



# PESD5V0X1BCAL

Extremely low capacitance bidirectional ESD protection diode

Rev. 1 — 1 February 2012

Product data sheet

## 1. Product profile

### 1.1 General description

Extremely low capacitance 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.

### 1.2 Features and benefits

- Bidirectional ESD protection of one line
- ESD protection up to 15 kV
- Extremely low capacitance:  
 $C_d = 0.85$  pF
- IEC 61000-4-2; level 4 (ESD)
- Low clamping voltage:  $V_{CL} = 17$  V
- AEC-Q101 qualified
- Ultra low leakage current:  $I_{RM} = 1$  nA

### 1.3 Applications

- Computers and peripherals
- Communication systems
- Audio and video equipment
- Portable electronics
- Cellular handsets and accessories
- SIM card protection
- 10/100/1000 Mbit/s Ethernet
- USB, High-Definition Multimedia Interface (HDMI), FireWire

### 1.4 Quick reference data


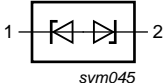
Table 1. Quick reference data

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	-	0.85	0.95	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
PESD5V0X1BCAL	-	leadless ultra small plastic package; 2 terminals; body 1.0 × 0.6 × 0.5 mm	SOD882

## 4. Marking

**Table 4. Marking codes**

Type number	Marking code
PESD5V0X1BCAL	NN

## 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] -	1.8	A
$T_j$	junction temperature		-	150	°C
$T_{amb}$	ambient temperature		-55	+150	°C
$T_{stg}$	storage temperature		-65	+150	°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).

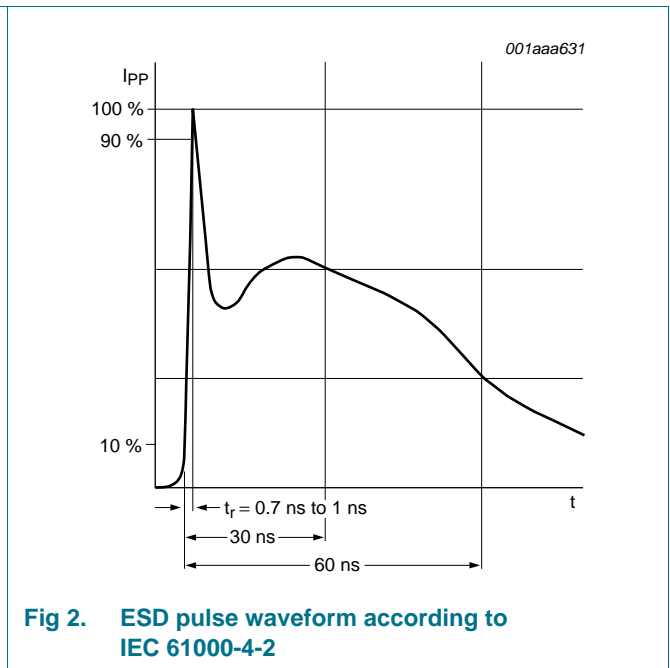
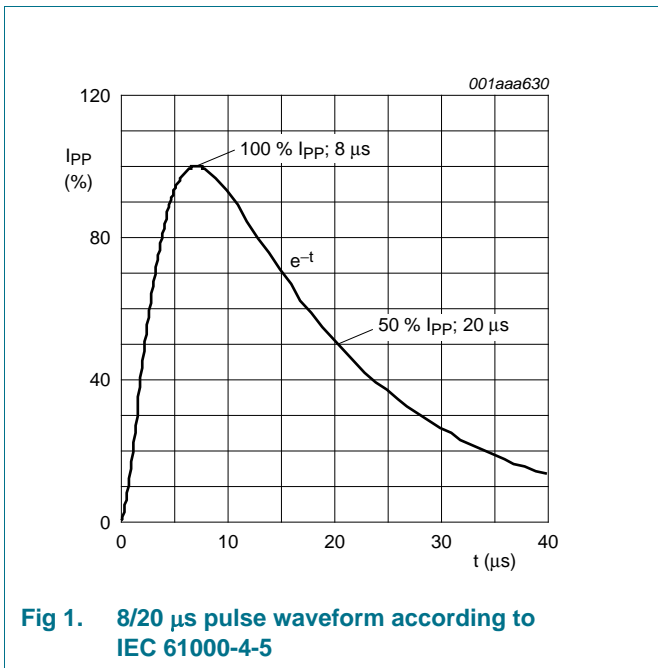
**Table 6. ESD maximum ratings**  
*T<sub>amb</sub> = 25 °C unless otherwise specified.*

Symbol	Parameter	Conditions	Min	Max	Unit
<b>Per device</b>					
V <sub>ESD</sub>	electrostatic discharge voltage	IEC 61000-4-2 (air discharge)	[1] -	15	kV
		IEC 61000-4-2 (contact discharge)	[1] -	15	kV
		machine model	-	400	V
		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



