



# PESD12VV1BL

Very low capacitance bidirectional ESD protection diode

14 October 2016

Product data sheet

## 1. General description

Very low capacitance bidirectional ElectroStatic Discharge (ESD) protection diode designed to protect one signal line from the damage caused by ESD and other transients. The device is housed in a leadless ultra small DFN1006-2 (SOD882) Surface-Mounted Device (SMD) plastic package.

## 2. Features and benefits

- Bidirectional ESD protection of one line
- Low diode capacitance  $C_d = 17 \text{ pF}$
- Rated peak pulse power:  $P_{PPM} = 290 \text{ W}$
- Ultra low leakage current  $I_{RM} < 1 \text{ nA}$
- ESD protection up to 30 kV
- IEC 61000-4-2; level 4 (ESD)
- IEC 61000-4-5 (surge);  $I_{PPM} = 7.8 \text{ A}$
- AEC-Q101 qualified

## 3. Applications

- Computers and peripherals
- Audio and video equipment
- Cellular handsets and accessories
- Portable electronics
- Communication systems

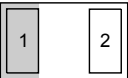
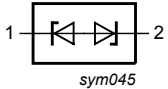
## 4. Quick reference data

Table 1. Quick reference data

| Symbol    | Parameter                | Conditions  | Min | Typ | Max | Unit |
|-----------|--------------------------|---|-----|-----|-----|------|
| $V_{RWM}$ | reverse standoff voltage | $T_{amb} = 25 \text{ }^{\circ}\text{C}$                                       | -   | -   | 12  | V    |
| $C_d$     | diode capacitance        | $f = 1 \text{ MHz}; V_R = 0 \text{ V}; T_{amb} = 25 \text{ }^{\circ}\text{C}$ | -   | 17  | 25  | pF   |

## 5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline  | Graphic symbol  |
|-----|--------|-------------|---|---|
| 1   | K      | cathode     | <br>Transparent<br>top view<br><b>DFN1006-2 (SOD882)</b> | <br>sym045 |
| 2   | K      | cathode     |   |   |

## 6. Ordering information

Table 3. Ordering information

| Type number | Package   |  |         |
|-------------|-----------|--|---------|
|             | Name      | Description  | Version |
| PESD12VV1BL | DFN1006-2 | DFN1006-2: leadless ultra small plastic package; 2 terminals | SOD882  |

## 7. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| PESD12VV1BL | MW           |

## 8. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol                     | Parameter                       | Conditions                       |     | Min | Max | Unit |
|----------------------------|---------------------------------|----------------------------------|-----|-----|-----|------|
| $P_{PPM}$                  | rated peak pulse power          |                                  | [1] | -   | 290 | W    |
| $I_{PPM}$                  | rated peak pulse current        | $t_p = 8/20 \mu s$               | [1] | -   | 7.8 | A    |
| $T_j$                      | junction temperature            |                                  |     | -   | 150 | °C   |
| $T_{amb}$                  | ambient temperature             |                                  |     | -55 | 150 | °C   |
| $T_{stg}$                  | storage temperature             |                                  |     | -65 | 150 | °C   |
| <b>ESD maximum ratings</b> |                                 |                                  |     |     |     |      |
| $V_{ESD}$                  | electrostatic discharge voltage | IEC 61000-4-2; contact discharge | [2] | -   | 30  | kV   |
|                            |                                 | machine model                    |     | -   | 400 | V    |
|                            |                                 | human body model (MIL-STD-883)   |     | -   | 10  | kV   |

[1] Device stressed with non-repetitive current pulses (8/20  $\mu s$  exponential decay waveform according to IEC 61000-4-5 and IEC 61643-321).

[2] Device stressed with ten non-repetitive ESD pulses.

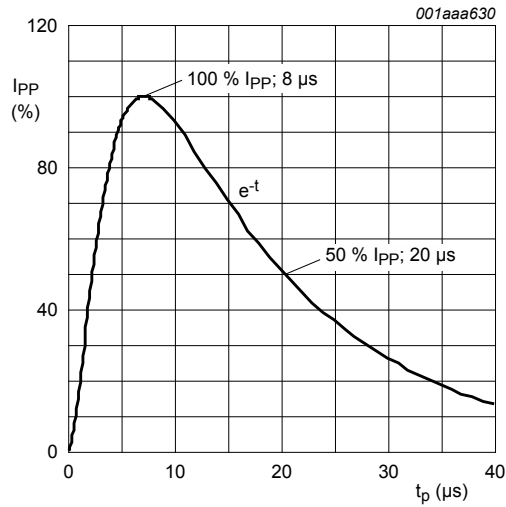


Fig. 1. 8/20  $\mu$ s pulse waveform according to IEC 61000-4-5 and IEC 61643-321

