# PESD5V0F1BL-Q

## Femtofarad bidirectional ESD protection diode

10 June 2022 Product data sheet

## 1. General description

Femtofarad bidirectional ElectroStatic Discharge (ESD) protection diode in a leadless ultra small SOD882 Surface-Mounted Device (SMD) plastic package designed to protect one signal line from the damage caused by ESD and other transients. The combination of extremely low capacitance, high ESD maximum rating and ultra small package makes the device ideal for high-speed data line protection and antenna protection applications.

## 2. Features and benefits

- Bidirectional ESD protection of one line
- Femtofarad capacitance: $C_d$ = 400 fF
- Low ESD clamping voltage: 30 V at 30 ns and ± 8 kV
- Very low leakage current: $I_{RM}$ < 1 nA
- ESD protection up to 10 kV
- IEC 61000-4-2; level 4 (ESD)
- Qualified according to AEC-Q101 and recommended for use in automotive applications

## 3. Applications

- 10/100/1000 Mbit/s Ethernet
- Portable electronics
- FireWire
- Communication systems
- High-speed data lines
- Computers and peripherals
- Subscriber Identity Module (SIM) card protection
- Audio and video equipment
- Cellular handsets and accessories
- Antenna protection

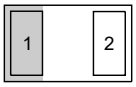
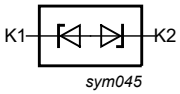
## 4. Quick reference data

**Table 1. Quick reference data**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_{RWM}$ | reverse standoff voltage | $T_{amb}$ = 25 °C | | - | - | 5.5 | V |
| $C_d$ | diode capacitance | f = 1 MHz; $V_R$ = 0 V; $T_{amb}$ = 25 °C | | - | 0.4 | 0.55 | pF |

# 5. Pinning information

**Table 2. Pinning information**

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|---|---|---|---|---|
| 1 | K1 | cathode (diode 1) |  Transparent top view **DFN1006-2 (SOD882)** |  |
| 2 | K2 | cathode (diode 2) | | |

# 6. Ordering information

**Table 3. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| PESD5V0F1BL-Q | DFN1006-2 | plastic, leadless ultra small package; 2 terminals; 0.65 mm pitch; 1 mm x 0.6 mm x 0.48 mm body | SOD882 |

# 7. Marking

**Table 4. Marking codes**

| Type number | Marking code |
|---|---|
| PESD5V0F1BL-Q | ZZ |

# 8. Limiting values

**Table 5. Limiting values**

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

| Symbol | Parameter | Conditions | | Min | Max | Unit |
|---|---|---|---|---|---|---|
| $I_{PPM}$ | rated peak pulse current | $t_p$ = 8/20 µs | [1] | - | 2.5 | A |
| $T_j$ | junction temperature | | | - | 125 | °C |
| $T_{amb}$ | ambient temperature | | | -40 | 125 | °C |
| $T_{stg}$ | storage temperature | | | -55 | 125 | °C |
| **ESD maximum ratings** | | | | | | |
| $V_{ESD}$ | electrostatic discharge voltage | IEC 61000-4-2; contact discharge | [2] | - | 10 | kV |
| | | MIL-STD-883; human body model (HBM) | [2] | - | 10 | kV |

[1] Non-repetitive current pulse 8/20 #s exponential decay waveform according to IEC 61000-4-5.
[2] Device stressed with ten non-repetitive ESD pulses.

