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

1.3 Applications

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

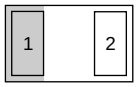
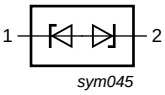
1.4 Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per device						
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)	 Transparent top view	 sym045
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
Per device						
I_{PPM}	rated peak pulse current	t_p = 8/20 μs	[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 μs exponential decay waveform according to IEC 61000-4-5 and IEC 61643-321).

Table 6. ESD maximum ratings

T_{amb} = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions		Min	Max	Unit
Per device						
V_{ESD}	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
Per device	
IEC 61000-4-2; level 4 (ESD)	> 15 kV (air); > 8 kV (contact)
MIL-STD-883; class 3B (human body model)	> 8 kV

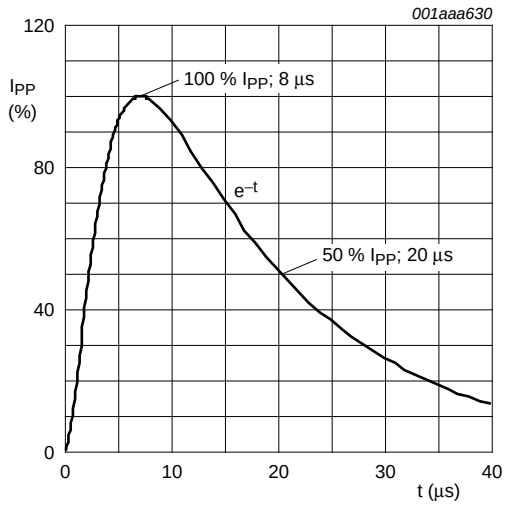


Fig 1. 8/20 µs pulse waveform according to IEC 61000-4-5

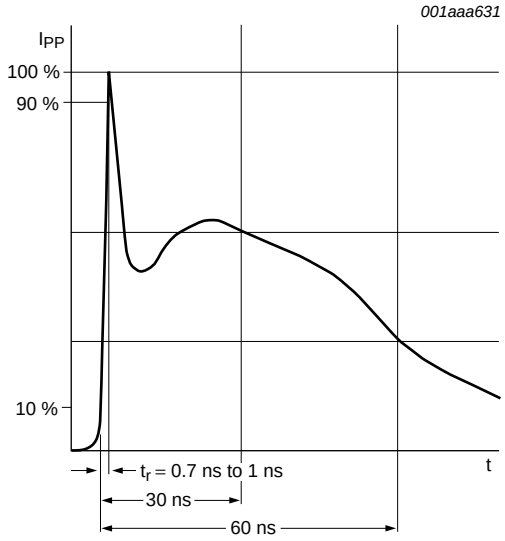


Fig 2. ESD pulse waveform according to IEC 61000-4-2

6. Characteristics

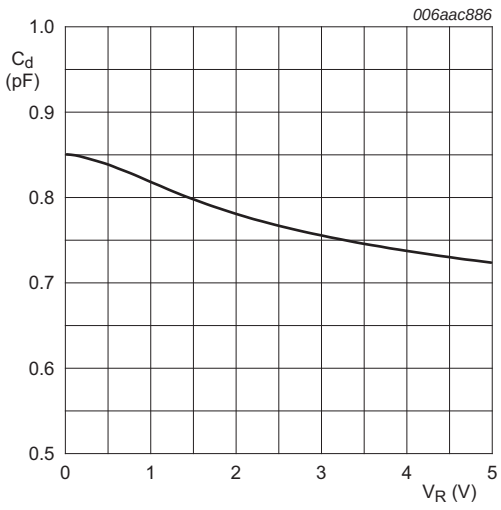
Table 8. Characteristics

T_{amb} = 25 °C unless otherwise specified.