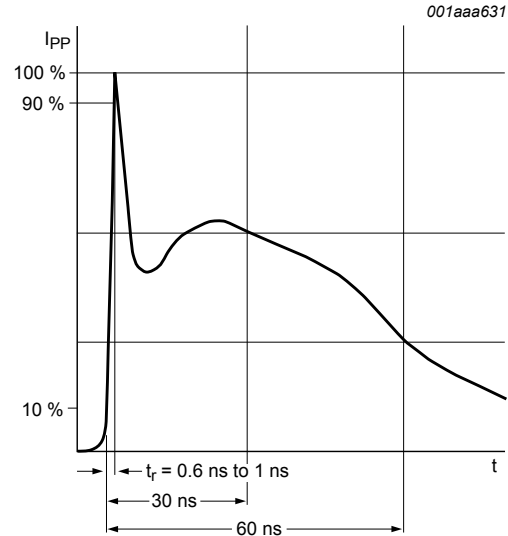


Fig. 2. ESD pulse waveform according to IEC 61000-4-2

## 9. Characteristics

Table 6. Characteristics

| Symbol    | Parameter                | Conditions   |     | Min  | Typ  | Max  | Unit     |
|-----------|--------------------------|--|-----|------|------|------|----------|
| $V_{RWM}$ | reverse standoff voltage | $T_{amb} = 25\text{ }^{\circ}\text{C}$   |     | -    | -    | 12   | V        |
| $V_{BR}$  | breakdown voltage        | $I_R = 5\text{ mA}$ ; $T_{amb} = 25\text{ }^{\circ}\text{C}$                     |     | 14.6 | 15.7 | 16.8 | V        |
| $I_{RM}$  | reverse leakage current  | $V_{RWM} = 12\text{ V}$ ; $T_{amb} = 25\text{ }^{\circ}\text{C}$                 |     | -    | 1    | 10   | nA       |
| $C_d$     | diode capacitance        | $f = 1\text{ MHz}$ ; $V_R = 0\text{ V}$ ; $T_{amb} = 25\text{ }^{\circ}\text{C}$ |     | -    | 17   | 25   | pF       |
| $V_{CL}$  | clamping voltage         | $I_{PP} = 1\text{ A}$ ; $T_{amb} = 25\text{ }^{\circ}\text{C}$                   | [1] | -    | -    | 22   | V        |
|           |                          | $I_{PPM} = 7.8\text{ A}$ ; $T_{amb} = 25\text{ }^{\circ}\text{C}$                | [1] | -    | -    | 38   | V        |
| $R_{dyn}$ | dynamic resistance       | $I_R = 10\text{ A}$ ; $T_{amb} = 25\text{ }^{\circ}\text{C}$                     | [2] | -    | 0.7  | -    | $\Omega$ |

[1] Device stressed with 8/20  $\mu$ s exponential decay waveform according to IEC 61000-4-5 and IEC 61643-321.

[2] Non-repetitive current pulse, Transmission Line Pulse (TLP)  $t_p = 100\text{ ns}$ ; square pulse; ANSI / ESD STM5.5.1-2008.

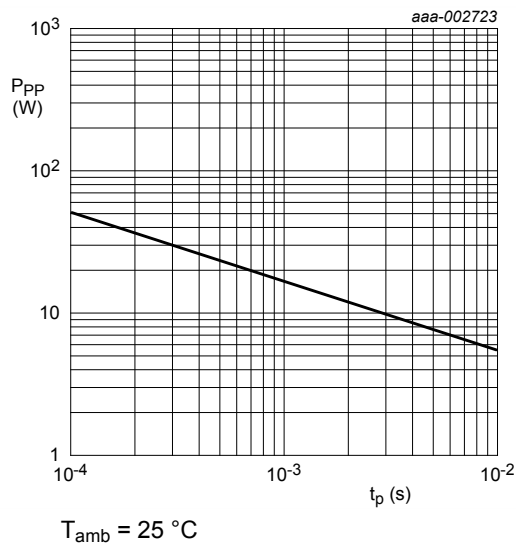


Fig. 3. Rated peak pulse power as a function of square pulse duration; maximum values

