

# SP3022-01ETG-NM

0.35 pF, 20 kV, SOD882, Bidirectional Non-Magnetic TVS, Low Capacitance ESD Protection

HF RoHS Pb

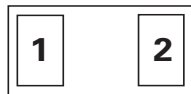


## Description

The SP3022-01ETG-NM provides low capacitance, bidirectional and non-magnetic of protection for electronic equipment that may experience destructive electrostatic discharges (ESD). The typical capacitance of 0.35 pF helps ensure excellent signal integrity on the most challenging consumer electronics interfaces.

It can safely absorb repetitive ESD strikes at  $\pm 20$  kV (contact discharge, IEC 61000-4-2) without performance degradation and safely dissipate 3.0 A of 8/20  $\mu$ s surge current (IEC 61000-4-5 2<sup>nd</sup> edition).

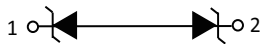
## Pinout



## Features

- Non-magnetic protection for medical applications
- ESD, IEC 61000-4-2,  $\pm 20$  kV contact,  $\pm 30$  kV air
- EFT, IEC 61000-4-4, 40 A (5/50 ns)
- Maximum surge tolerance, IEC 61000-4-5, 2<sup>nd</sup> edition, 3.0 A (8/20  $\mu$ s)
- Low capacitance of 0.35 pF (Typ@ $V_R = 0$  V)
- Low leakage current of 10 nA (Typ) at 5.3 V
- Halogen-free, lead-free and RoHS compliant
- Moisture sensitivity level (MSL-1)

## Functional Block Diagram



## Applications

- Medical Device
- External Storage
- HDMI 2.0, DisplayPort 1.3, eSATA
- MIPI Camera and Display
- Tablets, eReaders
- Ultrabooks, Notebooks
- USB 3.0/USB 2.0/MHL

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### Absolute Maximum Ratings

| Symbol     | Parameter                           | Value      | Units |
|------------|-------------------------------------|------------|-------|
| $I_{PP}$   | Peak Current ( $t_p = 8/20 \mu s$ ) | 3          | A     |
| $T_{OP}$   | Operating Temperature               | -40 to 125 | °C    |
| $T_{STOR}$ | Storage Temperature                 | -55 to 150 | °C    |

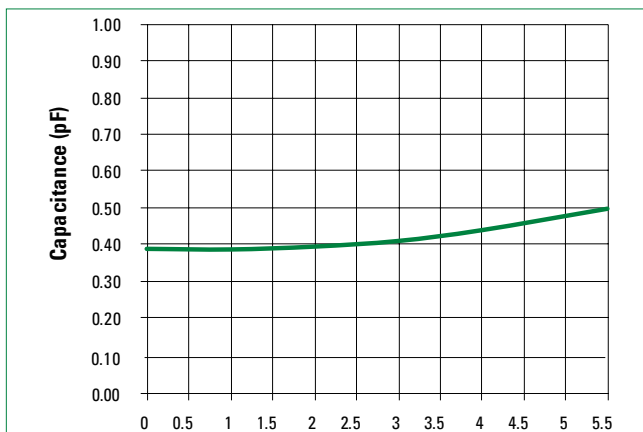
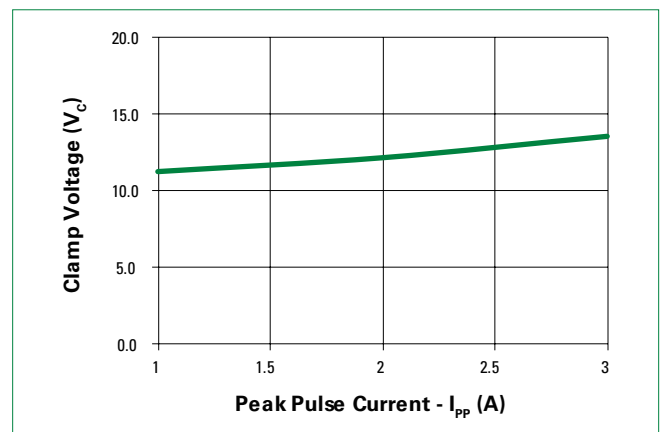
**CAUTION:** Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the component. This is a stress only rating and operation of the component at these or any other conditions above those indicated in the operational sections of this specification is not implied.

