# SP3022 Series

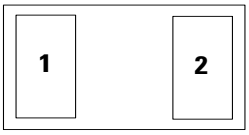
## 0.35pF 20kV Bidirectional Discrete TVS

RoHS Pb GREEN

## Additional Information

Resources | Accessories | Samples

### Pinout




(AEC-Q101 qualified)

### Functional Block Diagram


## 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 above the maximum level specified in the international standard IEC 61000-4-2, 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.

## Features & Benefits

- Lead-Free and RoHS-Compliant
- ESD, IEC 61000-4-2, ±20kV contact discharge, ±30kV air discharge
- EFT, IEC 61000-4-4, 40A (5/50ns)
- Lightning, 3A (8/20µs per IEC 61000-4-5 2nd Edition)
- Low capacitance of 0.35pF @ VR=0V (TYP)
- Low leakage current of 100nA at 5.3V (MAX)
- Space efficient SOD882 footprint
- Extremely low dynamic resistance (0.7Ω TYP)
- AEC-Q101 qualified

## 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
- Automotive Electronics



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### 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 |

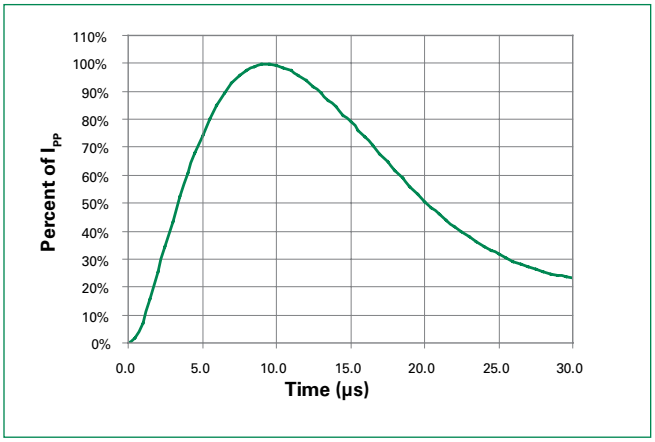
**Caution:** Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the component. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

### Electrical Characteristics (TOP=25ºC)

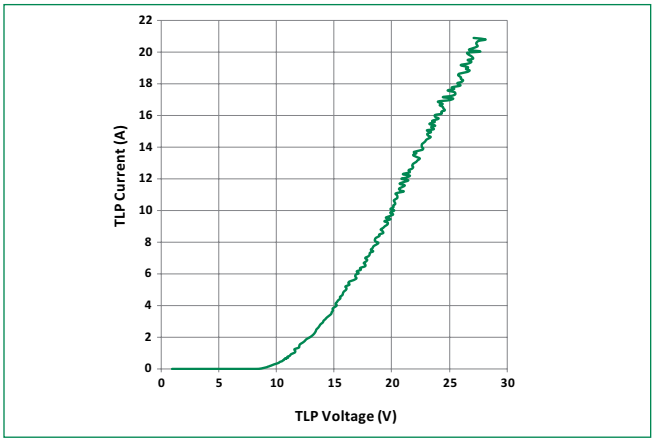
| Parameter | Symbol | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| Reverse Standoff Voltage | $V_{RWM}$ | $I_R$=1µA | | | 5.3 | V |
| Breakdown Voltage | $V_{BR}$ | $I_R$=1mA | 6.8 | 7.8 | 9.1 | V |
| Reverse Leakage Current | $I_{LEAK}$ | $V_R$=5.3V | | <10 | 100 | nA |
| 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] | $V_{ESD}$ | IEC 61000-4-2 (Contact) | ±20 | | | kV |
| | | IEC 61000-4-2 (Air) | ±30 | | | kV |
| Diode Capacitance[1] | $C_{I/O-I/O}$ | Reverse Bias=0V, f=1MHz | | 0.35 | 0.5 | pF |

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

### 8/20 Pulse Waveform




### Transmission Line Pulsing(TLP) Plot



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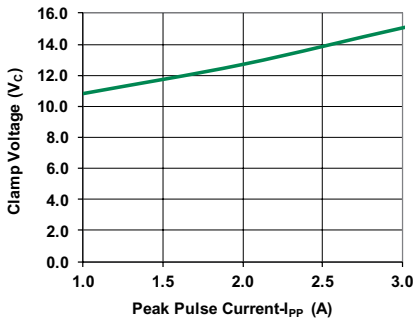
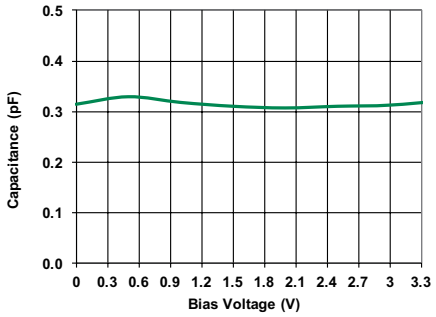
### Clamping Voltage vs IPP

