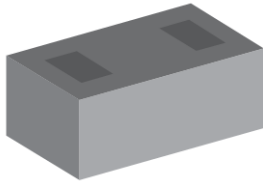


## Ultra-low clamping single line bidirectional ESD protection in extra-small 01005 package



**ST01005 package**

### Features

- Ultra-low clamping voltage: +/-7 V IEC 61000-4-2 8 kV contact discharge at 30 ns
- Bidirectional device
- Low leakage current
- 01005 package
- ECOPACK2 compliant component
- ESD / transient protection according to:
  - IEC61000-4-2 (ESD): 15kV / 25kV contact / air discharge
  - IEC61000-4-4 (EFT): 40A
  - IEC61000-4-5 (surge): 5A

### Applications

- Where transient overvoltage protection in ESD sensitive equipment is required, such as:
  - Smartphones, mobile phone and accessories
  - Tablet and notebooks
  - Portable multimedia devices and accessories
  - Wearable, home automation, healthcare
  - Highly integrated systems

| Product status |
|----------------|
| ESDZV5-1BV2    |

### Description

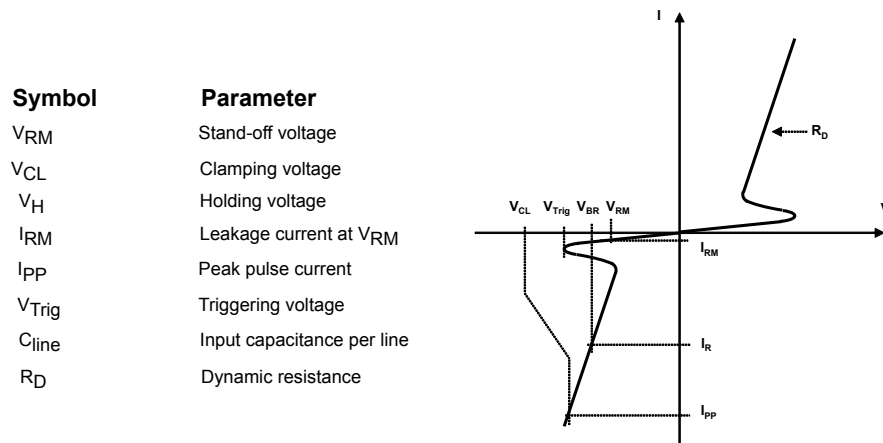
Bidirectional single line TVS diode designed to protect the data lines or other I/O ports against ESD transients.

The **ESDZV5-1BV2** is the smallest and most efficient 15 kV ESD protection, ideal for applications where both reduced line capacitance, board space saving and high ESD protection levels are required.

# 1 Characteristics

**Table 1. Absolute maximum ratings**

| Symbol           | Parameter                                     |                   | Value       | Unit |
|------------------|---|-------------------|-------------|------|
| V <sub>PP</sub>  | Peak pulse voltage                            | IEC 61000-4-2:    |             |      |
|                  |   | Contact discharge | 15          | kV   |
|                  |   | Air discharge     | 25          |      |
| I <sub>PP</sub>  | Peak pulse current                            | 8/20μs            | 5           | A    |
| P <sub>PP</sub>  | Peak pulse power                              |                   | 45          | W    |
| T <sub>stg</sub> | Storage junction temperature range            |                   | -65 to +150 | °C   |
| T <sub>j</sub>   | Maximum operating junction temperature        |                   | -40 to +150 |      |
| T <sub>L</sub>   | Maximum temperature for soldering during 10 s |                   | 260         | °C   |

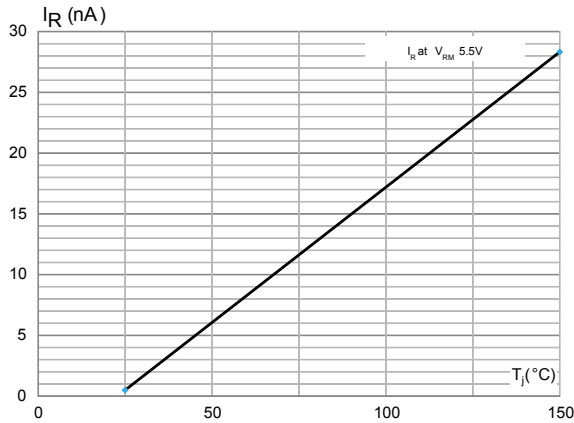
**Figure 1. Electrical characteristics (definitions)**