**6. Characteristics**

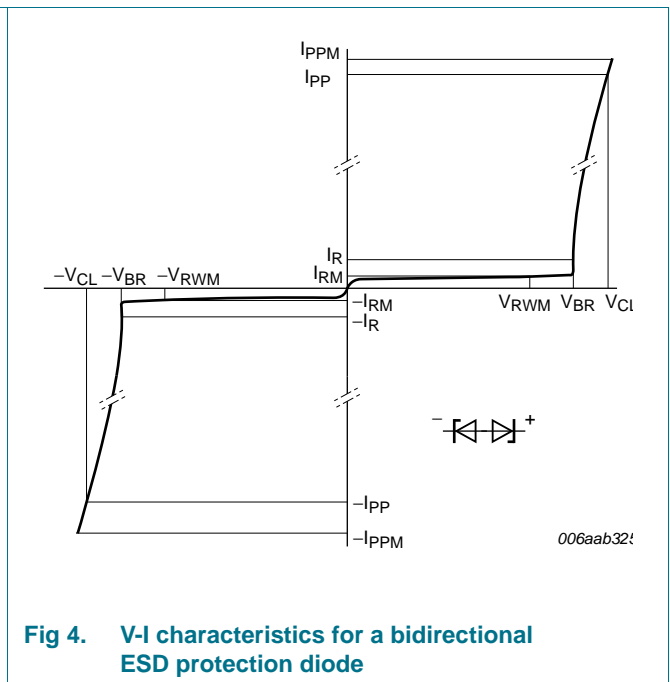
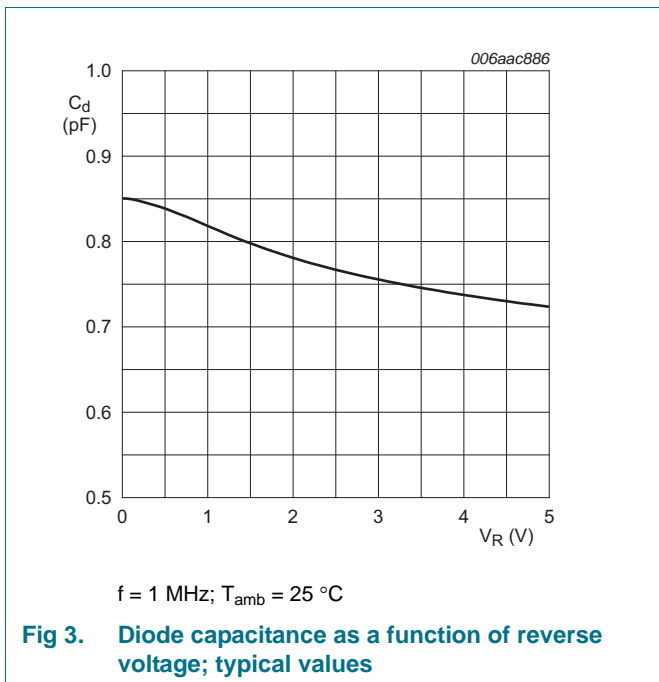
**Table 8. Characteristics**

