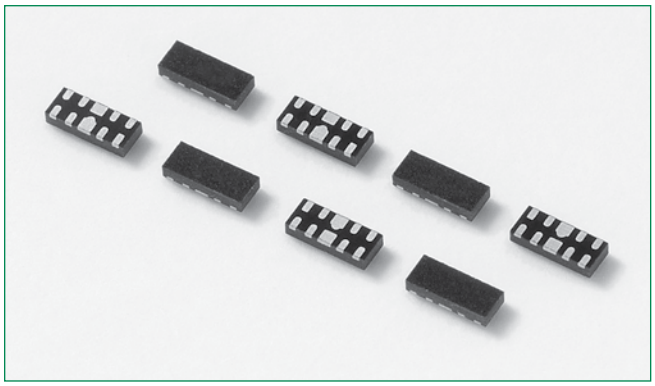
TVS Diode Array (SPA® Diodes)

Low Capacitance ESD Protection - SP3010 Series

SP3010 Series 0.45pF Diode Array

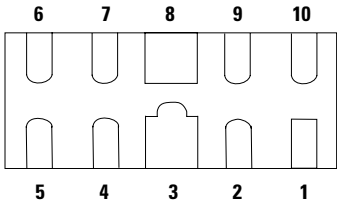
RoHS Pb GREEN



Description

The SP3010 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 at the maximum level specified in the IEC 61000-4-2 international standard (Level 4, ±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

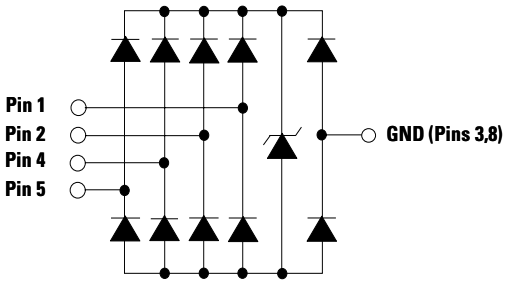


*Pins 6, 7, 9, 10 are not internally connected but should be connected to the trace.

Features

- ESD, IEC 61000-4-2, ±8kV contact, ±15kV air
- EFT, IEC 61000-4-4, 40A (5/50ns)
- Lightning, IEC 61000-4-5 2nd edition, 3A (t_P=8/20µs)
- Low capacitance of 0.45pF (TYP) per I/O
- Low leakage current of 0.1µA (TYP) at 5V
- Small form factor µDFN(JEDEC MO-229) package saves board space
- RoHS compliant and lead-free
- AEC-Q101 qualified

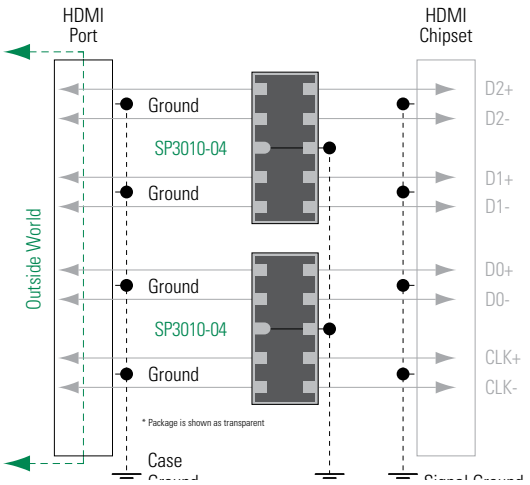
Functional Block Diagram



Applications

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

Application Example



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.

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Absolute Maximum Ratings

Symbol	Parameter	Value	Units
I_{PP}	Peak Current (t_p=8/20µs)	3.0	A
T_{OP}	Operating Temperature	–40 to 125	°C
T_{STOR}	Storage Temperature	–55 to 150	°C

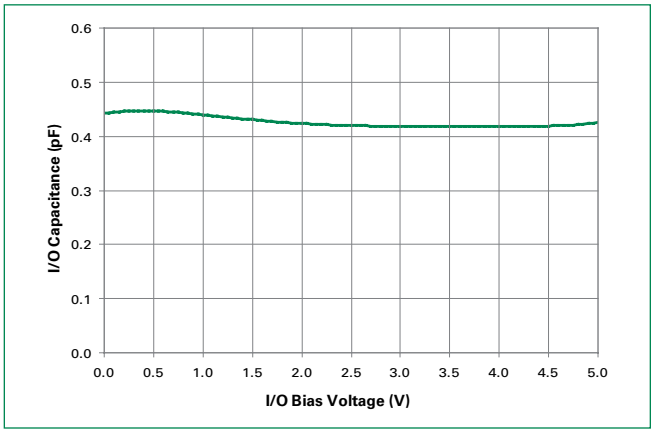
CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