**Table 2. Electrical characteristics (T<sub>amb</sub> = 25 °C)**

| Symbol            | Test conditions   | Min. | Typ. | Max. | Unit |
|-------------------|---|------|------|------|------|
| V <sub>Trig</sub> | Higher voltage than V <sub>TRIG</sub> guarantees the protection turn-on | 5.8  |      | 8.5  | V    |
| I <sub>RM</sub>   | V <sub>RM</sub> = 5.5 V <sup>(1)</sup>                                  |      |      | 100  | nA   |
| R <sub>D</sub>    | Pulse duration 100 ns   |      | 0.18 |      | Ω    |
| V <sub>CL</sub>   | 8 kV contact discharge after 30 ns, IEC 61000-4-2                       |      | 7    |      | V    |
| C <sub>line</sub> | F = 1 MHz, V <sub>OSC</sub> = 30 mV                                     |      | 5    | 6    | pF   |
| V <sub>H</sub>    | Lower voltage than V <sub>H</sub> guarantees the protection turn-off    | 4    | 4.3  | 4.8  | V    |

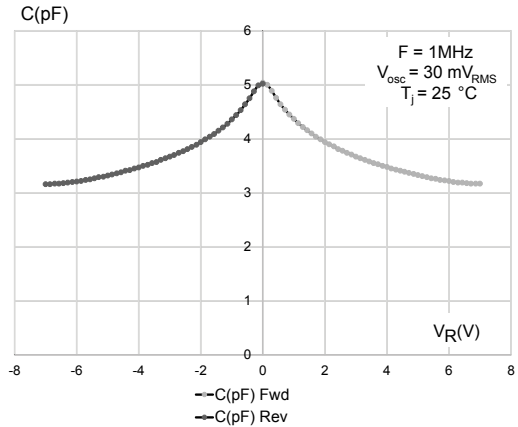
1. Application note: When used to protect a line connected to a DC source, the DC voltage must be lower than the minimum V<sub>H</sub> to enable the diode to return to its non-conducting state after the transient.

## 1.1 Characteristics (curves)

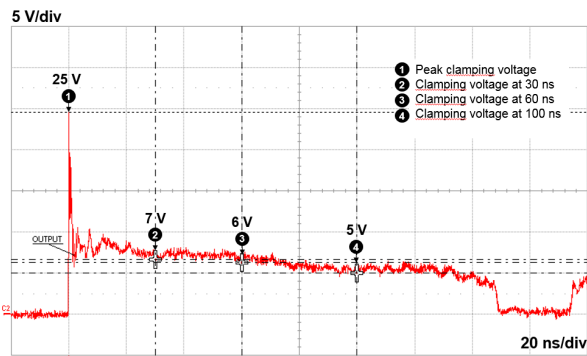
**Figure 2. Leakage current versus junction temperature (typical values)**



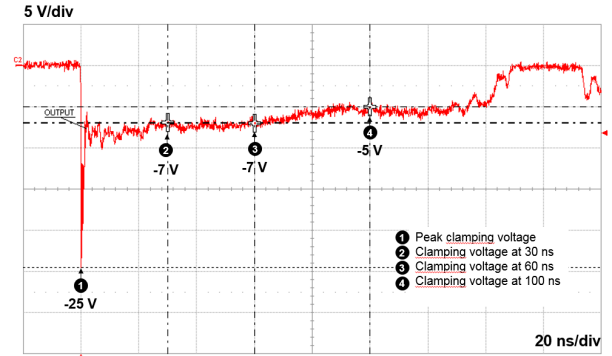
**Figure 3. Junction capacitance versus applied voltage (typical values)**



