

## Features

- ❑ Transient protection for high-speed data lines  
IEC 61000-4-2 (ESD)  $\pm 30\text{kV}$  (Air)  
 $\pm 30\text{kV}$  (Contact)  
IEC 61000-4-4 (EFT) 40A (5/50ns)  
IEC 61000-4-5 (Lightning) 12A (8/20us)
- ❑ Protects one I/O line (bidirectional)
- ❑ Low clamping voltage
- ❑ Working voltages : 3.3V
- ❑ Low leakage current
- ❑ Response Time is < 1 ns

## Description

TS0321VEX is an ultra-low capacitance ESD and Surge Protector designed to provide electrostatic discharge (ESD) protection for high-speed data interfaces. TS0321VEX is designed to protect parasitic-sensitive systems against over-voltage and over-current transient events. It complies with IEC 61000-4-2 (ESD), Level 4 ( $\pm 15\text{kV}$  air,  $\pm 8\text{kV}$  contact discharge), IEC 61000-4-4 (electrical fast transient - EFT) (40A, 5/50 ns), IEC 61000-4-5 (Surge) (12A, 8/20 $\mu\text{s}$ ), very fast charged device model (CDM) ESD and cable discharge event (CDE), etc.

TS0321VEX is in an SOD323 package. The combined features of ultra-low capacitance and high ESD robustness make TS0321VEX ideal for applications where arrays are not practical. The low clamping voltage of the TS0321VEX guarantees a minimum stress on the protected IC.

## Applications

- ❑ Cell Phone Handsets and Accessories
- ❑ Microprocessor based equipment
- ❑ Personal Digital Assistants (PDA's)
- ❑ Notebooks, Desktops, and Servers
- ❑ Portable Instrumentation
- ❑ Peripherals
- ❑ USB Interface

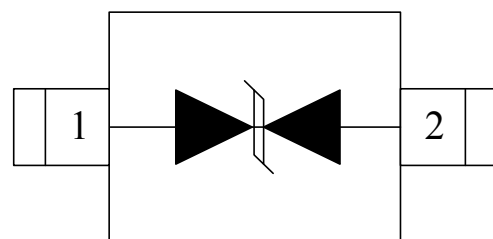
## Mechanical Characteristics

- ❑ SOD323 package
- ❑ Flammability Rating: UL 94V-0
- ❑ Packaging: Tape and Reel
- ❑ High temperature soldering guaranteed: 260°C/10s
- ❑ Reel size: 7 inch

## Ordering Information

- ❑ Package: SOD323
- ❑ Material: Halogen free
- ❑ Packing: Tape & Reel
- ❑ Quantity per reel: 3,000pcs

## Pin Configuration



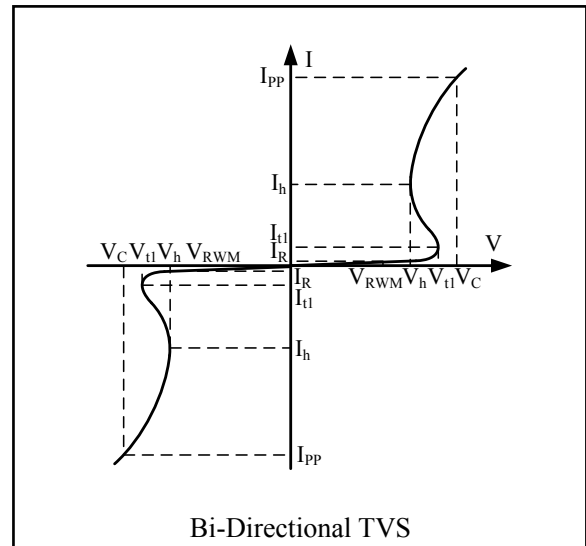
(Top View)

## Absolute Maximum Rating

| Symbol    | Parameter                                                      | Value                | Units |
|-----------|----------------------------------------------------------------|----------------------|-------|
| $I_{PP}$  | Peak Pulse Current (8/20 $\mu$ s)                              | 12                   | A     |
| $V_{ESD}$ | ESD per IEC 61000-4-2 (Air)<br>ESD per IEC 61000-4-2 (Contact) | $\pm 30$<br>$\pm 30$ | kV    |
| $T_{OPT}$ | Operating Temperature                                          | -45 to +85           | °C    |
| $T_{STG}$ | Storage Temperature                                            | -55 to +150          | °C    |

