

## SP3530 0.3pF 22kV unidirectional TVS diode

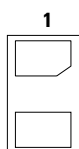


### Description

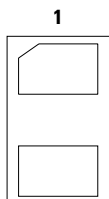
This SP3530 unidirectional diode provides a high level of protection for electronic equipment that may be exposed to electrostatic discharges (ESD). This robust component can safely absorb repetitive ESD strikes above the maximum level specified in the IEC 61000-4-2 international standard ( $\pm 8\text{kV}$  contact discharge) without performance degradation. The extremely low loading capacitance also makes it ideal for protecting high speed signal pins such as V-By-One®, HDMI, USB3.0, USB2.0, and IEEE 1394.

### Pinout

0201 DFN



SOD882

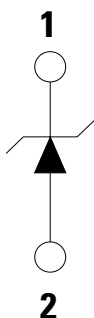


Bottom View

### Features

- ESD, IEC 61000-4-2,  $\pm 22\text{kV}$  contact,  $\pm 22\text{kV}$  air
- EFT, IEC 61000-4-4, 40A ( $t_p = 5/50\text{ns}$ )
- Lightning, IEC 61000-4-5, 2<sup>nd</sup> edition, 2.5A ( $t_p = 8/20\mu\text{s}$ )
- Low capacitance of 0.3pF (TYP) at 3GHz
- Low profile 0201 DFN packages and SOD882 packages
- Facilitates excellent signal integrity
- ELV Compliant
- AEC-Q101 qualified
- Halogen free, Lead free and RoHS compliant
- Moisture Sensitivity Level (MSL -1)

### Functional Block Diagram



### Applications

- Ultra-high speed data lines
- USB 3.1, 3.0, 2.0
- HDMI 2.0, 1.4a, 1.3
- DisplayPort™
- V-by-One®
- LVDS interfaces
- Consumer, mobile and portable electronics
- Tablet PC and external storage with high speed interfaces
- Applications requiring high ESD performance in small packages

## Absolute Maximum Ratings

| Symbol     | Parameter                        | Value      | Units |
|------------|----------------------------------|------------|-------|
| $I_{PP}$   | Peak Current ( $t_p=8/20\mu s$ ) | 2.5        | 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.

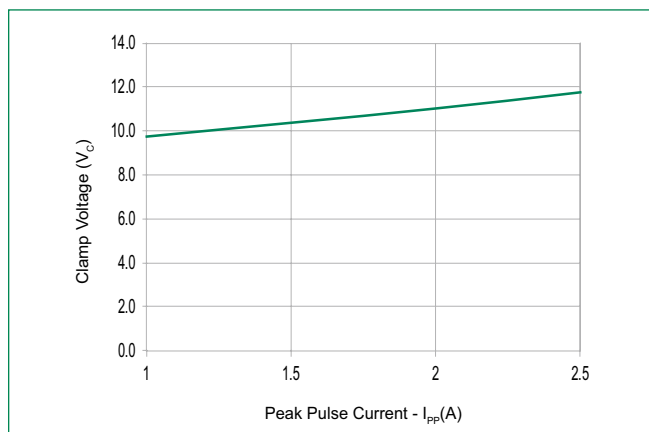
## Electrical Characteristics - ( $T_{OP}=25^{\circ}C$ )

| Parameter                          | Test Conditions               | Min      | Typ  | Max | Units    |
|------------------------------------|-------------------------------|----------|------|-----|----------|
| Input Capacitance                  | @ $V_R = 0V$ , $f = 3GHz$     |          | 0.30 |     | pF       |
| Breakdown Voltage                  | $V_{BR}$ @ $I_T=1mA$          |          | 8.2  |     | V        |
| Reverse Working Voltage            | $I_R \leq 1\mu A$             |          |      | 7.0 | V        |
| Reverse Leakage Current            | $I_L$ @ $V_{RWM}=5.0V$        |          | 0.02 | 1   | $\mu A$  |
| Dynamic Resistance <sup>2</sup>    | TLP, $t_p=100ns$ , I/O to GND |          | 0.58 |     | $\Omega$ |
| Clamping Voltage <sup>1</sup>      | $V_{CL}$ @ $I_{PP}=2.5A$      |          | 11.8 |     | V        |
| ESD Withstand Voltage <sup>1</sup> | IEC 61000-4-2 (Contact)       | $\pm 22$ |      |     | kV       |
|                                    | IEC 61000-4-2 (Air)           | $\pm 22$ |      |     |          |

