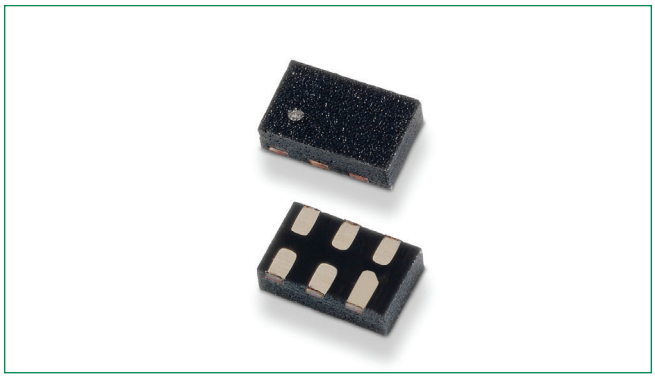
TVS Diode Arrays (SPA® Diodes)

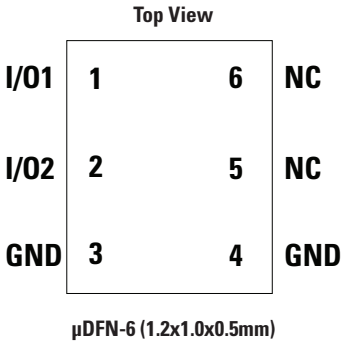
Low Capacitance ESD Protection - SP3423

SP3423, 0.2pF, +/-10kV Diode Array

HF RoHS Pb GREEN

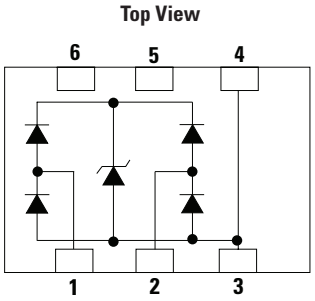


Pinout



µDFN-6 (1.2x1.0x0.5mm)

Functional Block Diagram



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 2.0/3.0
- Ethernet up to 10GbE

Description

The SP3423 integrates 2 channels of low capacitance steering diodes and and an avalanche breakdown diode to provide protection for electronic equipment that may experience destructive electrostatic discharges (ESD). The SP3423 can safely absorb repetitive ESD strikes above the maximum contact level specified in IEC 61000-4-2 international standard (±8kV contact discharge) without performance degradation.

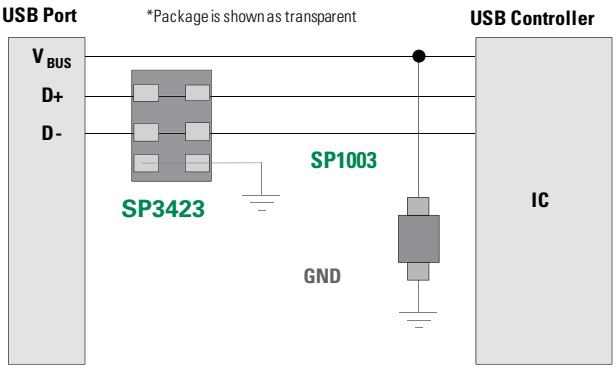
The low off-state capacitance makes it ideal for protecting high-speed signal lines such as USB2.0/3.0 and 10GbE interfaces with an extremely low dynamic resistance to protect the most sensitive, state of the art chipsets against ESD transients.

Its flow-through capability makes this SP3423 TVS a PCB layout friendly component and helps reduce stray PCB capacitances.

Features

- ESD, IEC 61000-4-2, ±10kV contact, ±15kV air
- EFT, IEC 61000-4-4, 80A (t_P=5/50ns)
- Lightning, 2A (8/20µs as defined in IEC 61000-4-5 2nd edition)
- Low capacitance of 0.2pF (TYP) per I/O
- Low leakage current of 0.01µA (TYP) at 5V
- Small µDFN-6 footprint (1.2 mm x 1.0 mm x 0.5 mm)
- AEC-Q101 qualified
- Moisture Sensitivity Level(MSL -1)
- Halogen free, lead free and RoHS compliant

USB 2.0/3.0 Protection Application Example



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: JC.12/08/20

TVS Diode Arrays (SPA® Diodes)