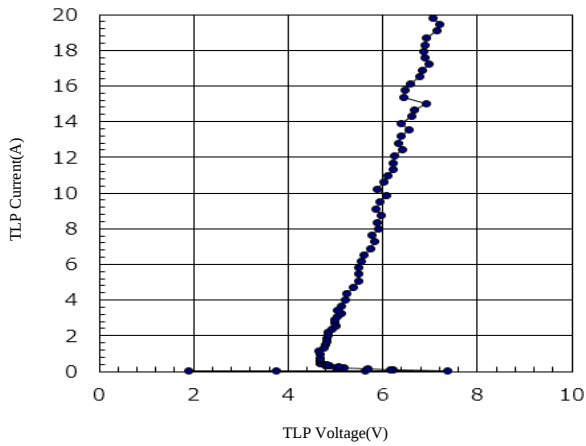
## Electrical Characteristics (T = 25°C)

| Symbol     | Parameter                                |
|------------|------------------------------------------|
| $V_{RWM}$  | Nominal Reverse Working Voltage          |
| $I_R$      | Reverse Leakage Current @ $V_{RWM}$      |
| $V_{tl}$   | Trigger Voltage                          |
| $I_{tl}$   | Trigger Current @ $V_{tl}$               |
| $V_h$      | Holding Voltage                          |
| $I_h$      | Holding Current @ $V_h$                  |
| $V_C$      | Clamping Voltage @ $I_{PP}$              |
| $I_{PP}$   | Maximum Peak Pulse Current               |
| $C_{ESD}$  | Parasitic Capacitance                    |
| $C_\Delta$ | Variation in $C_{ESD}$ with Reverse Bias |

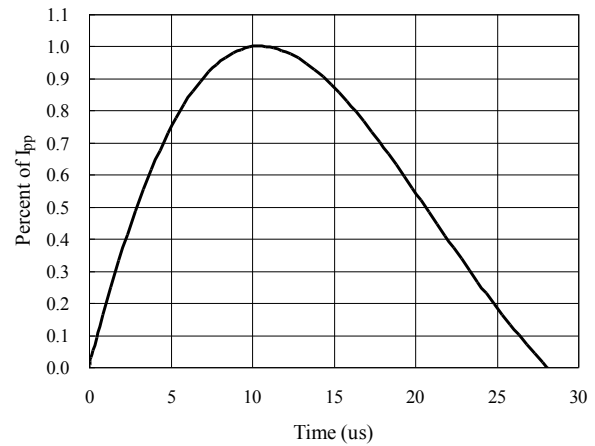


| Symbol    | Test Condition                   | Minimum | Typical | Maximum | Units   |
|-----------|----------------------------------|---------|---------|---------|---------|
| $V_{RWM}$ |                                  |         |         | 3.3     | V       |
| $I_R$     | $V_{RWM} = 3.3V, T = 25^\circ C$ |         | 0.01    | 0.1     | $\mu A$ |
| $V_{tl}$  | $I_{tl} = 1\mu A$                | 6.5     |         | 7.5     | V       |
| $V_h$     | $I_h = 10mA$                     | 3.5     |         | 4.5     | V       |
| $V_C$     | $I_{PP} = 1A, t_p = 8/20\mu s$   |         |         | 5.0     | V       |
| $V_C$     | $I_{PP} = 12A, t_p = 8/20\mu s$  |         |         | 10.0    | V       |
| $C_{ESD}$ | $V_R = 3.3V, f = 1MHz$           |         | 1.5     | 2.0     | pF      |

