



# PESD5V0F1BRLD

Femtofarad bidirectional ESD protection diode

Rev. 1 — 30 January 2014

Product data sheet

## 1. Product profile

### 1.1 General description

Femtofarad bidirectional ElectroStatic Discharge (ESD) protection diode designed to protect one signal line from the damage caused by ESD and other transients. The device is encapsulated in a leadless ultra small DFN1006D-2 (SOD882D) Surface-Mounted Device (SMD) plastic package with visible and solderable side pads.

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.

### 1.2 Features and benefits

- Bidirectional ESD protection of one line
- ESD protection up to 10 kV (contact) and 15 kV (air)
- Femtofarad capacitance:  $C_d = 400$  fF
- IEC 61000-4-2; level 4 (ESD)
- Low ESD clamping voltage: 30 V at 30 ns and  $\pm 8$  kV
- Package height typ. 0.37 mm
- Very low leakage current:  $I_{RM} < 1$  nA
- AEC-Q101 qualified

### 1.3 Applications

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

### 1.4 Quick reference data

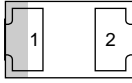
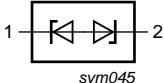
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per device</b>						
$V_{RWM}$	reverse standoff voltage		-	-	5.5	V
$C_d$	diode capacitance	$f = 1$ MHz; $V_R = 0$ V	-	0.4	0.55	pF



## 2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	cathode (diode 1)	 <p>Transparent top view</p>	 <p>sym045</p>
2	cathode (diode 2)		

## 3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PESD5V0F1BRLD	DFN1006D-2	leadless ultra small plastic package; 2 terminals; body 1 × 0.6 × 0.4 mm	SOD882D

## 4. Marking

Table 4. Marking codes

Type number	Marking code
PESD5V0F1BRLD	H

## 5. Limiting values

Table 5. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
<b>Per device</b>					
$I_{PPM}$	rated peak pulse current	$t_p = 8/20 \mu s$	[1] -	2.5	A
$T_j$	junction temperature		-	+125	°C
$T_{amb}$	ambient temperature		-40	+125	°C
$T_{stg}$	storage temperature		-55	+125	°C

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

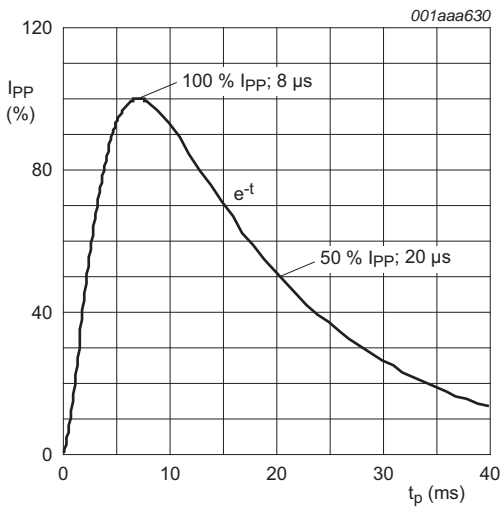
**Table 6. ESD maximum ratings**  
*T<sub>amb</sub> = 25 °C unless otherwise specified.*

Symbol	Parameter	Conditions	Min	Max	Unit
<b>Per device</b>					
V <sub>ESD</sub>	electrostatic discharge voltage	IEC 61000-4-2 (contact discharge)	[1]	-	10 kV
		IEC 61000-4-2 (air discharge)	[1]	-	15 kV
		MIL-STD-883 (human body model)	-	-	10 kV

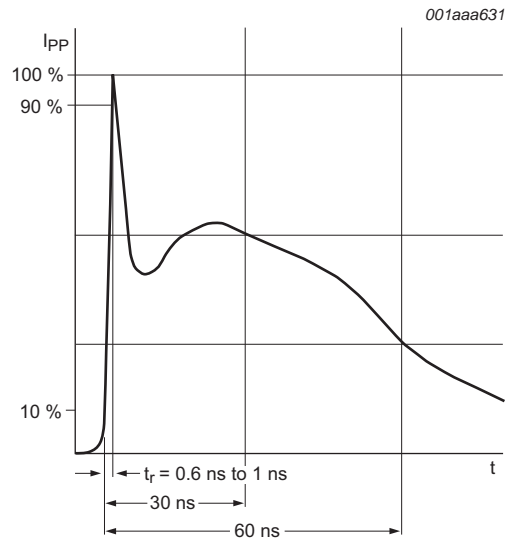
[1] Device stressed with ten non-repetitive ESD pulses.