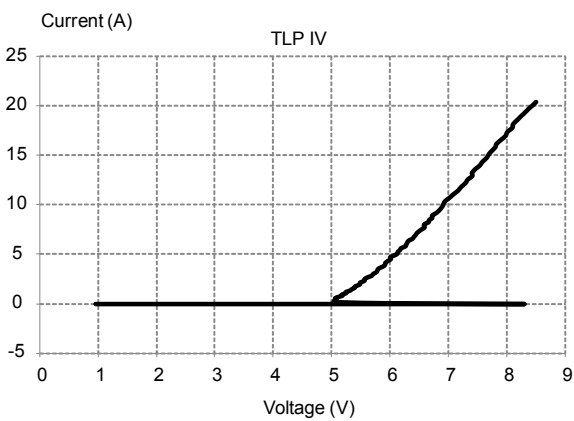
**Figure 4. ESD response to IEC 61000-4-2 (+8 kV contact discharge)**



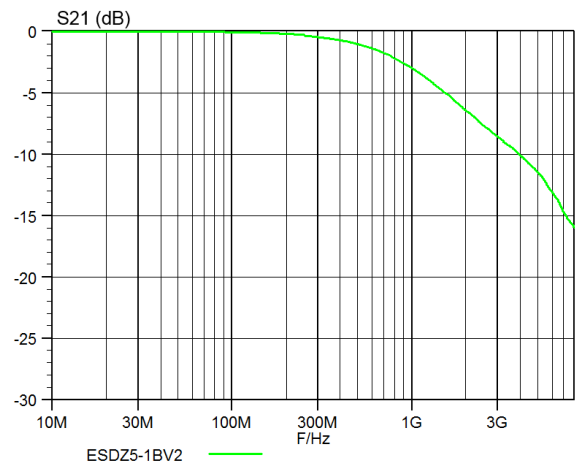
**Figure 5. ESD response to IEC 61000-4-2 (-8 kV contact discharge)**



**Figure 6. TLP characteristic**



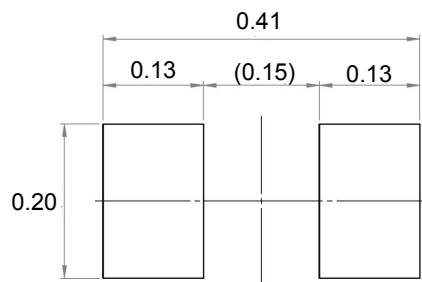
**Figure 7. S21 attenuation measurement result**



## 2 Recommendation on PCB assembly

### 2.1 Footprint

Figure 8. Footprint in mm

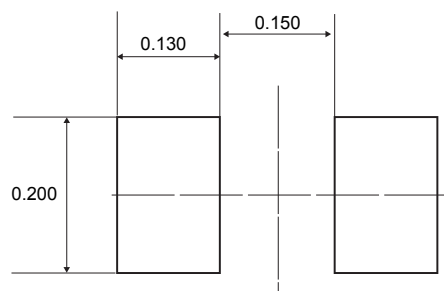


1. SMD footprint design is recommended

### 2.2 Stencil opening design

1. Recommended design reference
  - a. Stencil opening thickness: 75  $\mu\text{m}$ .
  - b. Stencil aperture ratio: 100%

Figure 9. Stencil opening dimensions



### 2.3 Solder paste

1. Halide-free flux qualification ROL0 according to ANSI/J-STD-004.
2. "No clean" solder paste is recommended.
3. Offers a high tack force to resist component movement during high speed.
4. Use solder paste with fine particles: Type 4 (powder particle size 20-38  $\mu\text{m}$  per IPCJ STD-005).