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

| Parameter                            | Symbol       | Test Conditions                                          | Min      | Typ  | Max  | Units    |
|--------------------------------------|--------------|----------------------------------------------------------|----------|------|------|----------|
| Reverse Standoff Voltage             | $V_{RWM}$    |                                                          |          |      | 5.3  | V        |
| Breakdown Voltage                    | $V_{BR}$     | $I_R = 1 \text{ mA}$                                     | 7.0      | 8.5  | 10   | V        |
| Reverse Leakage Current              | $I_{LEAK}$   | $V_R = 5.3 \text{ V}$                                    |          | 10   | 100  | nA       |
| Clamp Voltage <sup>1</sup>           | $V_C$        | $I_{PP} = 1 \text{ A}$ , $t_p = 8/20 \mu s$ , I/O to GND |          | 10.5 |      | V        |
|                                      |              | $I_{PP} = 3 \text{ A}$ , $t_p = 8/20 \mu s$ , I/O to GND |          | 13.0 |      | V        |
| Dynamic Resistance <sup>2</sup>      | $R_{DYN}$    | TLP, $t_p = 100 \text{ ns}$ , I/O to GND                 |          | 0.65 |      | $\Omega$ |
| ESD Withstand Voltage <sup>1,3</sup> | $V_{ESD}$    | IEC 61000-4-2 (Contact Discharge)                        | $\pm 20$ |      |      | kV       |
|                                      |              | IEC 61000-4-2 (Air Discharge)                            | $\pm 30$ |      |      | kV       |
| Diode Capacitance <sup>1</sup>       | $C_{IO-GND}$ | Reverse Bias = 0 V, $f = 1 \text{ MHz}$ , I/O to GND     |          | 0.35 | 0.50 | pF       |

**Note:**

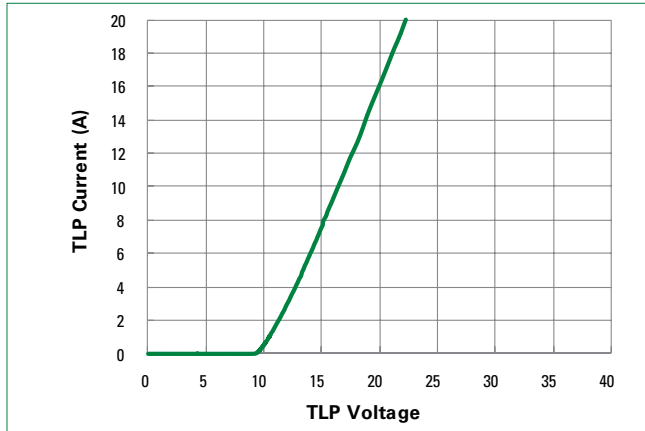
- Parameter is guaranteed by design and/or component characterization.
- Transmission Line Pulse (TLP) with 100 ns width, 0.2 ns rise time, and average window  $t_1 = 70 \text{ ns}$  to  $t_2 = 90 \text{ ns}$ .
- Device stressed with ten non-repetitive ESD pulses.

**Capacitance vs. Reverse Bias****Clamping Voltage vs  $I_{PP}$** 

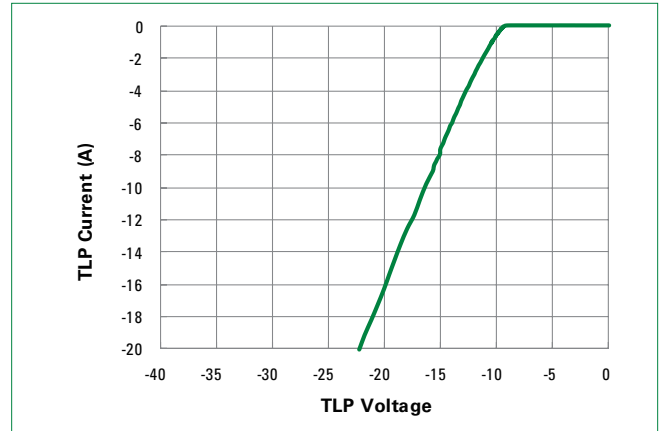
# SP3022-01ETG-NM

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Positive Transmission Line Pulsing (TLP) Plot



