SP3022 Series 0.35pF 20kV Bidirectional Discrete TVS

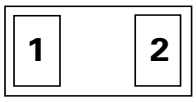
AUTOMOTIVE GRADE | RoHS | Pb | GREEN

Description

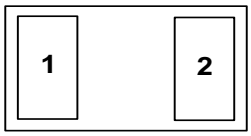
The SP3022 includes back-to-back TVS diodes fabricated in a proprietary silicon avalanche technology to provide protection for electronic equipment that may experience destructive electrostatic discharges (ESD). These robust diodes can safely absorb repetitive ESD strikes up to the maximum level specified in the IEC61000-4-2 international standard (±20kV contact discharge) without performance degradation. The back-to-back configuration provides symmetrical ESD protection for data lines when AC signals are present and the low loading capacitance makes it ideal for protecting high speed data lines such as HDMI,USB2.0, USB3.0 and eSATA.

Pinout

0201 Flipchip



SOD882

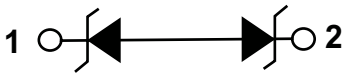


(AEC-Q101 qualified)

Features

- ESD protection of ±20kV contact discharge, ±30kV air discharge, (IEC61000-4-2)
- EFT, IEC61000-4-4, 40A (5/50ns)
- Lightning protection, IEC61000-4-5, 3A (t_p=8/20µs)
- Low capacitance of 0.35pF @ V_R=0V (TYP)
- Low leakage current of 100nA at 5.3V (MAX)
- Space efficient 0201 and 0402 footprint
- Extremely low dynamic resistance (0.7Ω TYP)
- AEC-Q101 qualified (SOD882 package)

Functional Block Diagram



Applications

- USB 3.0/USB 2.0/MHL
- MIPI Camera and Display
- HDMI 2.0, DisplayPort 1.3, eSATA
- Set Top Boxes, Game Consoles
- Smart Phones
- External Storage
- Ultrabooks, Notebooks
- Tablets, eReaders
- High Speed Serial Interfaces

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: 05/27/15

TVS Diode Arrays (SPA® Diodes)

Low Capacitance ESD Protection - SP3022 Series

Absolute Maximum Ratings

Symbol	Parameter	Value	Units
P_{PK}	Peak Pulse Power (t_p=8/20µs)	20	W
I_{PP}	Peak Current (t_p=8/20µs)	3.0	A
T_{OP}	Operating Temperature	-40 to 125	°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

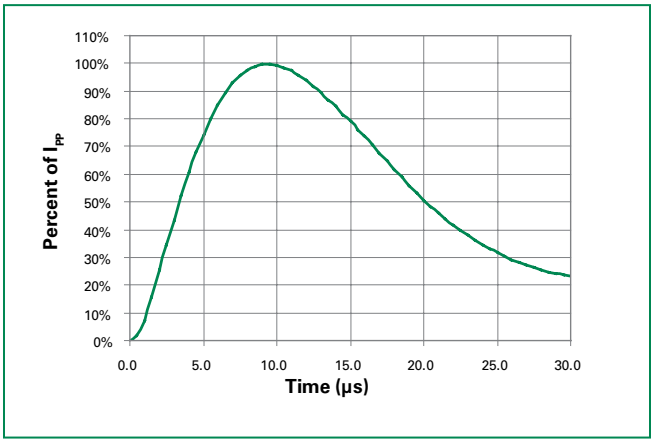
Parameter	Rating	Units
Storage Temperature Range	-55 to 150	°C
Maximum Junction Temperature	150	°C
Maximum Lead Temperature (Soldering 20-40s)	260	°C