### 2.4 Placement

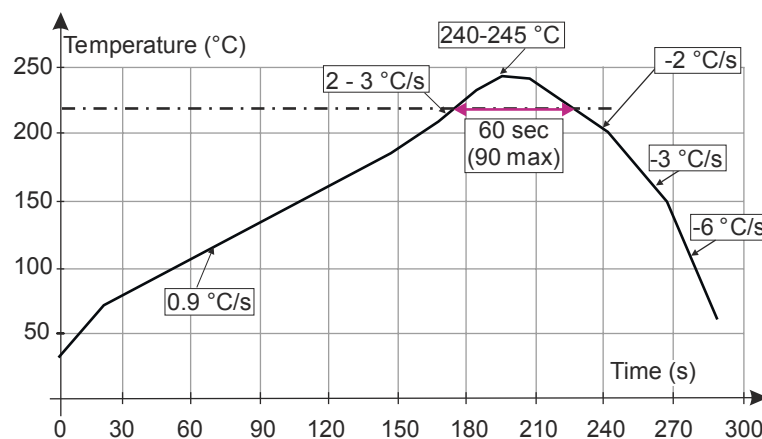
1. Manual positioning is not recommended.
2. It is recommended to use the lead recognition capabilities of the placement system, not the outline centering
3. Standard tolerance of  $\pm 0.05$  mm is recommended.
4. 1.0 N placement force is recommended. Too much placement force can lead to squeezed out solder paste and cause solder joints to short. Too low placement force can lead to insufficient contact between package and solder paste that could cause open solder joints or badly centered packages.
5. To improve the package placement accuracy, a bottom side optical control should be performed with a high resolution tool.
6. For assembly, a perfect supporting of the PCB (all the more on flexible PCB) is recommended during solder paste printing, pick and place and reflow soldering by using optimized tools.

### 2.5 PCB design preference

1. To control the solder paste amount, the closed via is recommended instead of open vias.
2. The position of tracks and open vias in the solder area should be well balanced. A symmetrical layout is recommended, to avoid any tilt phenomena caused by asymmetrical solder paste due to solder flow away.

### 2.6 Reflow profile

**Figure 10. ST ECOPACK<sup>®</sup> recommended soldering reflow profile for PCB mounting**



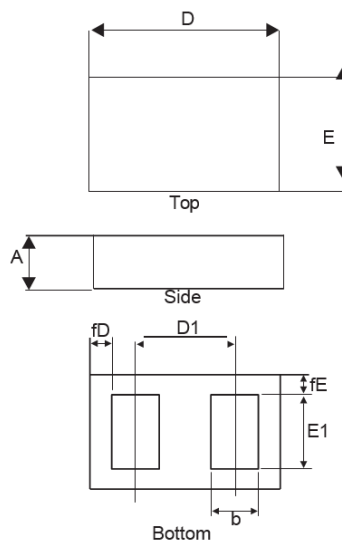
**Note:** Minimize air convection currents in the reflow oven to avoid component movement. Maximum soldering profile corresponds to the latest IPC/JEDEC J-STD-020.

### 3 Package information

In order to meet environmental requirements, ST offers these devices in different grades of **ECOPACK** packages, depending on their level of environmental compliance. ECOPACK specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK is an ST trademark.

#### 3.1 ST01005 package information

**Figure 11. ST01005 package outline**



**Table 3. ST01005 package mechanical data**

| Ref. | Dimensions  |        |       |
|------|-------------|--------|-------|
|      | Millimeters |        |       |
|      | Min.        | Typ.   | Max.  |
| A    | 0.130       | 0.150  | 0.180 |
| b    |             | 0.130  |       |
| D    | 0.440       | 0.455  | 0.470 |
| D1   |             | 0.280  |       |
| E    | 0.230       | 0.245  | 0.260 |
| E1   |             | 0.200  |       |
| fD   |             | 0.0225 |       |
| fE   |             | 0.0225 |       |