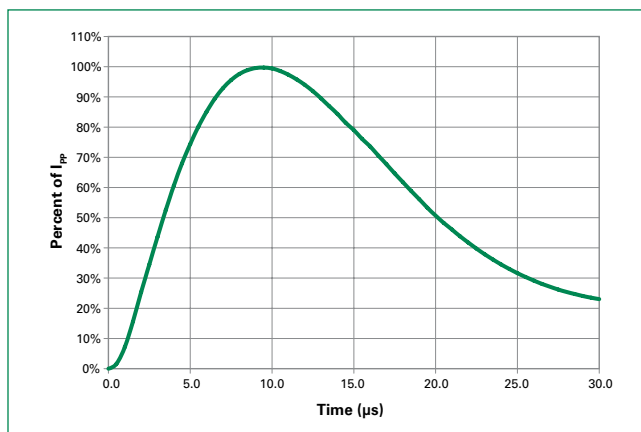
**Note:**

- Parameter is guaranteed by design and/or component characterization.
- Transmission Line Pulse (TLP) with 100ns width, 2ns rise time, and average window  $t_1=70ns$  to  $t_2=90ns$

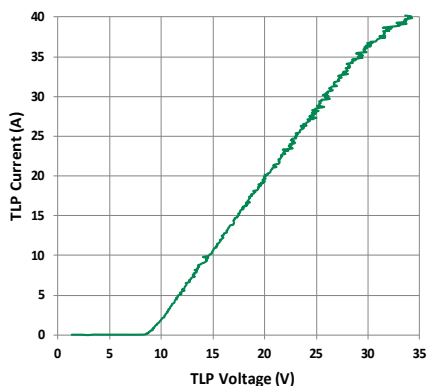
## Clamping Voltage vs $I_{PP}$



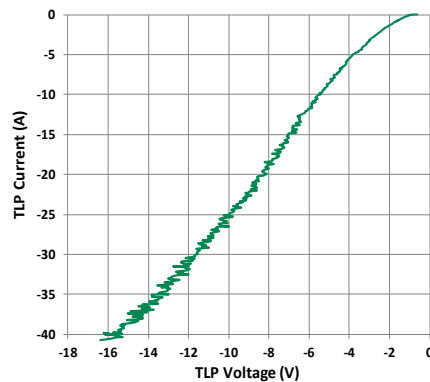
## 8/20 $\mu s$ Pulse Waveform



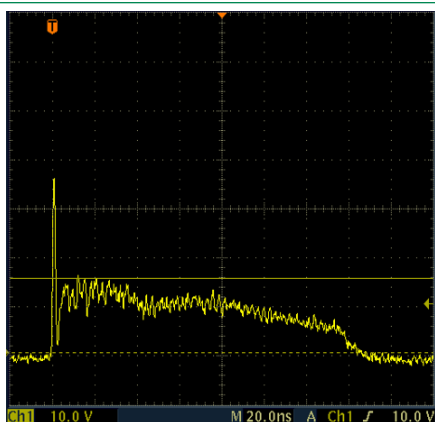
### Positive Transmission Line Pulsing (TLP) Plot



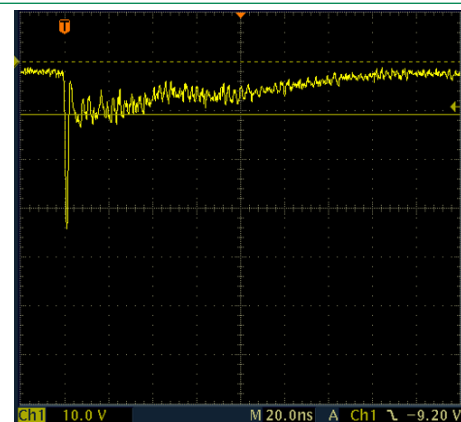
### Negative Transmission Line Pulsing (TLP) Plot