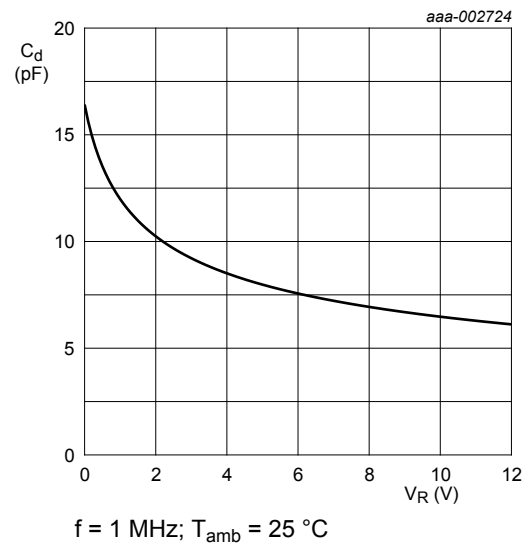


Fig. 4. Diode capacitance as a function of reverse voltage; typical values

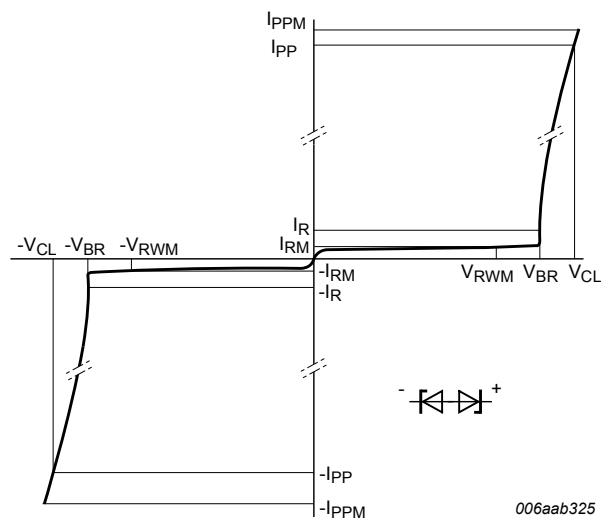


Fig. 5. V-I characteristics for a bidirectional ESD protection diode

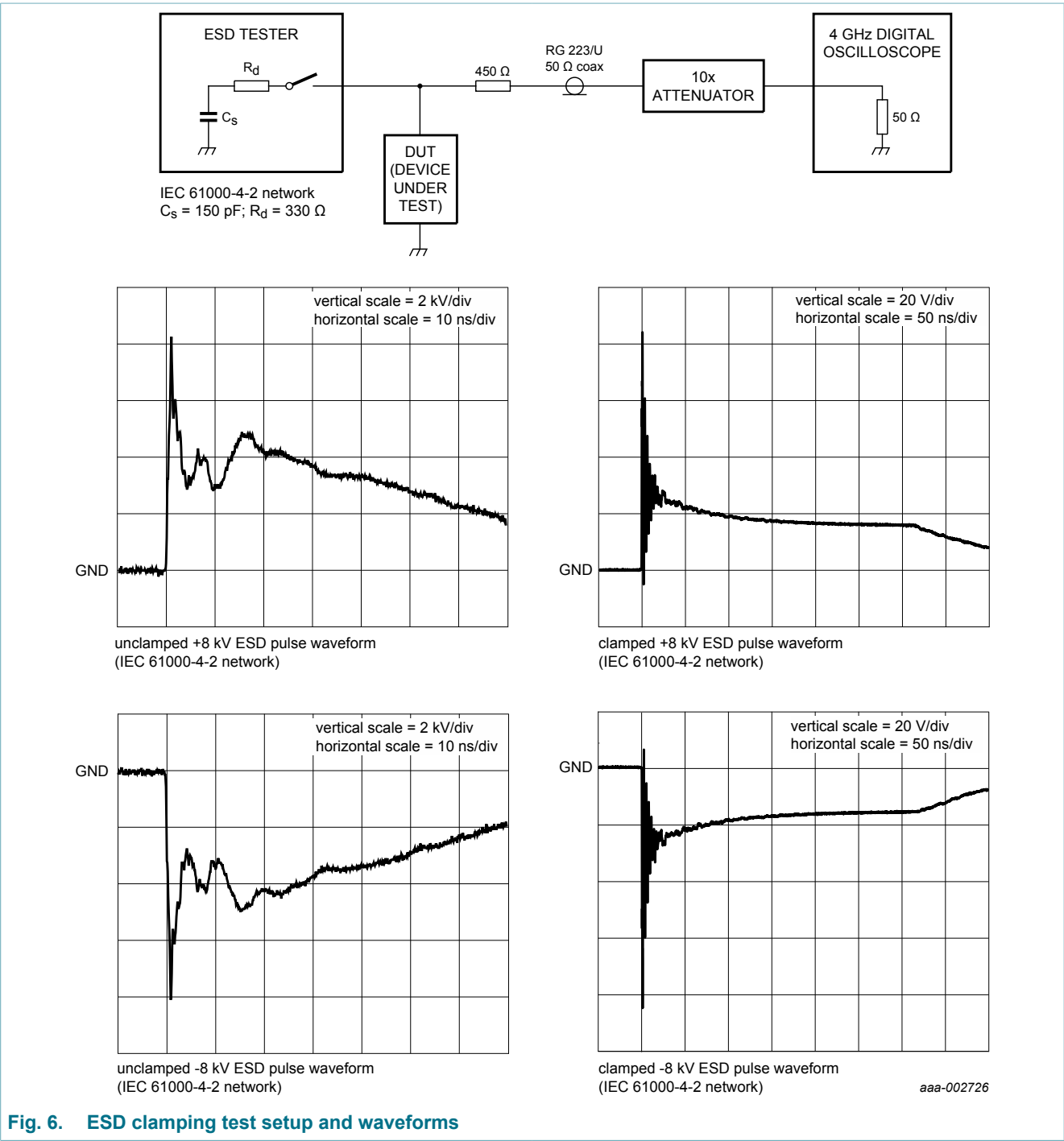


Fig. 6. ESD clamping test setup and waveforms

## 10. Application information

The device is designed for the protection of one bidirectional data line from surge pulses and ESD damage. The device is suitable on lines where the signal polarities are both positive and negative with respect to ground.

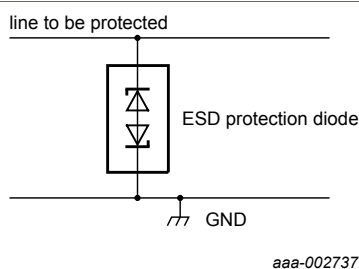


Fig. 7. Application diagram