**Table 7. ESD standards compliance**

Standard	Conditions
<b>Per device</b>	
IEC 61000-4-2; level 4 (ESD)	> 15 kV (air); > 8 kV (contact)
MIL-STD-883; class 3B (human body model)	> 8 kV



**Fig 1. 8/20 μs pulse waveform according to IEC 61000-4-5 and IEC 61643-321**



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

## 6. Characteristics

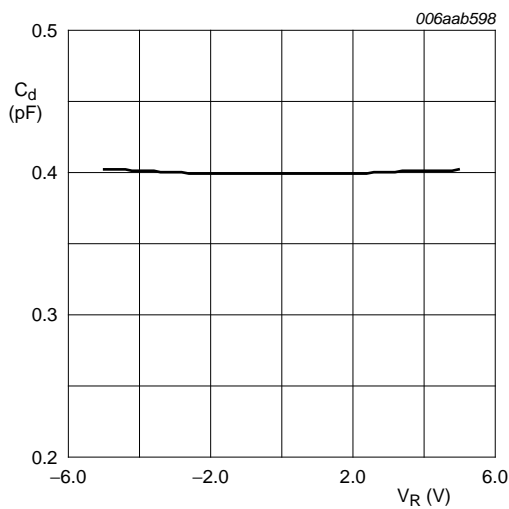
**Table 8. Characteristics**

$T_{amb} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per device</b>						
$V_{RWM}$	reverse standoff voltage		-	-	5.5	V
$I_{RM}$	reverse leakage current	$V_{RWM} = 5\text{ V}$	-	1	100	nA
$V_{BR}$	breakdown voltage	$I_R = 1\text{ mA}$	6	8	10	V
$C_d$	diode capacitance	$f = 1\text{ MHz}; V_R = 0\text{ V}$	-	0.4	0.55	pF
$V_{CL}$	clamping voltage	$I_{PP} = 1\text{ A}$	[1]	-	11	V
		$I_{PPM} = 2.5\text{ A}$	[1]	-	15	V
$r_{dyn}$	dynamic resistance	$I_R = 10\text{ A}$	[2]	1.5	-	$\Omega$

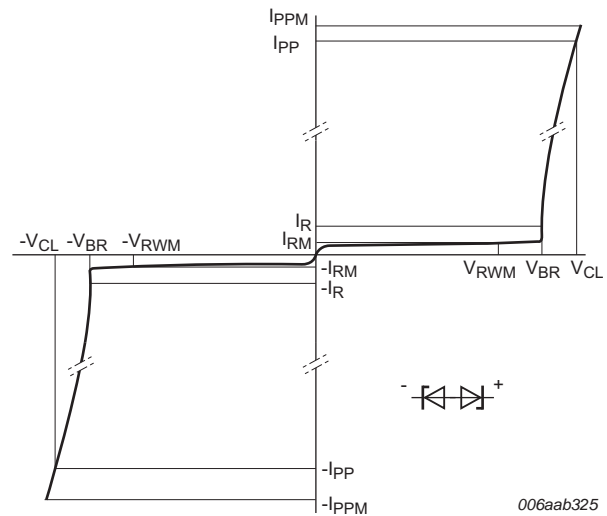
[1] Device stressed with 8/20  $\mu\text{s}$  exponential decay waveform according to IEC 61000-4-5 and IEC 61643-321.