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

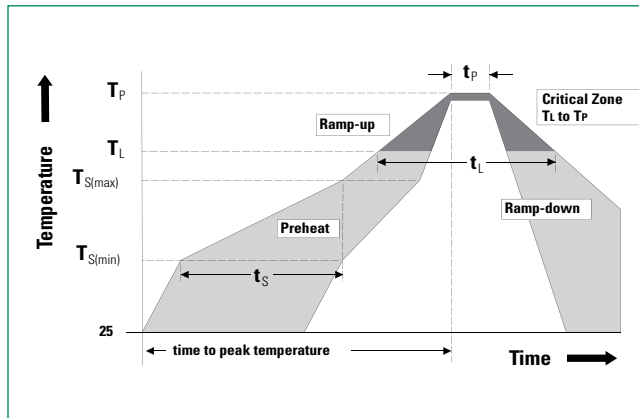


### IEC 61000-4-2 -8 kV Contact ESD Clamping Voltage

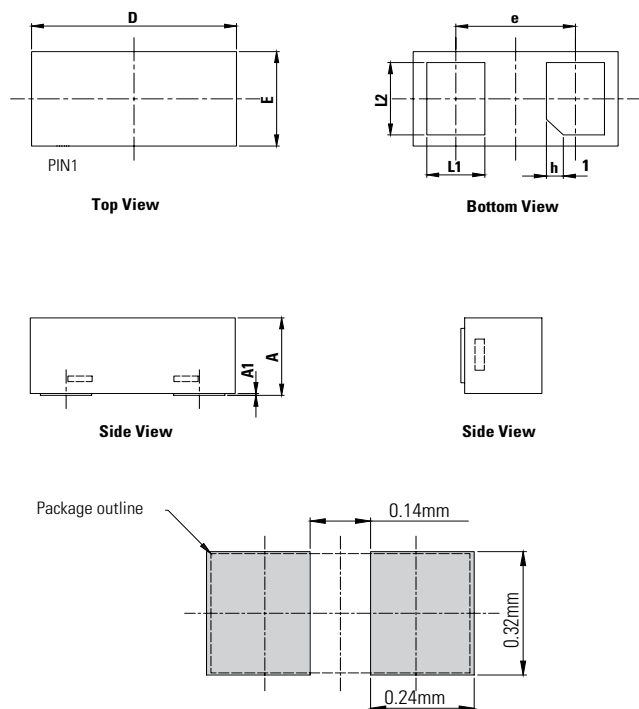


### Soldering Parameters

|                                                                        |                                    |                         |
|------------------------------------------------------------------------|------------------------------------|-------------------------|
| <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                   |

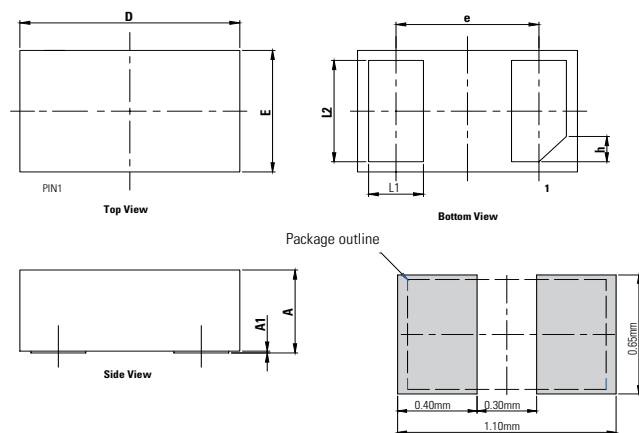


### Package Dimensions — 0201 DFN



| Symbol | Millimeters    |      |      | Inches          |       |       |
|--------|----------------|------|------|-----------------|-------|-------|
|        | Min            | Max  | Max  | Min             | Min   | Max   |
| A      | 0.23           | 0.28 | 0.33 | 0.009           | 0.011 | 0.013 |
| A1     | 0.00           | 0.02 | 0.05 | 0.000           | 0.001 | 0.002 |
| L1     | 0.12           | 0.18 | 0.24 | 0.005           | 0.007 | 0.009 |
| L2     | 0.18           | 0.24 | 0.30 | 0.007           | 0.009 | 0.012 |
| D      | 0.55           | 0.60 | 0.65 | 0.022           | 0.024 | 0.026 |
| E      | 0.25           | 0.30 | 0.35 | 0.010           | 0.012 | 0.014 |
| e      | 0.35 (BSC)     |      |      | 0.014 (BSC)     |       |       |
| h      | 0.05 ( x 45° ) |      |      | 0.002 ( x 45° ) |       |       |

### Package Dimensions — SOD882



Recommended soldering pad layout

| Symbol | Millimeters     |      |      | Inches          |       |       |
|--------|-----------------|------|------|-----------------|-------|-------|
|        | Min             | Max  | Max  | Min             | Min   | 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 |
| L1     | 0.20            | 0.25 | 0.30 | 0.008           | 0.010 | 0.012 |
| L2     | 0.45            | 0.50 | 0.55 | 0.018           | 0.020 | 0.022 |
| D      | 0.90            | 1.00 | 1.10 | 0.035           | 0.039 | 0.043 |
| E      | 0.50            | 0.60 | 0.70 | 0.020           | 0.024 | 0.028 |
| e      | 0.65 (BSC)      |      |      | 0.026 (BSC)     |       |       |
| h      | 0.125 ( x 45° ) |      |      | 0.005 ( x 45° ) |       |       |