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

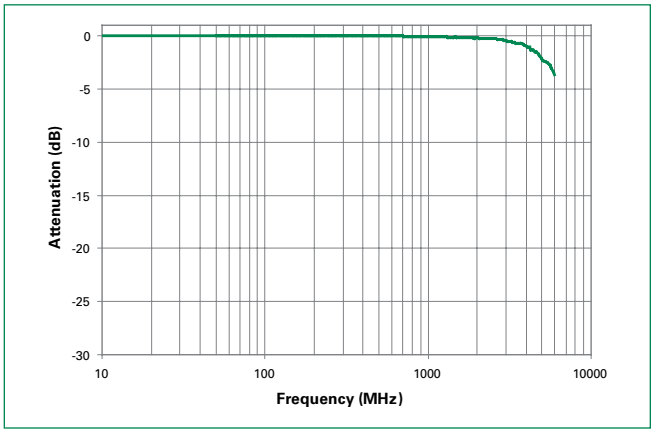
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	V_{RWM}	$I_R \leq 1\mu A$			6.0	V
Reverse Leakage Current	I_{LEAK}	V_R=5V, Any I/O to GND		0.1	0.5	µA
Clamp Voltage[1]	V_C	I_{PP}=1A, t_p=8/20µs, Fwd		10.8		V
		I_{PP}=2A, t_p=8/20µs, Fwd		12.3		V
Dynamic Resistance	R_{DYN}	$(V_{C2} - V_{C1}) / (I_{PP2} - I_{PP1})$		1.5		Ω
ESD Withstand Voltage[1]	V_{ESD}	IEC61000-4-2 (Contact)	±8			kV
		IEC61000-4-2 (Air)	±15			kV
Diode Capacitance[1]	$C_{I/O-GND}$	Reverse Bias=0V		0.45		pF

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

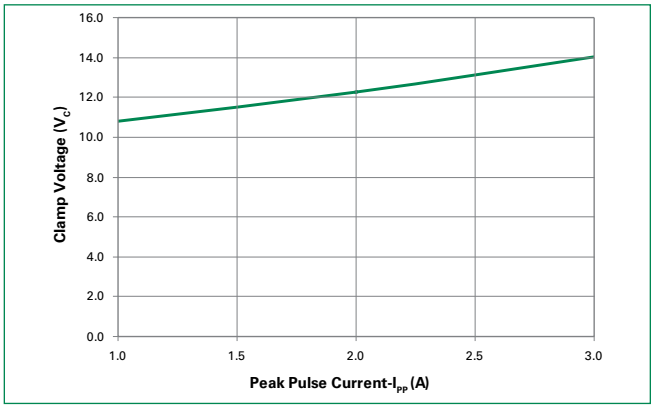
Capacitance vs. Bias Voltage



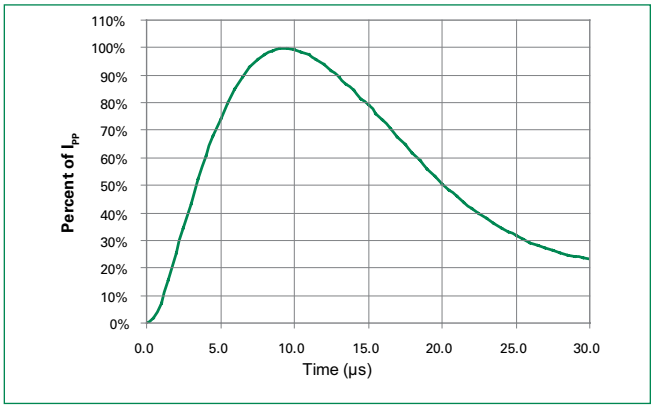
Insertion Loss (S21) I/O to GND



Clamping Voltage vs. I_{PP}



Pulse Waveform



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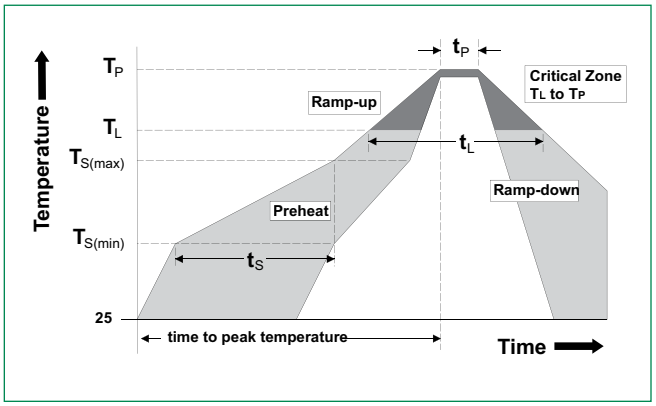
TVS Diode Array (SPA® Diodes)