Low Capacitance ESD Protection - SP3423

Absolute Maximum Ratings

Symbol	Parameter	Value	Units
I_{PP}	Peak Current (t_p=8/20µs)	2	A
T_{OP}	Operating Temperature	-40 to 125	°C
T_{STOR}	Storage Temperature	-55 to 150	°C

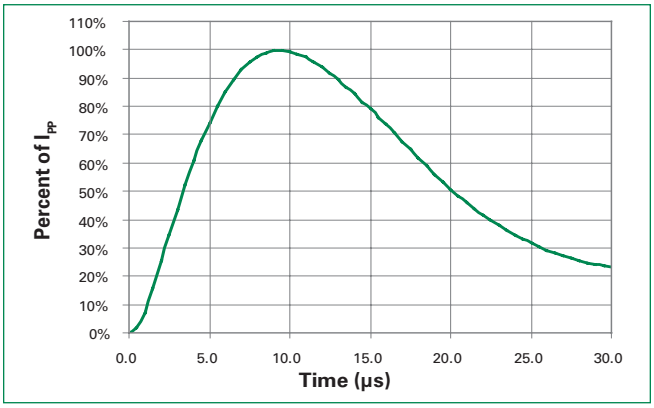
CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the component. This is a stress only rating and operation of the component at these or any other conditions above those indicated in the operational sections of this specification is not implied.

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

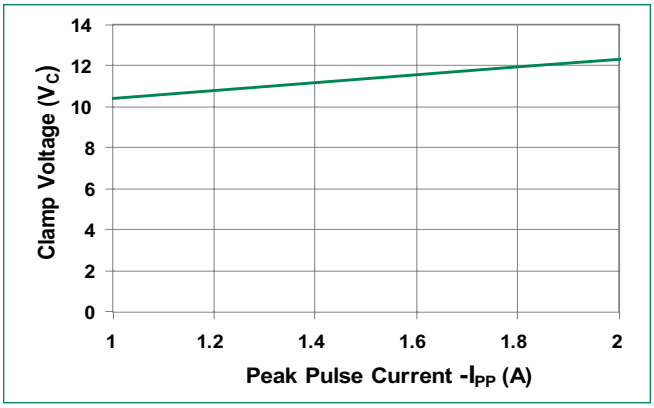
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	V_{RWM}	I_R = 1µA			5.0	V
Breakdown Voltage	V_{BR}	I_R = 1mA	7	8.4		V
Reverse Leakage Current	I_{LEAK}	V_R=5V, Any I/O to GND		0.01	0.5	µA
Clamp Voltage[1]	V_C	I_{PP}=1A, t_p=8/20µs, Fwd		10.4	13	V
		I_{PP}=2A, t_p=8/20µs, Fwd		12.3	15	V
Dynamic Resistance[2]	R_{DYN}	TLP, t_p=100ns, I/O to GND		0.65		Ω
ESD Withstand Voltage[1]	V_{ESD}	IEC 61000-4-2 (Contact)	±10			kV
		IEC 61000-4-2 (Air)	±15			kV
Diode Capacitance	$C_{I/O-GND}$	Reverse Bias=0V, f=3 GHz		0.2		pF
	$C_{I/O-I/O}$			0.1		

Note:
1. Parameter is guaranteed by design and/or component characterization.
2. Transmission Line Pulse (TLP) with 100ns width, 2ns rise time, and average window t1=70ns to t2= 90ns