### Part Numbering System

**SP 3530 -01 U T G**

TVS Diode Arrays (SPA® Diodes)

Series

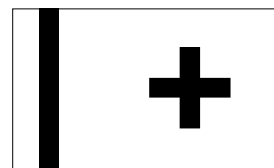
Number of Channels

Package

U: 0201 DFN  
E: SOD882

G= Green  
T= Tape & Reel

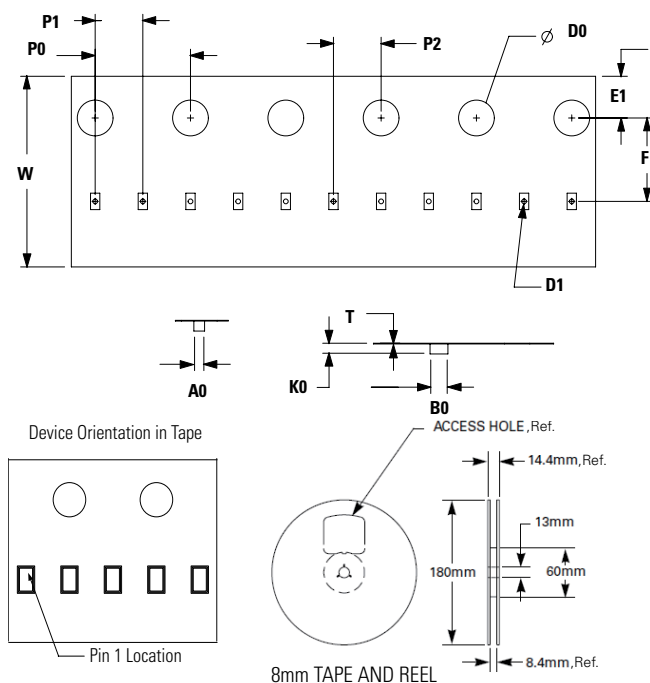
### Part Marking System



### Ordering Information

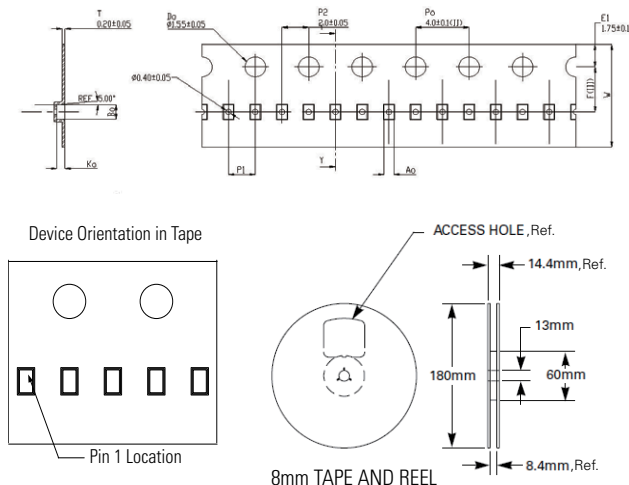
| Part Number  | Package  | Min. Order Qty. |
|--------------|----------|-----------------|
| SP3530-01UTG | 0201 DFN | 15000           |
| SP3530-01ETG | SOD882   | 10000           |

### Embossed Carrier Tape & Reel Specification — 0201 DFN



| Symbol | Millimeters                 |
|--------|-----------------------------|
| A0     | 0.33 min/0.41 max           |
| B0     | 0.63 min/0.71 max           |
| D0     | $\varnothing 1.50 +0.10/-0$ |
| D1     | $\varnothing 0.20 \pm 0.05$ |
| E1     | 1.75 $\pm$ 0.10             |
| F      | 3.50 $\pm$ 0.05             |
| K0     | 0.30 min/0.39 max           |
| P0     | 4.00 $\pm$ 0.10             |
| P1     | 2.00 $\pm$ 0.10             |
| P2     | 2.00 $\pm$ 0.05             |
| W      | 8.00 $\pm$ 0.30/0.10        |
| T      | 0.13 min/0.25 max           |

### Embossed Carrier Tape & Reel Specification — SOD882



| Symbol | Millimeters           |
|--------|-----------------------|
| A0     | 0.70 $\pm$ 0.045      |
| B0     | 1.10 $\pm$ 0.045      |
| K0     | 0.65 $\pm$ 0.045      |
| F      | 3.50 $\pm$ 0.05       |
| P1     | 2.00 $\pm$ 0.10       |
| W      | 8.00 $\pm$ 0.30 -0.10 |