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

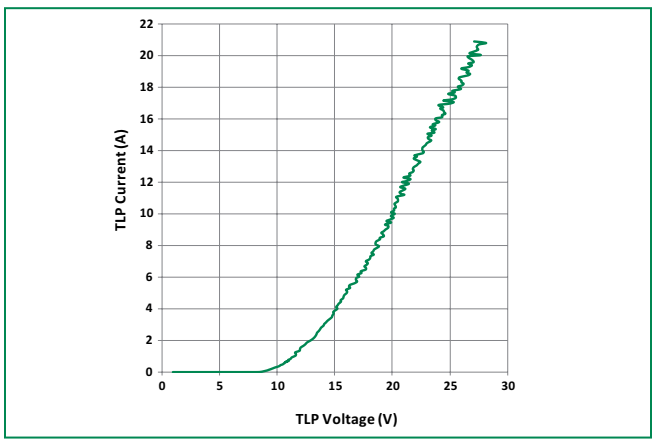
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	V_{RWM}				5.3	V
Reverse Breakdown Voltage	V_{BR}	1_R=1mA	6.8	7.8	9.0	V
Reverse Leakage Current	I_{LEAK}	V_R=5.3V		<10	100	nA
Clamp Voltage[1]	V_C	I_{PP}=1A, t_p=8/20µs, Fwd			12.0	V
Dynamic Resistance[2]	R_{DYN}	TLP, tp=100ns, I/O to GND		0.7		Ω
ESD Withstand Voltage[1]	V_{ESD}	IEC61000-4-2 (Contact)	±20			kV
		IEC61000-4-2 (Air)	±30			kV
Diode Capacitance[1]	C_D	Reverse Bias=0V		0.35	0.5	pF

Note:
[1] Parameter is guaranteed by design and/or device characterization.
[2] Transmission Line Pulse (TLP) with 100ns width and 200ps rise time.

Pulse Waveform



Transmission Line Pulsing(TLP) Plot



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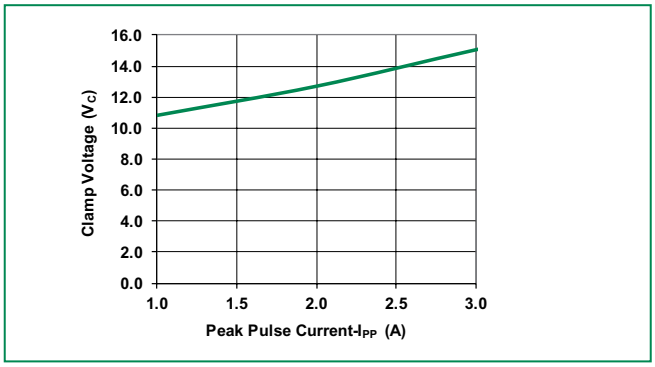
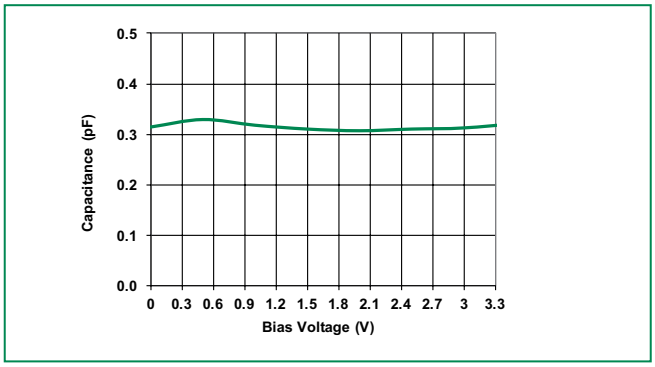
Clamping Voltage vs I_{PP}

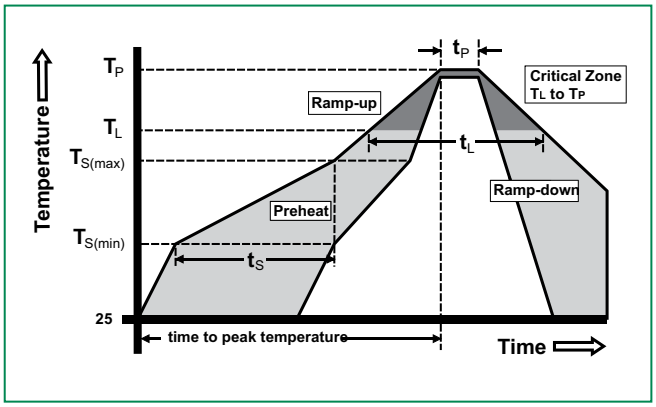


Capacitance vs. Reverse Bias



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



Product Characteristics of 0201 Flipchip

Lead Plating	Sn
Lead Material	Copper
Lead Coplanarity	6µm(max)
Substrate material	Silicon
Body Material	Silicon

Product Characteristics of SOD882

Lead Plating	Pre-Plated Frame or Matte Tin
Lead Material	Copper Alloy
Lead Coplanarity	0.0004 inches (0.102mm)
Substrate 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.