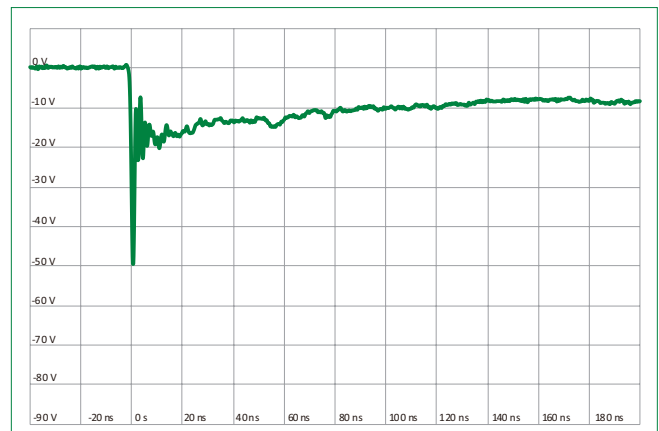
Negative Transmission Line Pulsing (TLP) Plot



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



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



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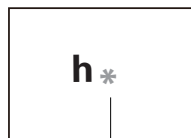
### Soldering Parameters

|                                                                        |                                    |                         |
|------------------------------------------------------------------------|------------------------------------|-------------------------|
| <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 – 120 seconds        |
| <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>  |                                    | 30 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                  |

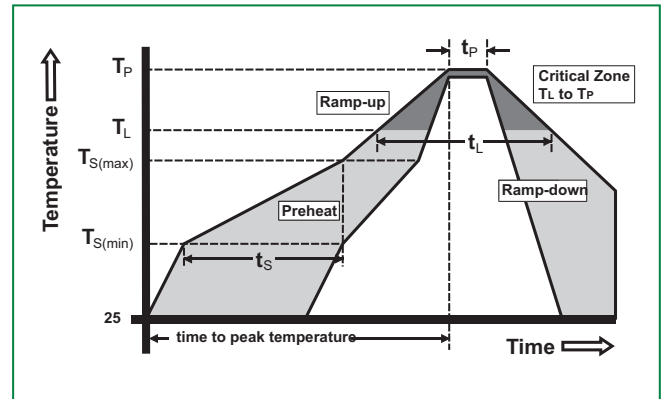
### Ordering Information

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

### Part Marking System



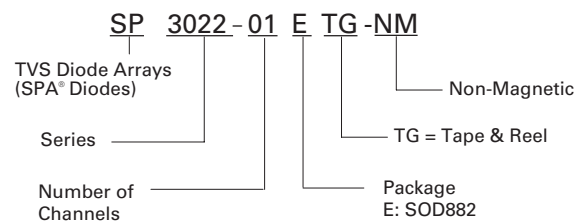
h : Part Code  
\* : Date Code



### Product Characteristics

|                      |                                                        |
|----------------------|--------------------------------------------------------|
| <b>Lead Plating</b>  | Matte Tin                                              |
| <b>Lead Material</b> | Copper Alloy                                           |
| <b>Body Material</b> | Molded Compound                                        |
| <b>Flammability</b>  | UL recognized compound meeting flammability rating V-0 |