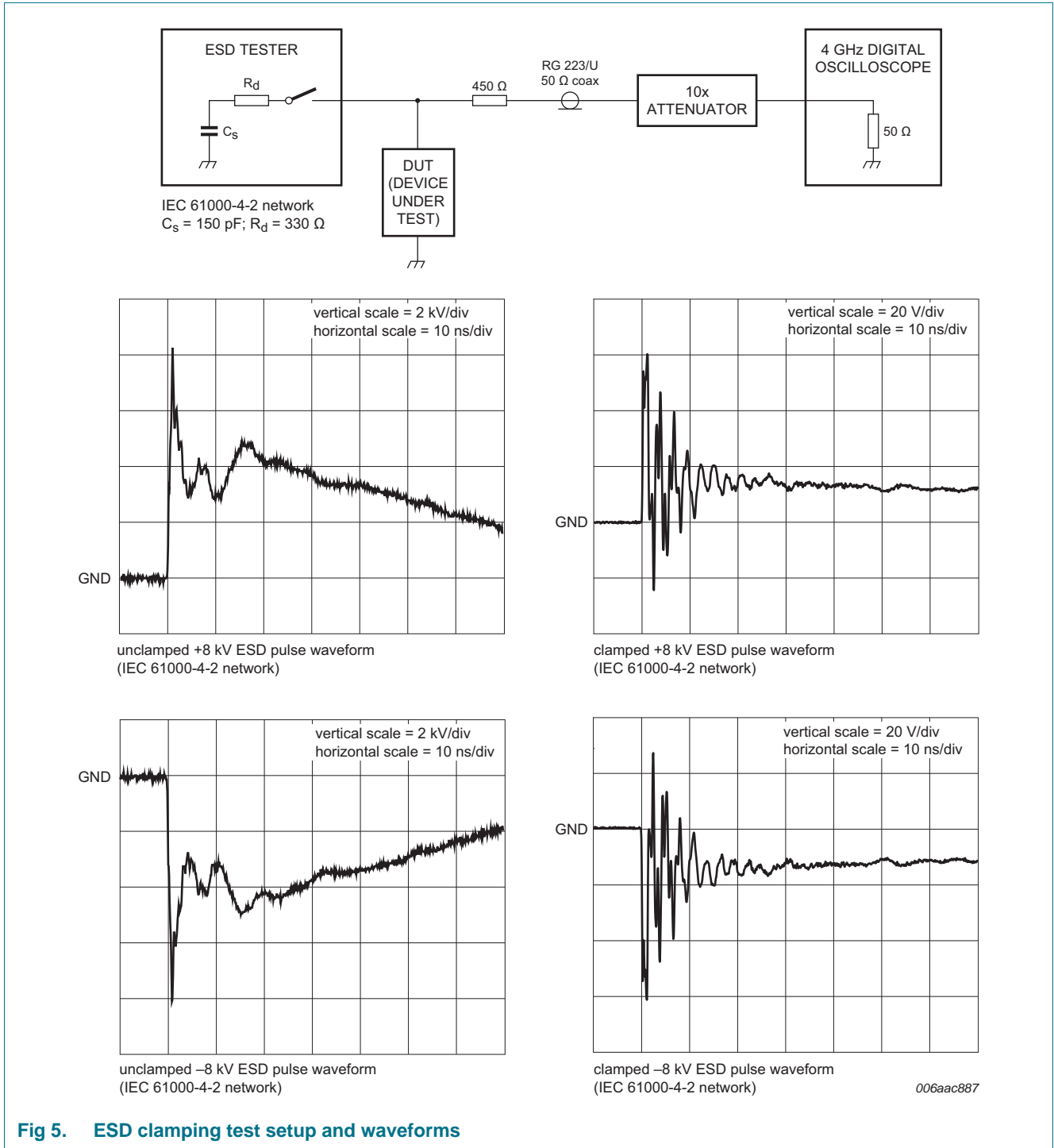
$T_{amb} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per device</b>						
$V_{RWM}$	reverse standoff voltage		-	-	5.5	V
$I_{RM}$	reverse leakage current	$V_{RWM} = 5.5\text{ V}$	-	<1	10	nA
$V_{BR}$	breakdown voltage	$I_R = 10\text{ mA}$	8.1	9.8	12.3	V
$C_d$	diode capacitance	$f = 1\text{ MHz}; V_R = 0\text{ V}$	-	0.85	0.95	pF
$V_{CL}$	clamping voltage	$I_{PPM} = 1.8\text{ A}$	[1]	-	17	V
$r_{dyn}$	dynamic resistance	$I_R = 10\text{ A}$	[2]	0.5	-	$\Omega$

[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; ANS/IESD STM5-1-2008.





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

## 7. Application information

PESD5V0X1BCAL 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.