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



$f = 1\text{ MHz}; T_{amb} = 25\text{ }^{\circ}\text{C}$

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



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

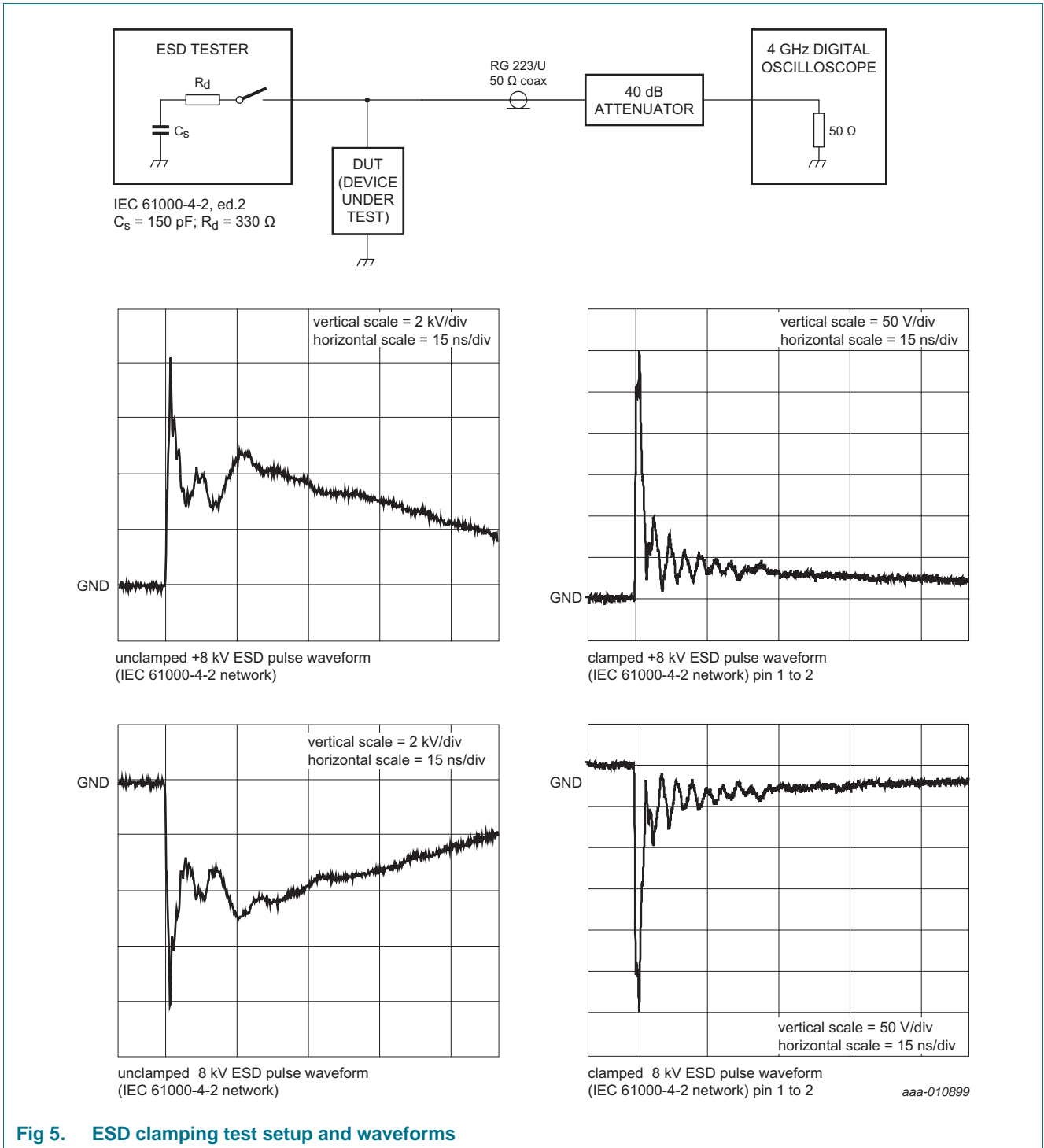
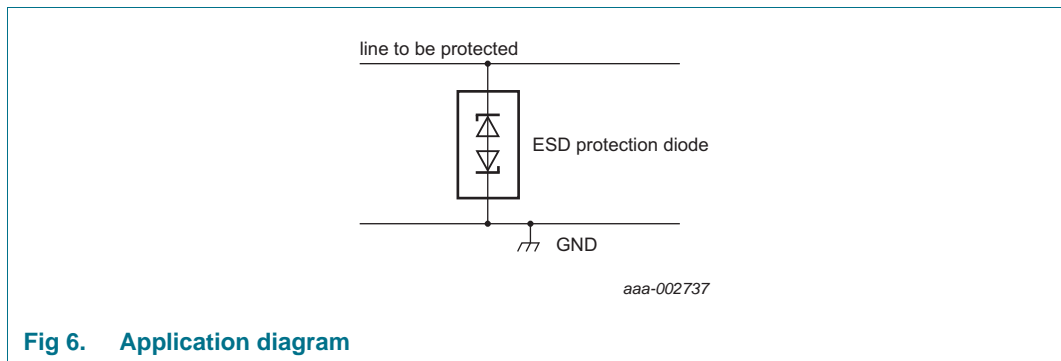


Fig 5. ESD clamping test setup and waveforms

## 7. Application information

The device is designed for the protection of one bidirectional data or signal 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.