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

[1] Device stressed with 8/20 µs 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 ns; square pulse; ANS/IESD STM5-1-2008.



f = 1 MHz; T_{amb} = 25 °C

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

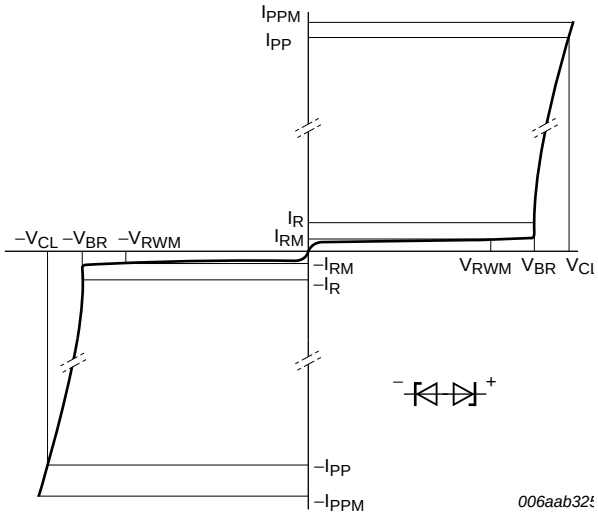


Fig 4. V-I characteristics for a bidirectional ESD protection diode

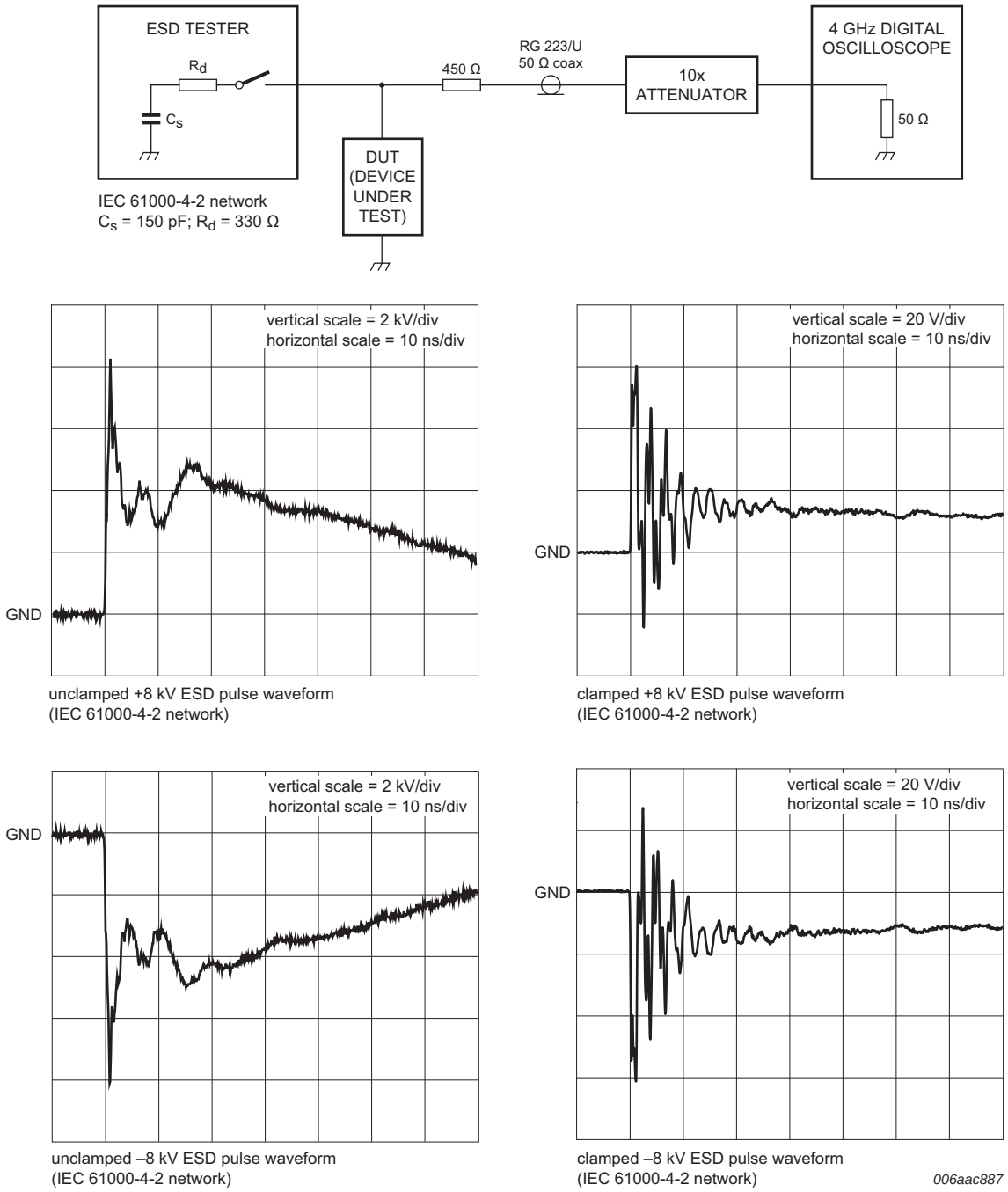


Fig 5. ESD clamping test setup and waveforms

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.

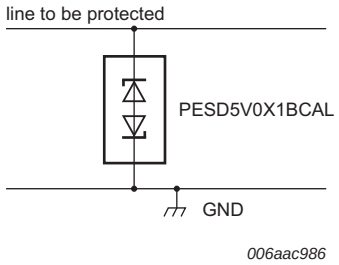


Fig 6. Application diagram

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:

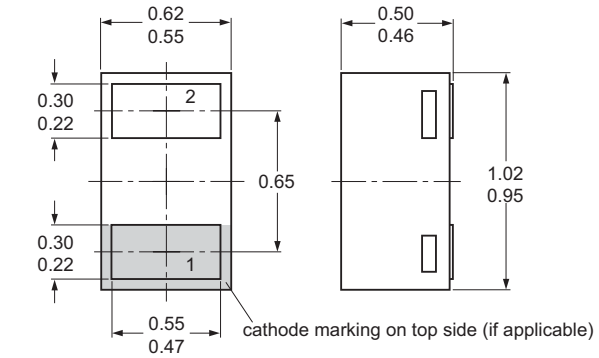
1. Place the device as close to the input terminal or connector as possible.
2. Minimize the path length between the device and the protected line.