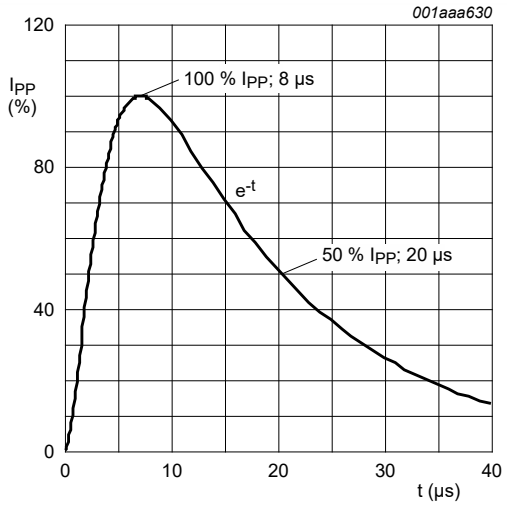



**Fig. 1. 8/20 µs pulse waveform according to IEC 61000-4-5**

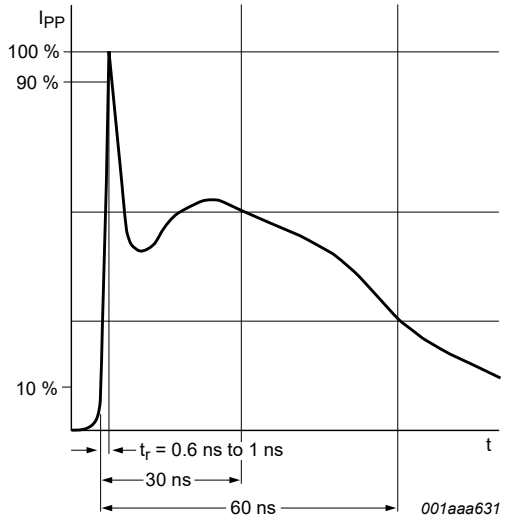


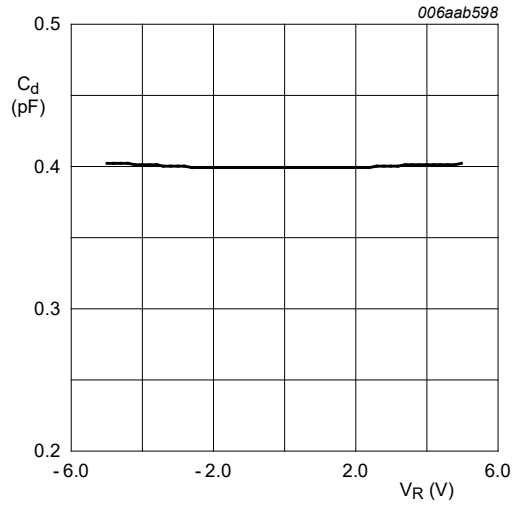

**Fig. 2. ESD pulse waveform according to IEC 61000-4-2**

# 9. Characteristics

**Table 6. Characteristics**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_{RWM}$ | reverse standoff voltage | $T_{amb}$ = 25 °C | | - | - | 5.5 | V |
| $V_{BR}$ | breakdown voltage | $I_R$ = 1 mA; $T_{amb}$ = 25 °C | | 6 | 8 | 10 | V |
| $I_{RM}$ | reverse leakage current | $V_{RWM}$ = 5 V; $T_{amb}$ = 25 °C | | - | 1 | 100 | nA |
| $C_d$ | diode capacitance | f = 1 MHz; $V_R$ = 0 V; $T_{amb}$ = 25 °C | | - | 0.4 | 0.55 | pF |
| $V_{CL}$ | clamping voltage | $I_{PP}$ = 1 A; $T_{amb}$ = 25 °C | [1] | - | - | 11 | V |
| | | $I_{PPM}$ = 2.5 A; $T_{amb}$ = 25 °C | [1] | - | - | 15 | V |
| $R_{diff}$ | differential resistance | $I_R$ = 20 mA; $T_{amb}$ = 25 °C | | - | - | 30 | Ω |

[1] Device stressed with 8/20 µs exponential decay waveform according to IEC 61000-4-5.