### 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:

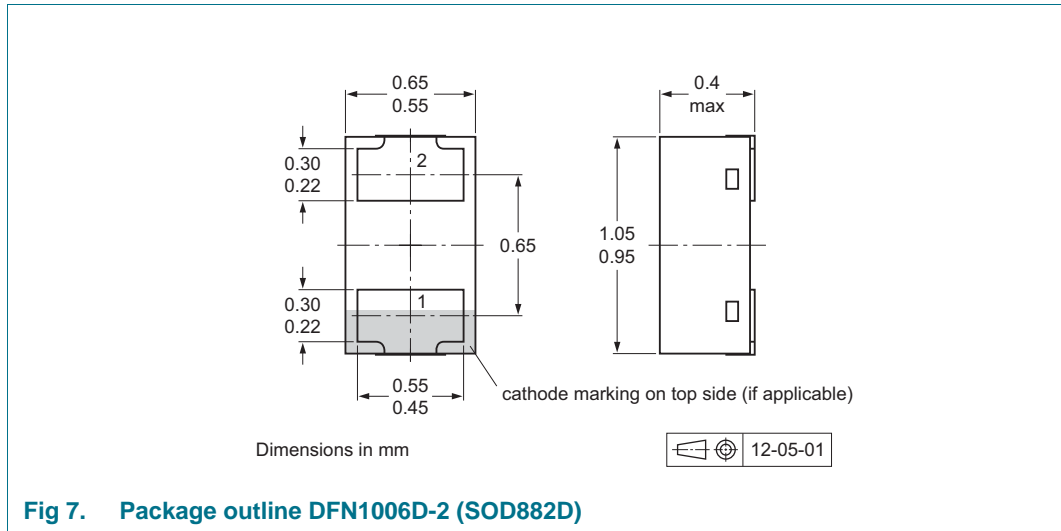
1. Place the device as close to the input terminal or connector as possible.
2. Minimize the path length between the device and the protected line.
3. Keep parallel signal paths to a minimum.
4. Avoid running protected conductors in parallel with unprotected conductors.
5. Minimize all Printed-Circuit 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.

## 8. Test information

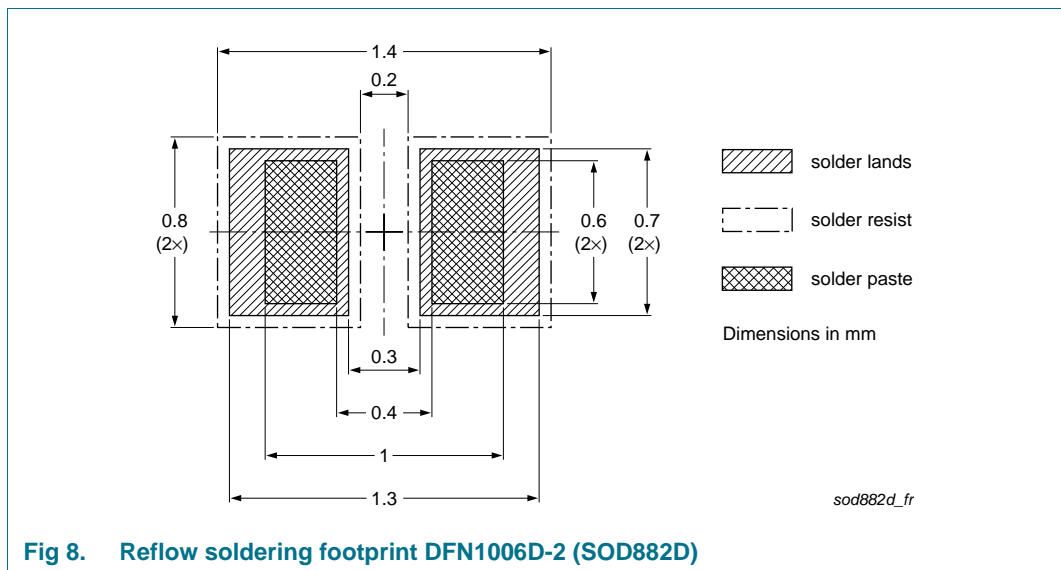
### 8.1 Quality information

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.

## 9. Package outline



## 10. Soldering



## 11. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PESD5V0F1BRLD v.1	20140130	Product data sheet	-	-



## 12. Legal information

### 12.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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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