### Circuit board layout and protection device placement

Circuit board layout is critical for the suppression of ESD, Electrical Fast Transient (EFT) and surge transients. The following guidelines are recommended:

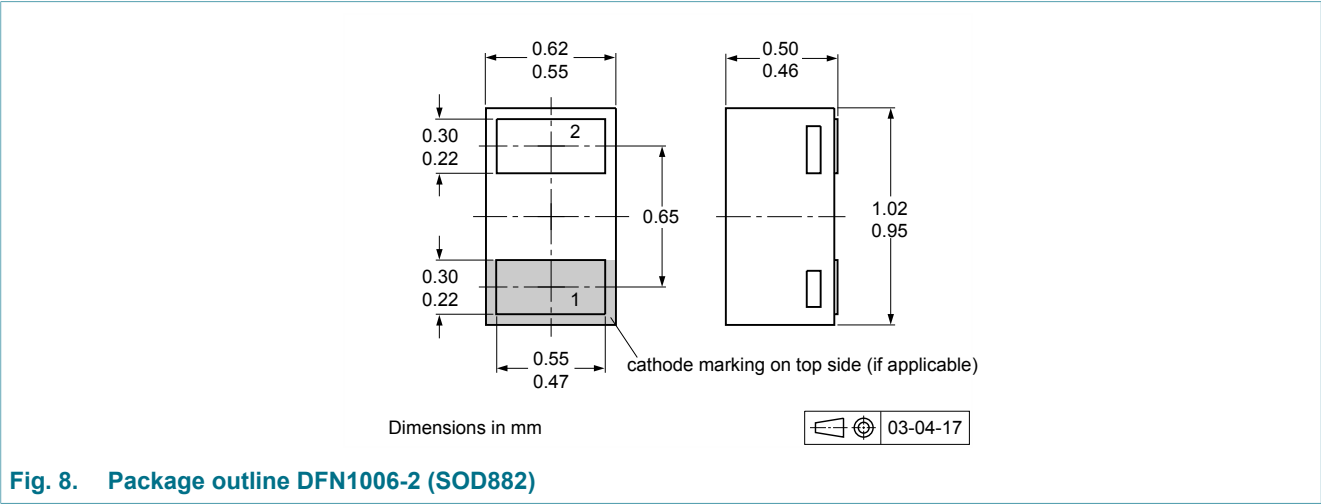
1. Place the device as close to the input terminal or connector as possible.
2. Minimize the path length between the device and the protected line.
3. Keep parallel signal paths to a minimum.
4. Avoid running protected conductors in parallel with unprotected conductors.
5. Minimize all Printed-Circuit Board (PCB) conductive loops including power and ground loops.
6. Minimize the length of the transient return path to ground.
7. Avoid using shared transient return paths to a common ground point.
8. Use ground planes whenever possible. For multilayer PCBs, use ground vias.