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TVS Diode Arrays (SPA® Diodes)

Low Capacitance ESD Protection - SP3022 Series

Ordering Information

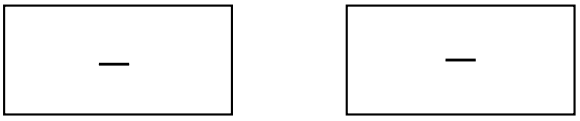
Part Number	Package	Marking	Min. Order Qty.	Packaging Option	P0/P1	Packaging Specification
SP3022-01WTG	0201 Flipchip	-	10000	Tape & Reel – 8mm tape/7" reel	4mm/2mm	EIA RS-481
SP3022-01ETG	SOD882	-	10000	Tape & Reel – 8mm tape/7" reel	4mm/2mm	EIA RS-481

Part Numbering System

SP 3022 - 01 x T G

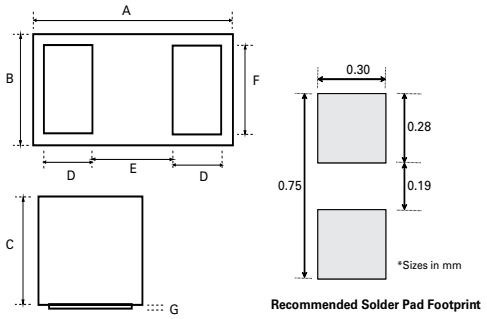
- SP 3022: TVS Diode Arrays (SPA® Diodes) — Series
- 01: Number of Channels
- x: Package — W: 0201 Flipchip; E: SOD882
- T: T= Tape & Reel
- G: G= Green

Part Marking System



SP3022-01WTG SP3022-01ETG

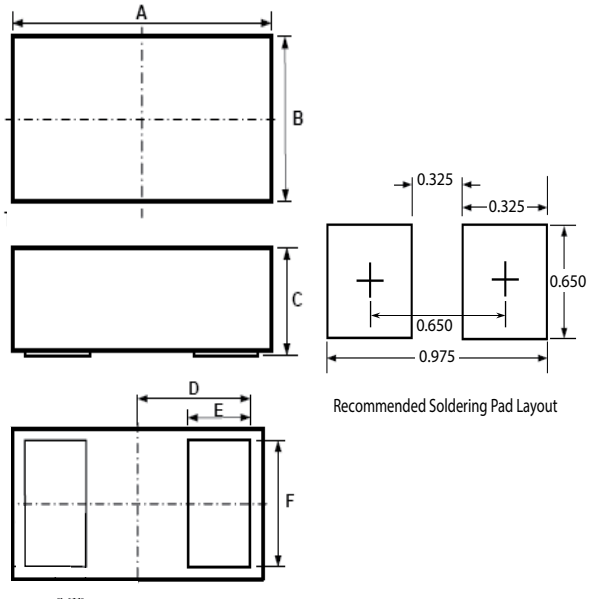
Package Dimensions — 0201 Flipchip



Recommended Solder Pad Footprint

Symbol	0201 Flipchip					
	Millimeters			Inches		
	Min	Typ	Max	Min	Typ	Max
A	0.595	0.620	0.645	0.0234	0.0244	0.0254
B	0.295	0.320	0.345	0.0116	0.0126	0.0136
C	0.245	0.275	0.305	0.0096	0.0108	0.0120
D	0.145	0.150	0.155	0.0057	0.0059	0.0061
E	0.245	0.250	0.255	0.0096	0.0098	0.0100
F	0.245	0.250	0.255	0.0096	0.0098	0.0100
G	0.005	0.010	0.015	0.0002	0.0004	0.0006