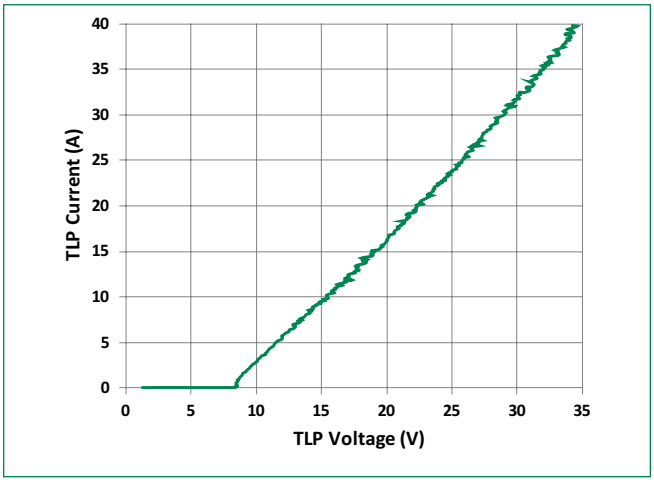
8/20µs Pulse Waveform



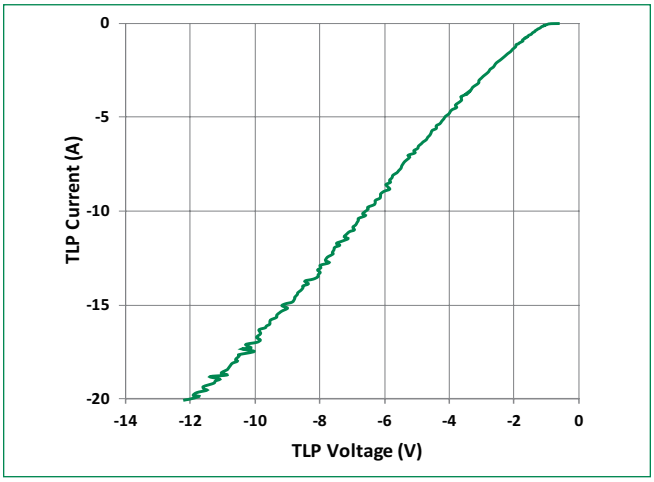
Clamping voltage vs. I_{PP} for 8/20µs waveshape



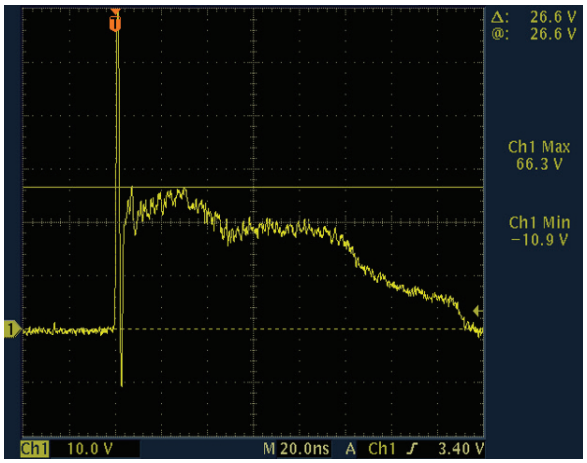
Positive Transmission Line Pulsing (TLP) Plot



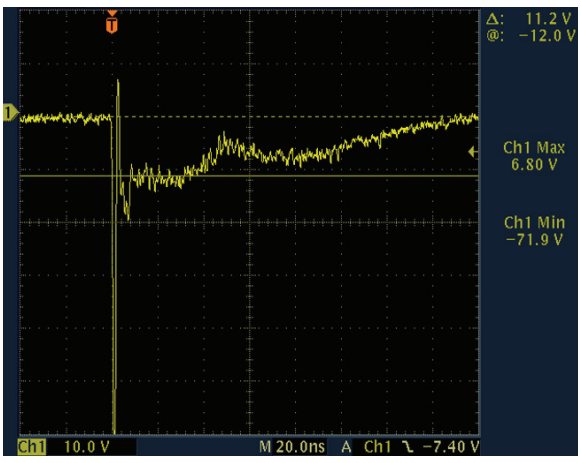
Negative Transmission Line Pulsing (TLP) Plot



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



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

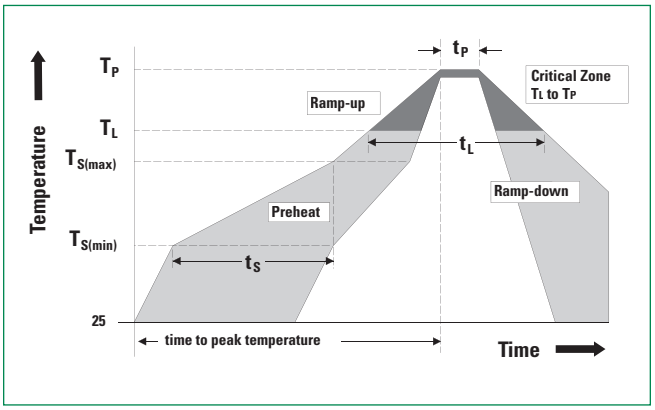


TVS Diode Arrays (SPA® Diodes)