3. Keep parallel signal paths to a minimum.
4. Avoid running protected conductors in parallel with unprotected conductors.
5. Minimize all Printed-Circuit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



Generic drawing for SOD882 package. This product has no cathode marking.

Fig 7. Package outline PESD5V0X1BCAL (SOD882)

10. Packing information

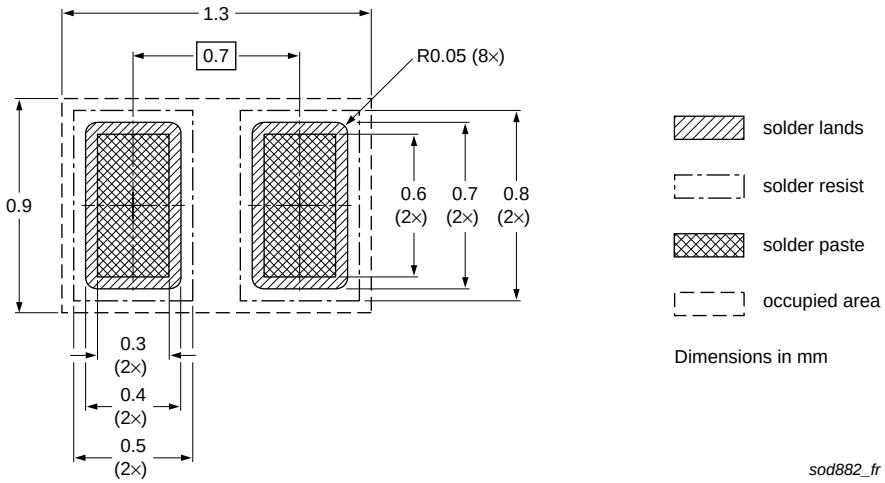
Table 9. Packing methods

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

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



Reflow soldering is the only recommended soldering method.

Fig 8. Reflow soldering footprint PESD5V0X1BCAL (SOD882)

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[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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15. Contents

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