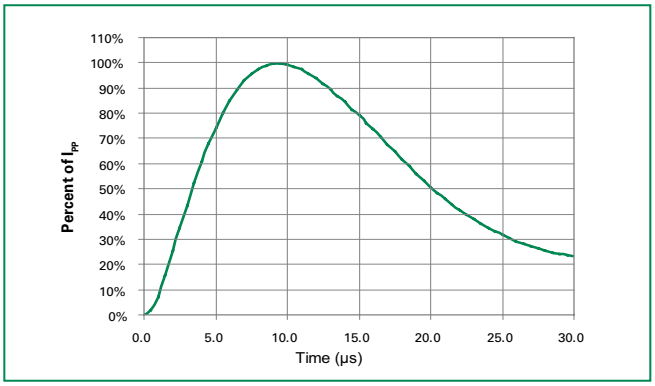
Insertion Loss (S21) I/O to GND



Clamping Voltage vs. I_{PP}



Pulse Waveform



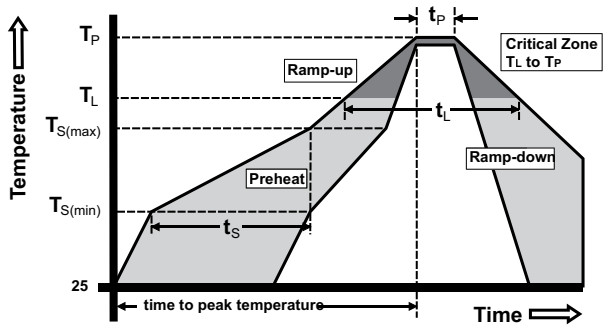
Revised: 09/24/14

TVS Diode Arrays (SPA® Diodes)

Low Capacitance ESD Protection - SP0524P Series

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)		$260^{+0/-5}$ °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 Numbering System

SP 0524P U T G

- SP: TVS Diode Arrays (SPA® Diodes)
- 0524P: Series
- U: Package µDFN-10 (2.5x1.0mm)
- T: T= Tape & Reel
- G: G= Green

Part Marking System

V * 4

- V: Product Series V = SP0524P
- *: Assembly Site
- 4: Number of Channels

Product Characteristics

Lead Plating	Pre-Plated Frame
Lead Material	Copper Alloy
Lead Coplanarity	0.0004 inches (0.102mm)
Substitute Material	Silicon
Body Material	Molded Epoxy
Flammability	UL 94 V-0

Notes :

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

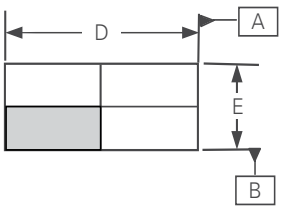
Ordering Information

Part Number	Package	Marking	Min. Order Qty.
SP0524PUTG	µDFN-10	V*4	3000

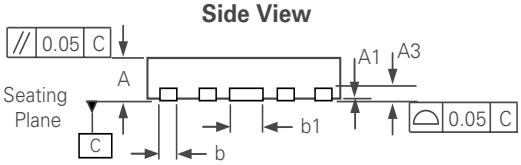
Revised: 09/24/14

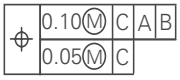
Package Dimensions — µDFN-10 (2.5x1.0x0.5mm)

Top View

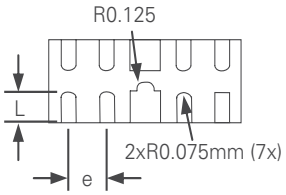


Side View





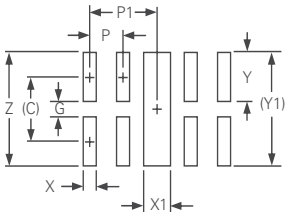
Bottom View



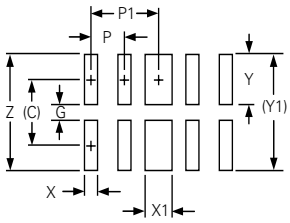
Package	µDFN-10 (2.5x1.0x0.5mm)					
JEDEC	MO-229					
Symbol	Millimeters			Inches		
	Min	Nom	Max	Min	Nom	Max
A	0.48	0.515	0.55	0.019	0.020	0.021
A1	0.00	--	0.05	0.000		0.022
A3	0.125 Ref			0.005 Ref		
b	0.15	0.20	0.25	0.006	0.008	0.012
b1	0.35	0.40	0.45	0.014	0.016	0.018
D	2.40	2.50	2.60	0.094	0.098	0.102
E	0.90	1.00	1.10	0.035	0.039	0.043
e	0.50 BSC			0.020 BSC		
L	0.30	0.365	0.43	0.012	0.014	0.016

Soldering Pad Layout Dimensions		
	Inch	Millimeter
C	(0.034)	(0.875)
G	0.008	0.20
P	0.020	0.50
P1	0.039	1.00
X	0.008	0.20
X1	0.016	0.40
Y	0.027	0.675
Y1	(0.061)	(1.55)
Z	0.061	1.55

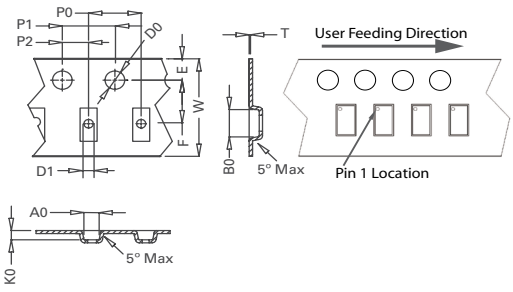
Recomended Soldering Pad Layout



Alternative Soldering Pad Layout



Embossed Carrier Tape & Reel Specification — µDFN-10



Package	µDFN-10 (2.5x1.0x0.5mm)
Symbol	Millimeters
A0	1.30 ± 0.10
B0	2.83 ± 0.10
D0	Ø 1.50 + 0.10
D1	Ø 1.00 + 0.25
E	1.75 ± 0.10
F	3.50 ± 0.05
K0	0.65 ± 0.10
P0	4.00 ± 0.10
P1	4.00 ± 0.10
P2	2.00 ± 0.05
T	0.254 ± 0.02
W	8.00 + 0.30 /- 0.10

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