Low Capacitance ESD Protection - SP3423

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



Ordering Information

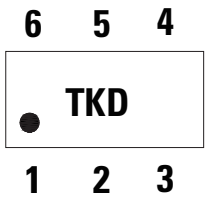
Part Number	Package	Min. Order Qty.
SP3423-02UTG	µDFN-6L	3000

Part Numbering System

SP 3423 - xx x T G

- TVS Diode Arrays (SPA® Diodes)
- Series
- Number of Channels
  - 02 = 2 channel
- Package
  - U= µDFN-6L
- T= Tape & Reel
- G= Green

Part Marking System



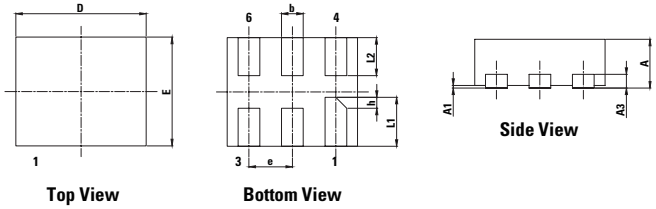
T : Part code
K : Assembly code
D : Date code

Product Characteristics

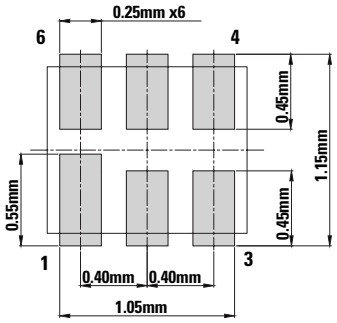
Lead Plating	Pre-Plated Frame (µDFN)
Lead Material	Copper Alloy
Substrate Material	Silicon
Body Material	Molded Compound
Flammability	UL Recognized compound meeting flammability rating V-0

Revised: JC.12/08/20

Package Dimensions —µDFN-6L



Top View Bottom View Side View

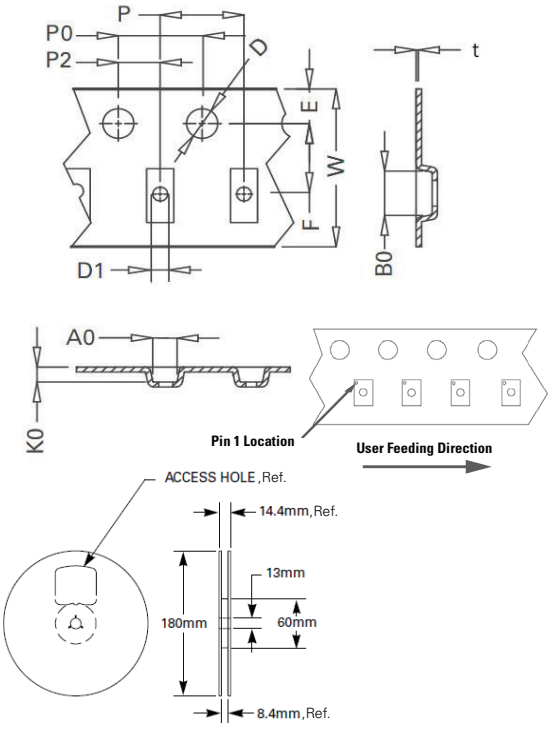


Recommended Soldering Pad Layout

Drawing# : U02-A

µDFN6 (1.2x1.0x0.45mm) JEDEC MO-229						
Symbol	Millimeters			Inches		
	Min	Nom	Max	Min	Nom	Max
A	0.40	0.45	0.50	0.016	0.018	0.020
A1	0.00	0.02	0.05	0.000	0.001	0.002
A3		0.125 REF			0.005 REF	
b	0.15	0.20	0.25	0.006	0.008	0.010
D	1.10	1.20	1.30	0.043	0.047	0.051
E	0.90	1.00	1.10	0.035	0.039	0.043
e		0.40 REF			0.016 BSC	
L1	0.35	0.45	0.55	0.014	0.018	0.022
L2	0.25	0.35	0.45	0.010	0.014	0.018
h		0.10 REF			0.004 REF	

Embossed Carrier Tape & Reel Specification — µDFN-6L



8mm TAPE AND REEL

Symbol	Millimeters		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
P	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	