f = 1 MHz; $T_{amb}$ = 25 °C

**Fig. 3. Diode capacitance as a function of reverse voltage; typical values**

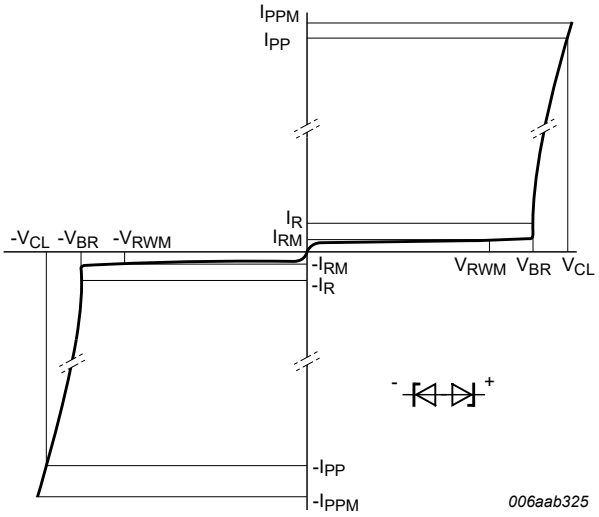



**Fig. 4. V-I characteristics for a bidirectional ESD protection diode**

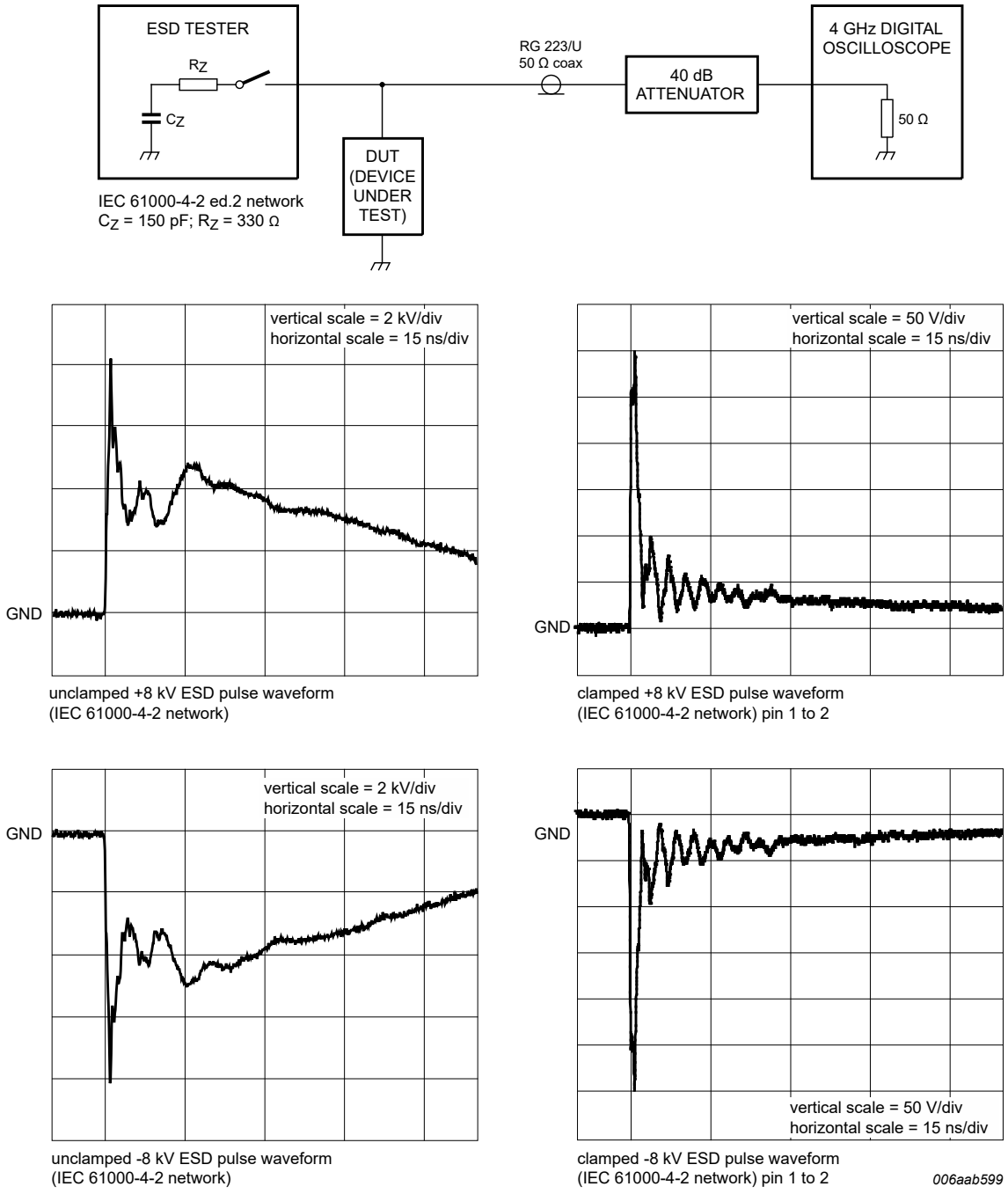



**Fig. 5. ESD clamping test setup and waveforms**

# 10. Application information

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

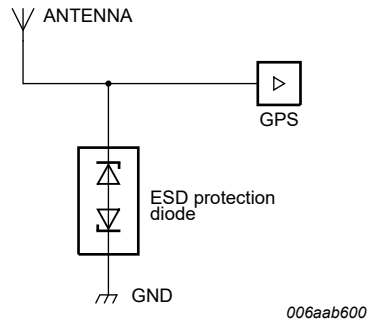



**Fig. 6. Application diagram**

**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.

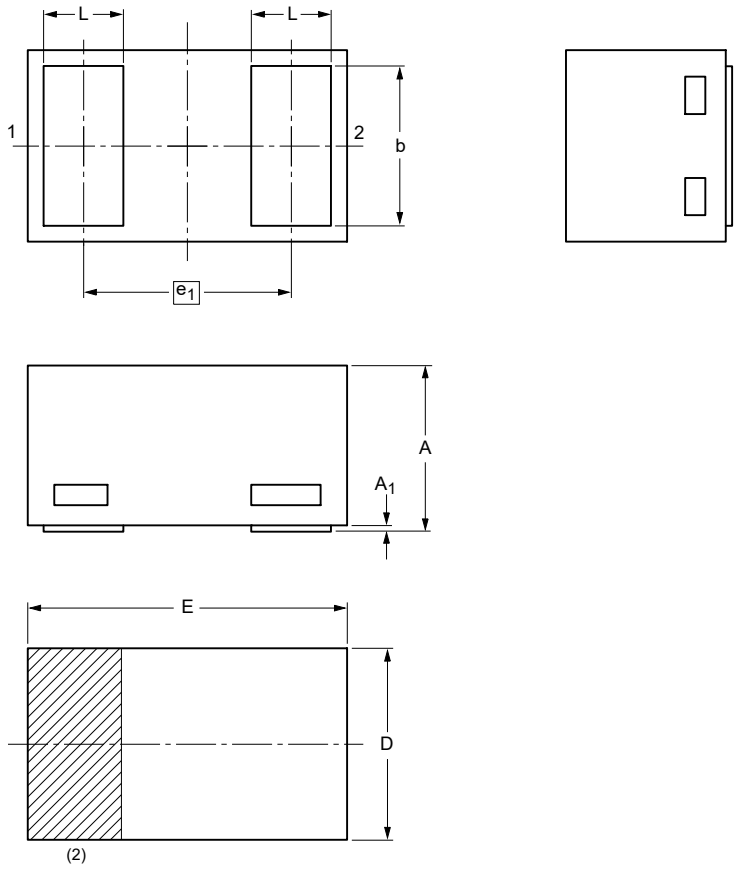
# 11. Test information

## 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

**DFN1006-2: Plastic, leadless ultra small package; 2 terminals; 0.65 mm pitch; 1 mm x 0.6 mm x 0.48 mm body** **SOD882**




Dimensions (mm are the original dimensions)

| Unit | | A(1) | $A_1$ | b | D | E | $e_1$ | L |
|---|---|---|---|---|---|---|---|---|