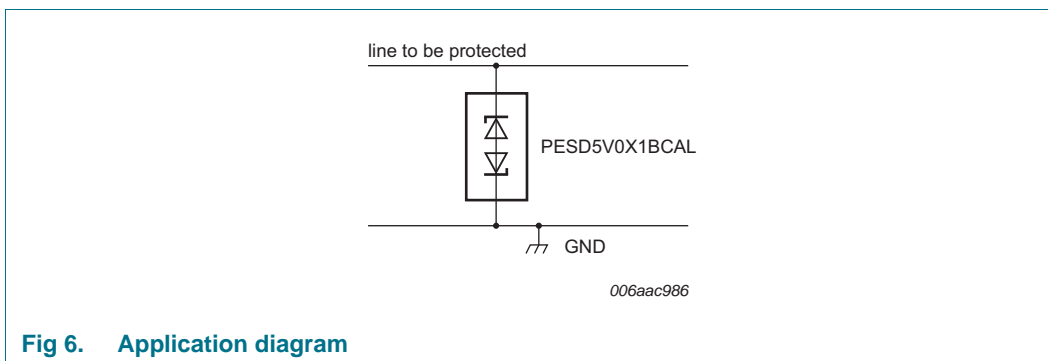


Fig 6. Application diagram

### 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:

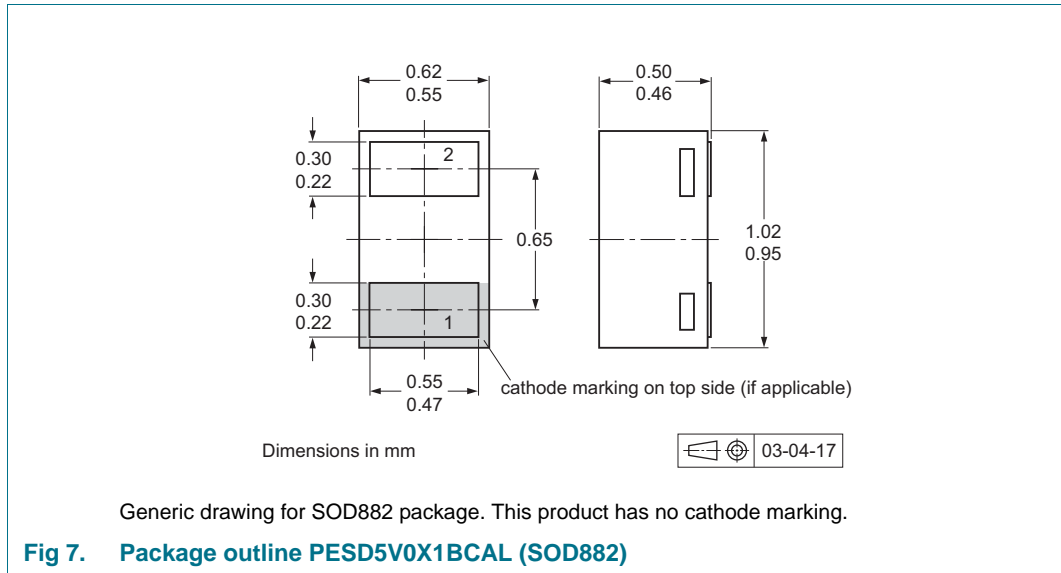
1. Place the device as close to the input terminal or connector as possible.
2. Minimize the path length between the device and the protected line.
3. Keep parallel signal paths to a minimum.
4. Avoid running protected conductors in parallel with unprotected conductors.
5. Minimize all Printed-Circuit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

## 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. Packing information

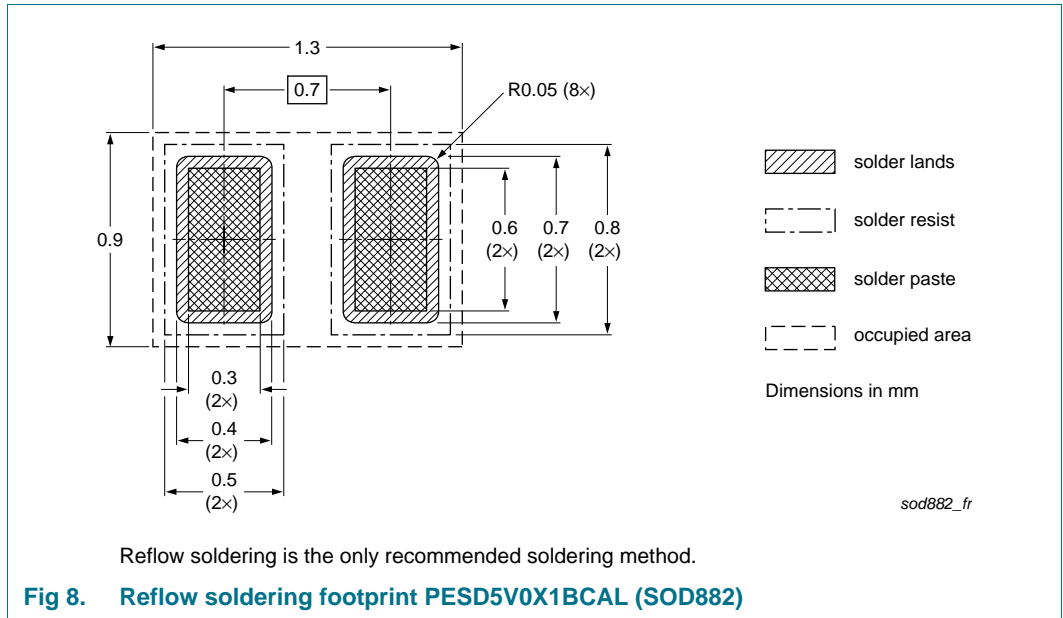
**Table 9. Packing methods**

The indicated -xxx are the last three digits of the 12NC ordering code.<sup>[1]</sup>

Type number	Package	Description	Packing quantity
			10000
PESD5V0X1BCAL	SOD882	2 mm pitch, 8 mm tape and reel	-315

[1] For further information and the availability of packing methods, see [Section 14](#).

**11. Soldering**





## 12. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PESD5V0X1BCAL v.1	20120201	Product data sheet	-	-

## 13. Legal information

### 13.1 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.
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