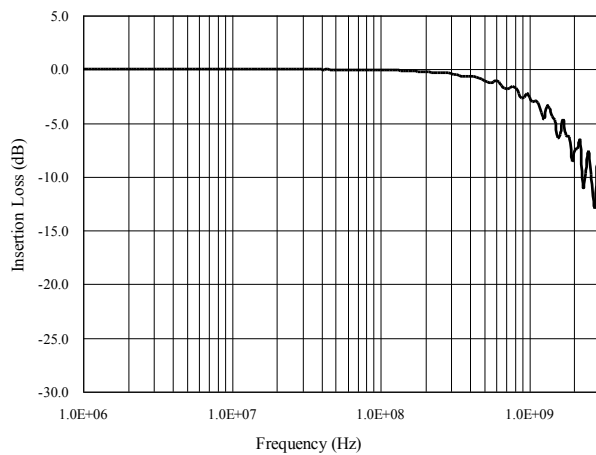
**TLP Measurement of I/O to I/O**



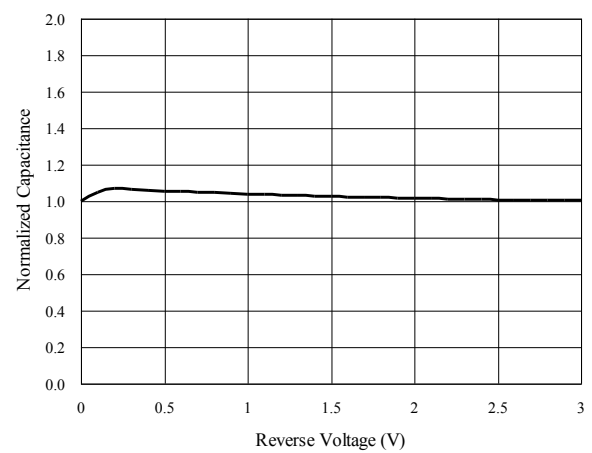
**8/20μs Pulse Waveform**



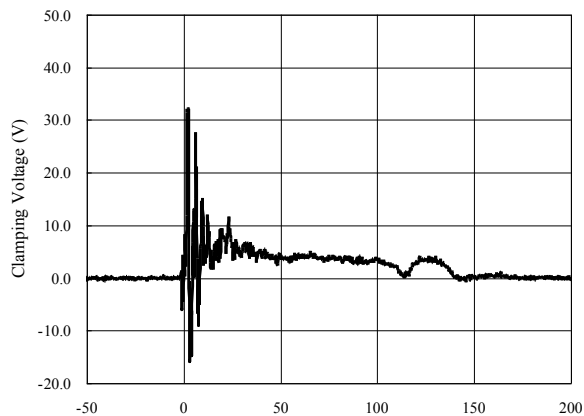
**Insertion Loss S21**



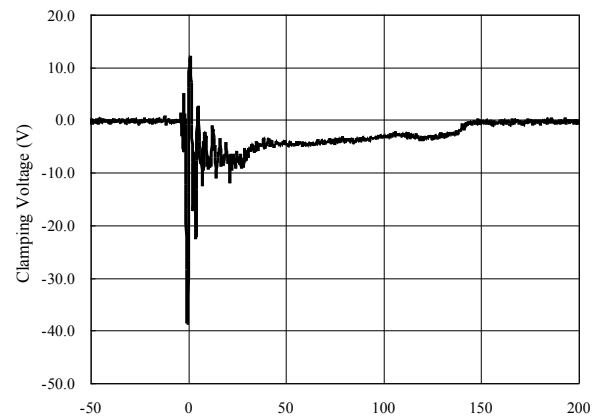
**Normalized Capacitance vs. Voltage**



**ESD Clamping of I/O to I/O  
(+8kV Contact per IEC 61000-4-2)**



**ESD Clamping of I/O to I/O  
(-8kV Contact per IEC 61000-4-2)**

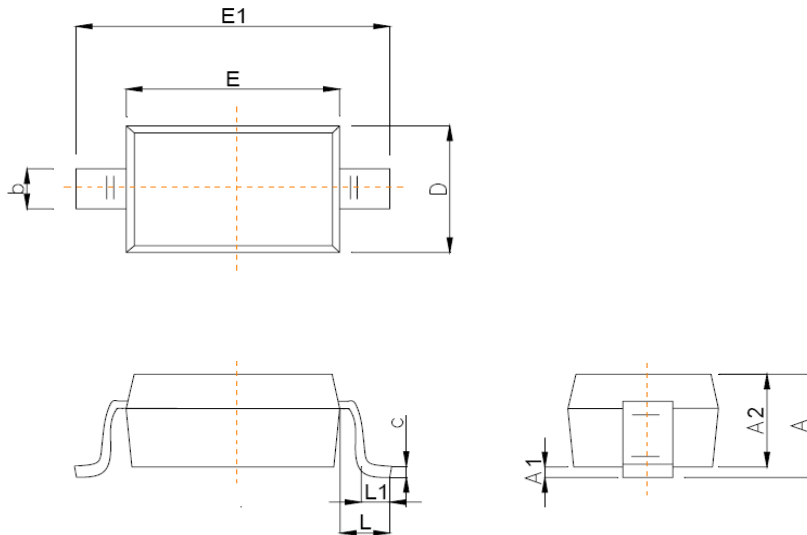


## Package Outline

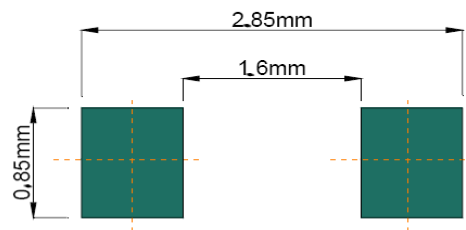
□ SOD323 package



## Package Outline Dimensions

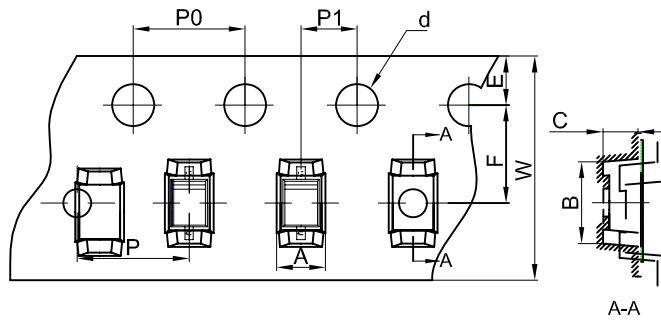


| Symbol | Dimensions In Millimeters |       |
|--------|---------------------------|-------|
|        | Min                       | Max   |
| A      |                           | 1.00  |
| A1     | 0.000                     | 0.100 |
| A2     | 0.800                     | 0.900 |
| b      | 0.250                     | 0.350 |
| c      | 0.080                     | 0.150 |
| D      | 1.200                     | 1.400 |
| E      | 1.600                     | 1.800 |
| E1     | 2.500                     | 2.700 |
| e      | 1.800                     | 2.040 |
| L      | 0.475 REF                 |       |
| L1     | 0.250                     | 0.400 |
| θ      | 0°                        | 8°    |