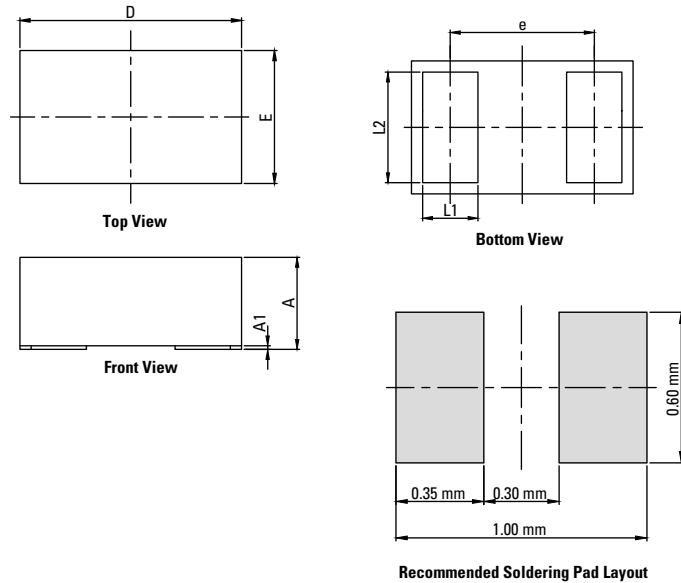
### Part Numbering System



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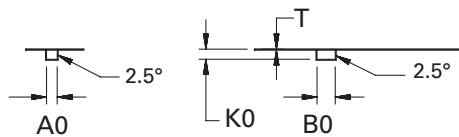
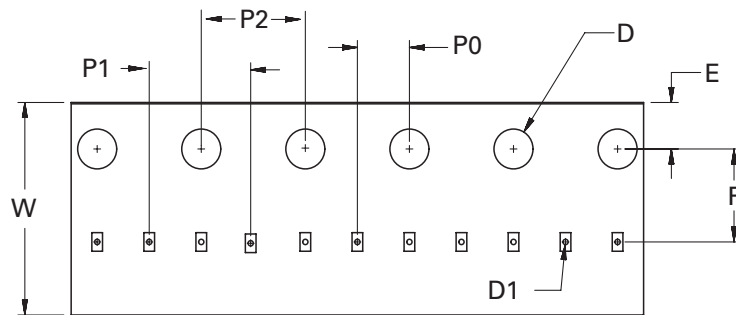
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### Package Dimensions — SOD882

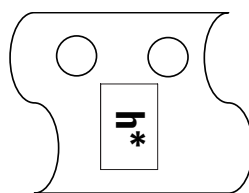


| Symbol | Millimeters |      | Inches   |       |
|--------|-------------|------|----------|-------|
|        | Min         | Max  | Min      | Max   |
| A      | 0.40        | 0.55 | 0.016    | 0.022 |
| A1     | 0.00        | 0.05 | 0.000    | 0.002 |
| L1     | 0.20        | 0.30 | 0.008    | 0.012 |
| L2     | 0.45        | 0.55 | 0.018    | 0.022 |
| D      | 0.95        | 1.05 | 0.037    | 0.041 |
| E      | 0.55        | 0.65 | 0.022    | 0.026 |
| e      | 0.65BSC     |      | 0.026BSC |       |

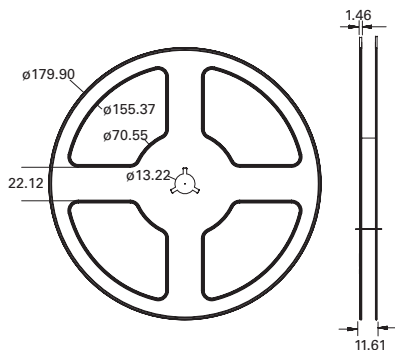
### Embossed Carrier Tape & Reel Specification — SOD882



Component Orientation in Tape



8 mm Tape and Reel



| Symbol | Millimeters     |
|--------|-----------------|
| A0     | 0.70+/-0.05     |
| B0     | 1.15+/-0.05     |
| D      | 1.50+0.10       |
| D1     | 0.40+/-0.10     |
| E      | 1.75+/-0.10     |
| F      | 3.50+/-0.05     |
| K0     | 0.55+/-0.05     |
| P0     | 2.00+/-0.05     |
| P1     | 4.00+/-0.10     |
| P2     | 4.00+/-0.10     |
| T      | 0.20+/-0.03     |
| W      | 8.00+0.30/-0.10 |

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