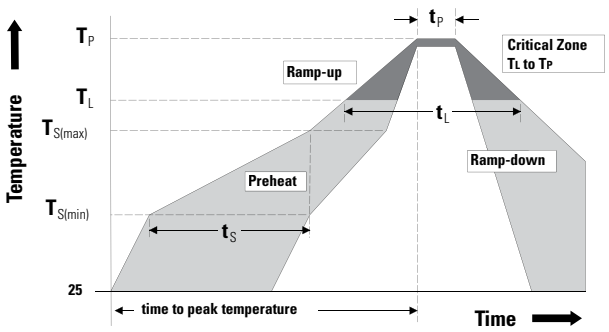



### Capacitance vs. Reverse Bias




## 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 SOD882

| | |
|---|---|
| **Lead Plating** | Pre-Plated Frame |
| **Lead Material** | Copper Alloy |
| **Substrate material** | Silicon |
| **Body Material** | Molded Compound |
| **Flammability** | UL Recognized compound meeting flammability rating V-0. |



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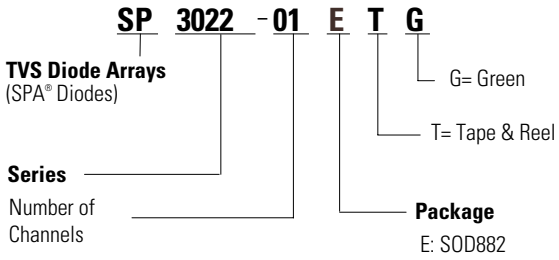
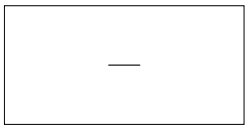
### Ordering Information

| Part Number | Package | Min. Order Qty. |
|---|---|---|
| SP3022-01ETG | SOD882 | 10000 |

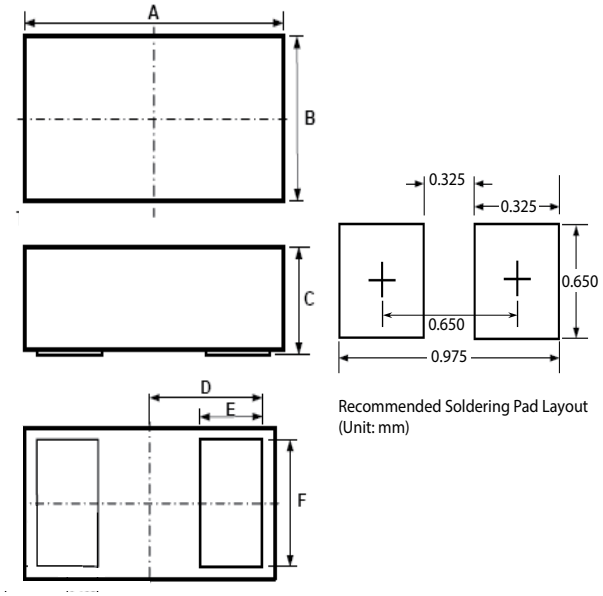
### Part Numbering System




### Part Marking System



## Package Dimensions — SOD882




Recommended Soldering Pad Layout
(Unit: mm)

| Symbol | Package | SOD882 | | | | |
|---|---|---|---|---|---|---|
| | JEDEC | MO-236 | | | | |
| | Millimeters | | | Inches | | |
| | Min | Typ | Max | Min | Typ | Max |
| A | 0.95 | 1.00 | 1.10 | 0.035 | 0.039 | 0.043 |
| B | 0.50 | 0.60 | 0.70 | 0.020 | 0.024 | 0.028 |
| C | 0.40 | 0.50 | 0.60 | 0.016 | 0.020 | 0.024 |
| D | | 0.45 | | | 0.018 | |
| E | 0.20 | 0.25 | 0.35 | 0.008 | 0.010 | 0.012 |
| F | 0.45 | 0.50 | 0.55 | 0.018 | 0.020 | 0.022 |



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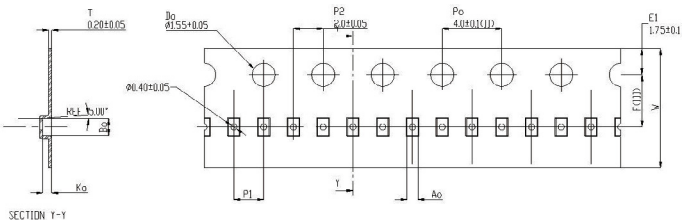
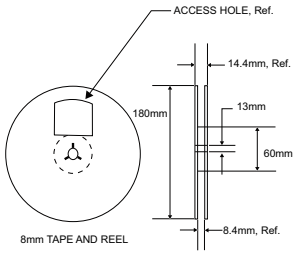
## Embossed Carrier Tape & Reel Specification — SOD882




| 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 |



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