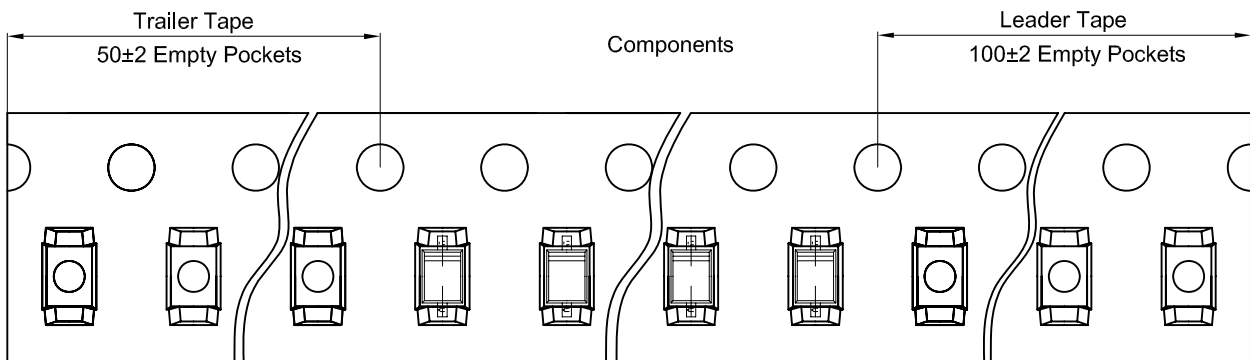
**Recommended Pad outline**

## Tape and Reel Specification

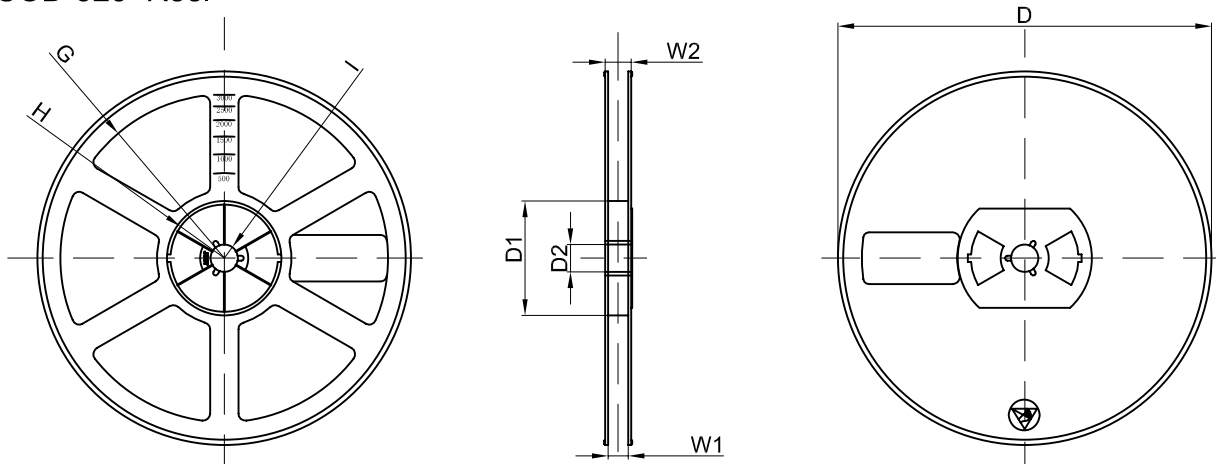


| Dimensions are in millimeter |         |         |         |        |        |        |        |        |        |           |
|------------------------------|---------|---------|---------|--------|--------|--------|--------|--------|--------|-----------|
| Pkg type                     | A       | B       | C       | d      | E      | F      | P0     | P      | P1     | W         |
| SOD-323                      | 1.46    | 2.90    | 1.25    | Ø1.50  | 1.75   | 3.50   | 4.00   | 4.00   | 2.00   | 8.00      |
| (Tolerance)                  | +/-0.05 | +/-0.05 | +/-0.05 | +/-0.1 | +/-0.1 | +/-0.1 | +/-0.1 | +/-0.1 | +/-0.1 | +0.3/-0.1 |

### SOD-323 Tape Leader and Trailer



### SOD-323 Reel



| Dimensions are in millimeter |         |       |       |        |        |       |      |       |
|------------------------------|---------|-------|-------|--------|--------|-------|------|-------|
| Reel Option                  | D       | D1    | D2    | G      | H      | I     | W1   | W2    |
| 7" Dia                       | Ø178.00 | 54.40 | 13.00 | R78.00 | R25.60 | R6.50 | 9.50 | 12.30 |
| Tolerance                    | +/-2    | +/-1  | +/-1  | +/-1   | +/-1   | +/-1  | +/-1 | +/-1  |

| REEL     | Reel Size | Box        | Box Size(mm) | Carton      | Carton Size(mm) | G.W.(kg) |
|----------|-----------|------------|--------------|-------------|-----------------|----------|
| 3000 pcs | 7 inch    | 45,000 pcs | 203×203×195  | 180,000 pcs | 438×438×220     |          |

**Marking Codes****Note:**

(1) "32VE" is the Part Number, fixed.

**Ordering Information**

| Part Number | Working Voltage | Quantity Per Reel | Reel Size |
|-------------|-----------------|-------------------|-----------|
| TS0321VEX   | 3.3V            | 3,000             | 7 Inch    |