Package Dimensions — SOD882



Recommended Soldering Pad Layout

Symbol	Package	SOD882				
	JEDEC	MO-236				
	Millimeters			Inches		
	Min	Typ	Max	Min	Typ	Max
A	0.95	1.00	1.05	0.037	0.039	0.041
B	0.55	0.60	0.65	0.022	0.024	0.026
C	0.50	0.55	0.60	0.020	0.022	0.024
D	0.45			0.018		
E	0.20	0.25	0.30	0.008	0.010	0.012
F	0.45	0.50	0.55	0.018	0.020	0.022

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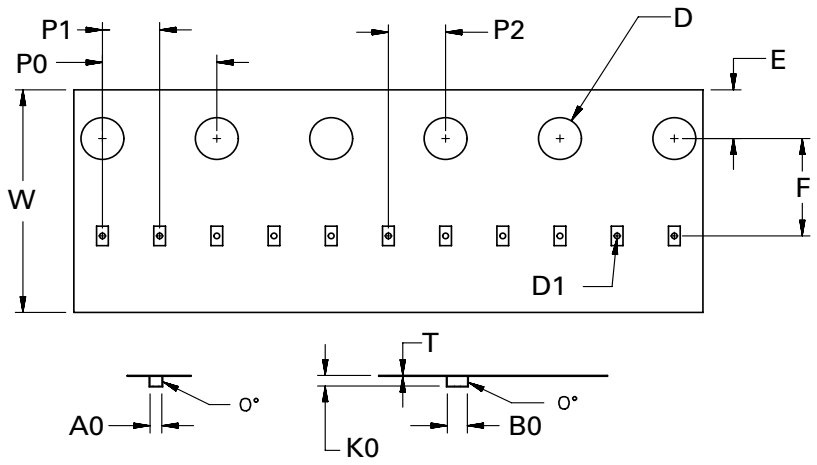
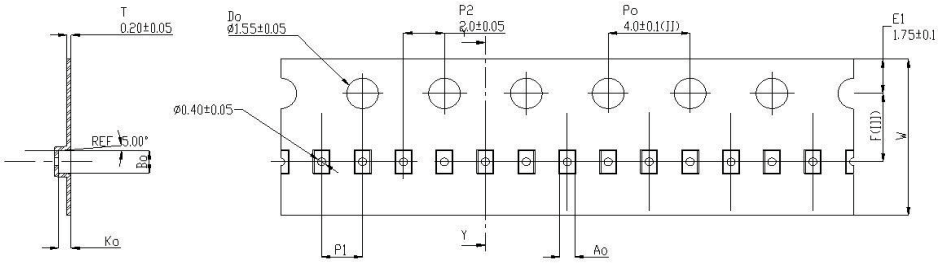
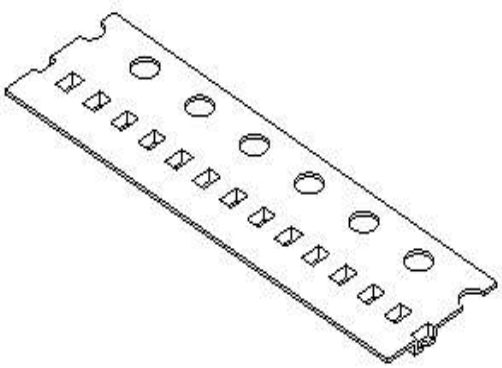
Embossed Carrier Tape & Reel Specification — 0201 Flipchip



Symbol	Millimeters
A0	0.41+/-0.03
B0	0.70+/-0.03
D	ø 1.50 + 0.10
D1	ø 0.20 +/- 0.05
E	1.75+/-0.10
F	3.50+/-0.05
K0	0.38+/-0.03
P0	4.00+/-0.10
P1	2.00+/-0.05
P2	2.00+/-0.05
W	8.00 + 0.30 -0.10
T	0.23+/-0.02

Embossed Carrier Tape & Reel Specification — SOD882





Symbol	Millimeters
A0	0.70+/-0.045
B0	1.10+/-0.045
K0	0.65+/-0.045
F	3.50+/-0.05
P1	2.00+/-0.10
W	8.00 + 0.30 -0.10

Notes :
1. All dimensions are in millimeters

Revised: 05/27/15