Figure 12. Marking layout

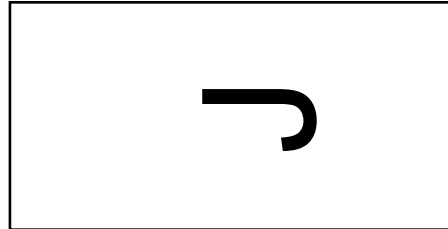
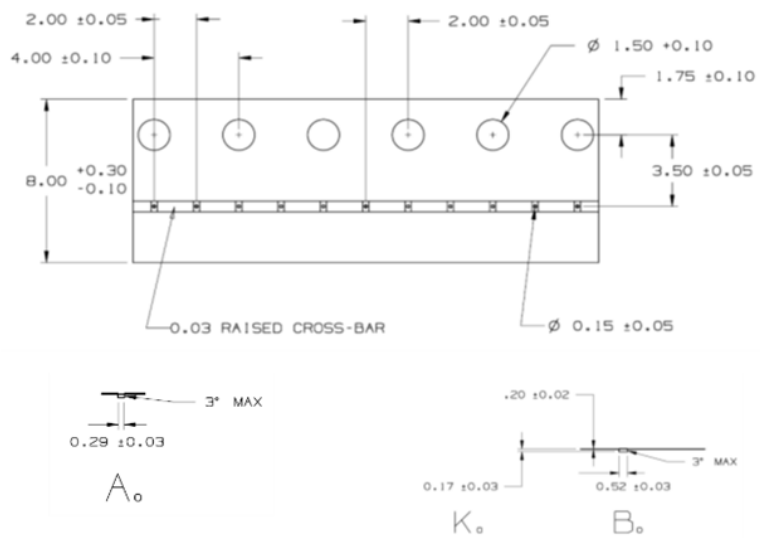


Figure 13. Tape and reel mechanical data



## 4 Ordering information

Figure 14. Ordering information scheme

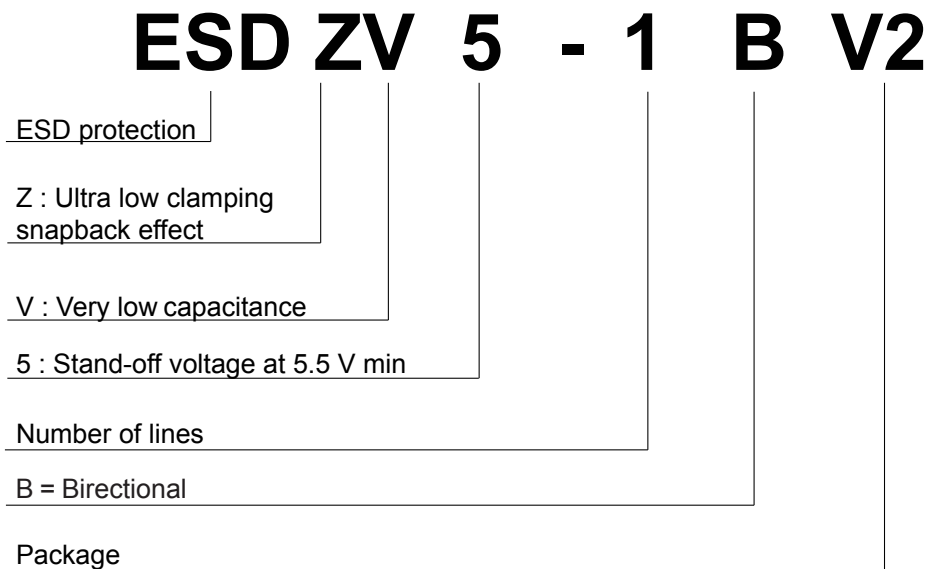


Table 4. Ordering information

| Order code  | Marking | Package | Weight   | Base qty. | Delivery mode |
|-------------|---------|---------|----------|-----------|---------------|
| ESDZV5-1BV2 | J       | ST01005 | 0.041 mg | 20000     | Tape and reel |

1. The marking can be rotated by multiples of 90° to differentiate assembly location



## Revision history

**Table 5. Document revision history**

| Date        | Revision | Changes  |
|-------------|----------|--|
| 16-Nov-2017 | 1        | Initial release.   |
| 27-Feb-2018 | 2        | Updated <a href="#">Section Features</a> and <a href="#">Table 1</a> . Absolute maximum ratings.             |
| 06-Nov-2018 | 3        | Updated <a href="#">Section 2.1 Footprint</a> and <a href="#">Table 3</a> . ST01005 package mechanical data. |
| 08-Dec-2020 | 4        | Updated <a href="#">Figure 13</a> . Marking layout.  |