## 11. Test information

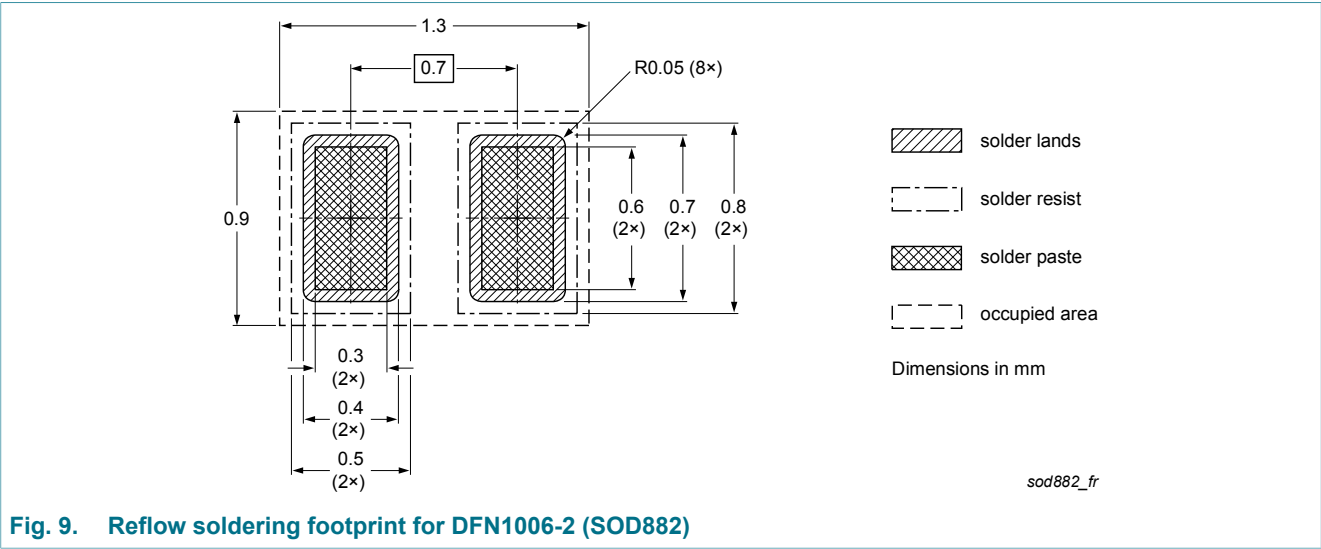
### Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - Stress test qualification for discrete semiconductors, and is suitable for use in automotive applications.

12. Package outline



13. Soldering



## 14. Revision history

Table 7. Revision history

| Data sheet ID   | Release date  | Data sheet status  | Change notice | Supersedes      |
|-----------------|---|--------------------|---------------|-----------------|
| PESD12VV1BL v.3 | 20161014  | Product data sheet | -             | PESD12VV1BL v.2 |
| Modifications:  | <ul style="list-style-type: none"><li>Deleted section "Packing information"</li></ul> |                    |               |                 |
| PESD12VV1BL v.2 | 20130318  | Product data sheet | -             | PESD12VV1BL v.1 |
| PESD12VV1BL v.1 | 20120403  | Product data sheet | -             | -               |



## 15. Legal information

### Data sheet status

| Document status [1][2]         | Product status [3] | Definition  |
|--------------------------------|--------------------|---|
| Objective [short] data sheet   | Development        | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet | Qualification      | This document contains data from the preliminary specification.                       |
| Product [short] data sheet     | Production         | This document contains the product specification.                                     |

- [1] Please consult the most recently issued document before initiating or completing a design.
- [2] The term 'short data sheet' is explained in section "Definitions".
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