Low Capacitance ESD Protection - SP3010 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 3010 – 04 U T G

TVS Diode Arrays
(SPA® Diodes)

Series

Number of Channels
-04 = 4 Channel

Package
µDFN-10 (2.5x1.0mm)

T= Tape & Reel

G= Green

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

Part Marking System

Q * 4

Product Series
Q = SP3010

Assembly Site

Number of Channels

Ordering Information

Part Number	Package	Min. Order Qty.
SP3010-04UTG	µDFN-10	3000

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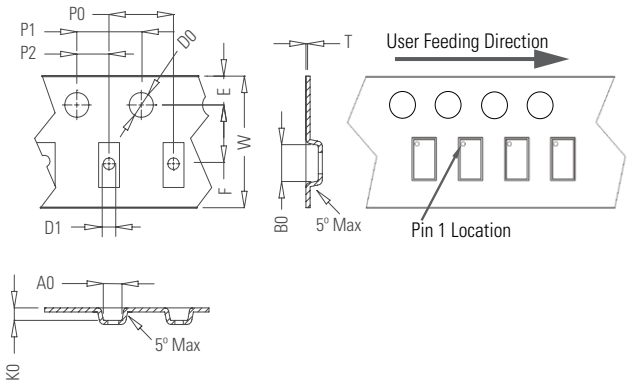
TVS Diode Array (SPA® Diodes)

Low Capacitance ESD Protection - SP3010 Series

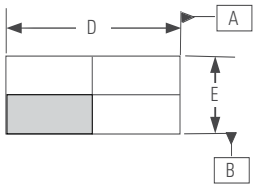
Embossed Carrier Tape & Reel Specification — µDFN-10



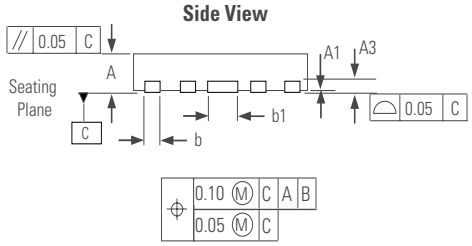
Package	µDFN-10 (2.5x1.0x0.5mm)
Symbol	**Millimeters**
A0	1.30 ± 0.10
B0	2.83 ± 0.10
D0	Ø 1.50 + 0.10
D1	Ø 1.00 + 0.25
E	1.75 ± 0.10
F	3.50 ± 0.05
K0	0.65 ± 0.10
P0	4.00 ± 0.10
P1	4.00 ± 0.10
P2	2.00 ± 0.05
T	0.254 ± 0.02
W	8.00 + 0.30 /- 0.10

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

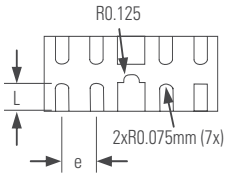
Top View



Side View

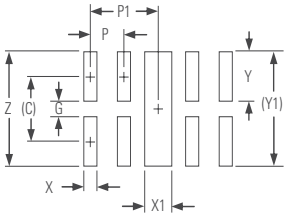


Bottom View

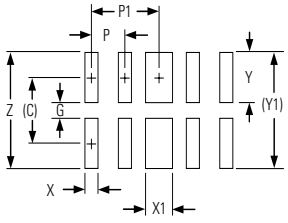


Package	µDFN-10 (2.5x1.0x0.5mm)					
JEDEC	MO-229					
Symbol	Millimeters			Inches		
	Min	**Nom**	**Max**	**Min**	**Nom**	**Max**
A	0.48	0.515	0.55	0.019	0.020	0.021
A1	0.00	--	0.05	0.000		0.022
A3		0.125 Ref			0.005 Ref	
b	0.15	0.20	0.25	0.006	0.008	0.012
b1	0.35	0.40	0.45	0.014	0.016	0.018
D	2.40	2.50	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

Recomended Soldering Pad Layout



Alternative Soldering Pad Layout



Soldering Pad Layout Dimensions		
Symbol	**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

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