| mm | max | 0.50 | 0.03 | 0.55 | 0.62 | 1.02 | | 0.30 |
| | nom | | | | | | 0.65 | |
| | min | 0.46 | | 0.47 | 0.55 | 0.95 | | 0.22 |

Note
1. Including plating thickness
2. The marking bar indicates the cathode (if applicable)

*sod882_po*

| Outline version | References | | | | European projection | Issue date |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOD882 | | | | | | ~~14-08-27~~ 19-10-21 |

**Fig. 7. Package outline DFN1006-2 (SOD882)**

## 13. Soldering

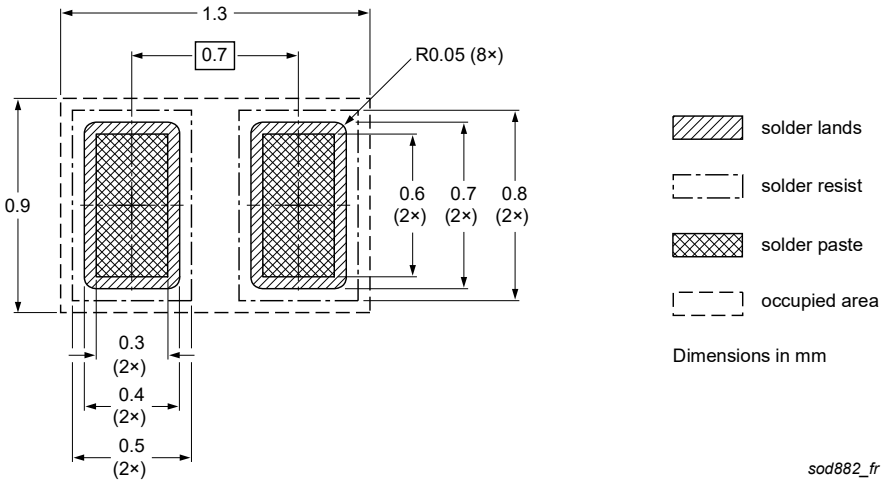



**Fig. 8. Reflow soldering footprint for DFN1006-2 (SOD882)**

# 14. Revision history

**Table 7. Revision history**

| Data sheet ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| PESD5V0F1BL-Q v.1 | 20220610 | 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. |

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[2] The term 'short data sheet' is explained in section "Definitions".
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