



PESD5V0X1BCAL

Extremely low capacitance bidirectional ESD protection diode

11 April 2023

Product data sheet

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.

2. Features and benefits

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

3. Applications

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

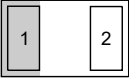
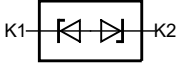
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{RWM}	reverse standoff voltage	$T_{amb} = 25 \text{ }^{\circ}\text{C}$	-	-	5.5	V
C_d	diode capacitance	$f = 1 \text{ MHz}; V_R = 0 \text{ V}; T_{amb} = 25 \text{ }^{\circ}\text{C}$	-	0.85	0.95	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)	 <i>sym045</i>
2	K2	cathode (diode 2)		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PESD5V0X1BCAL	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
PESD5V0X1BCAL	NN

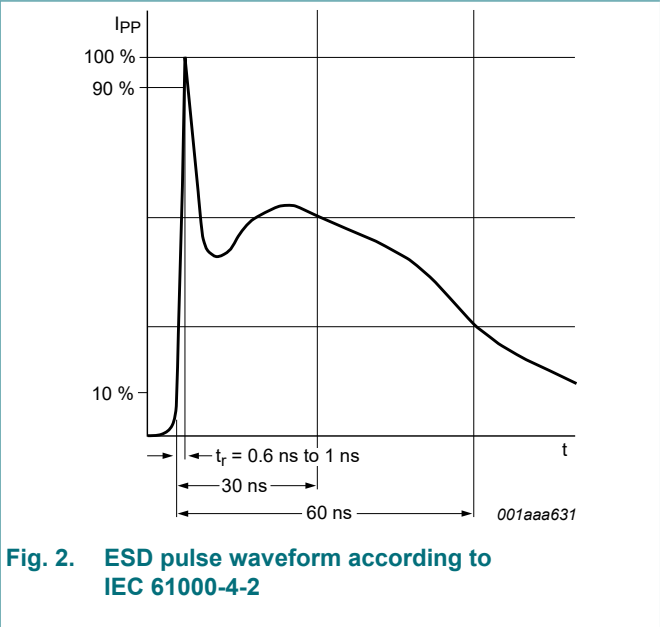
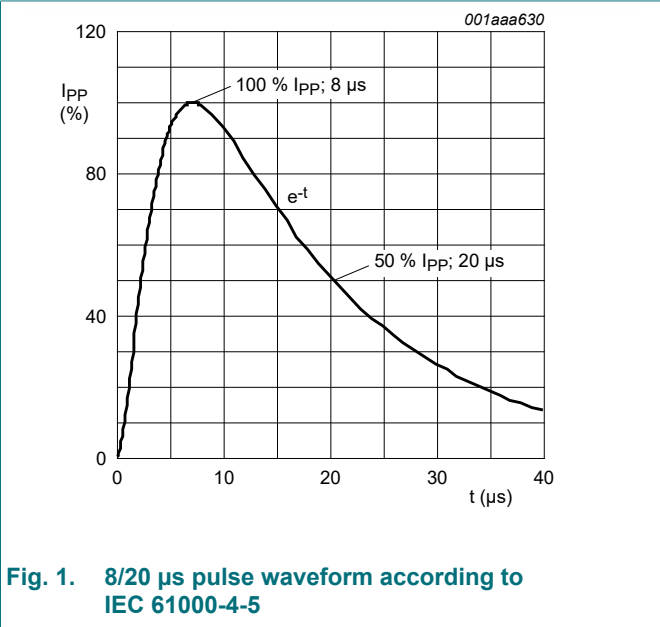
8. Limiting values

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]	-	1.8	A
T _j	junction temperature			-	150	°C
T _{amb}	ambient temperature			-55	150	°C
T _{stg}	storage temperature			-65	150	°C
ESD maximum ratings						
V _{ESD}	electrostatic discharge voltage	IEC 61000-4-2; air discharge	[2]	-	15	kV
		IEC 61000-4-2; contact discharge	[2]	-	15	kV
		MIL-STD-883; human body model (HBM)		-	10	kV

- [1] Device stressed with ten non-repetitive current pulses (8/20 μs exponential decay waveform according to IEC 61000-4-5)
[2] Device stressed with ten non-repetitive ESD pulses.



9. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{RWM}	reverse standoff voltage	$T_{amb} = 25\text{ }^{\circ}\text{C}$	-	-	5.5	V
V_{BR}	breakdown voltage	$I_R = 10\text{ mA}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$	8.1	9.8	12.3	V
I_{RM}	reverse leakage current	$V_{RWM} = 5.5\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$	-	1	10	nA
C_d	diode capacitance	$f = 1\text{ MHz}$; $V_R = 0\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$	-	0.85	0.95	pF
V_{CL}	clamping voltage	$I_{PPM} = 1.8\text{ A}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$	[1]	-	17	V
R_{dyn}	dynamic resistance	$I_R = 10\text{ A}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$	[2]	0.5	-	Ω

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

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

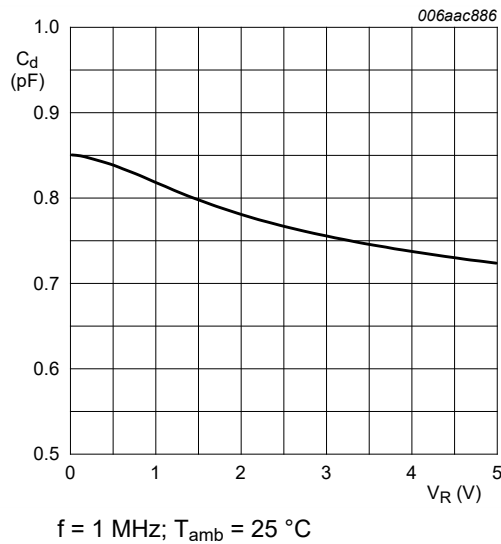


Fig. 3. Diode capacitance as a function of reverse voltage; typical values

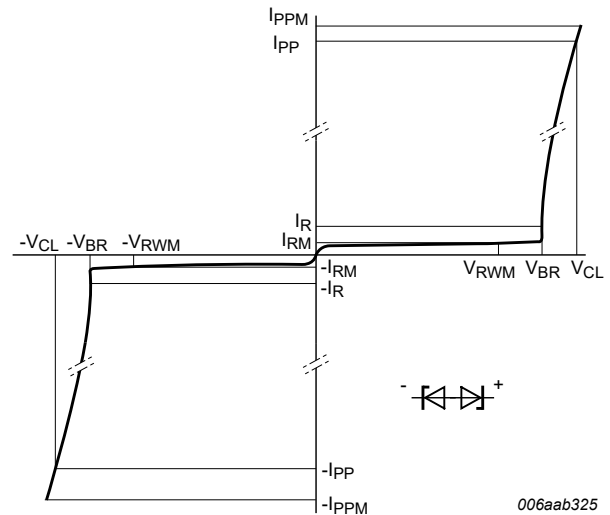


Fig. 4. V-I characteristics for a bidirectional ESD protection diode

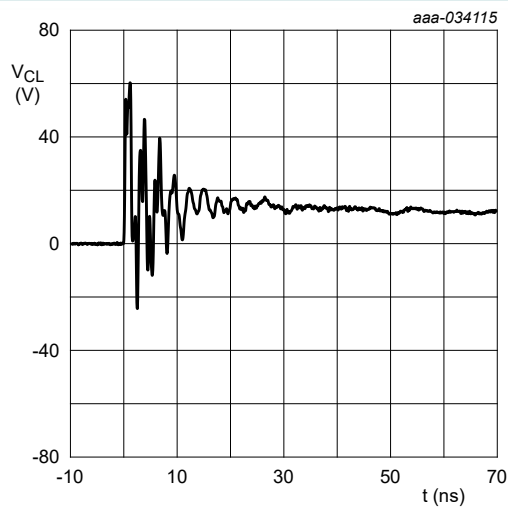


Fig. 5. Clamped +8 kV ESD pulse waveform (IEC 61000-4-2 network)

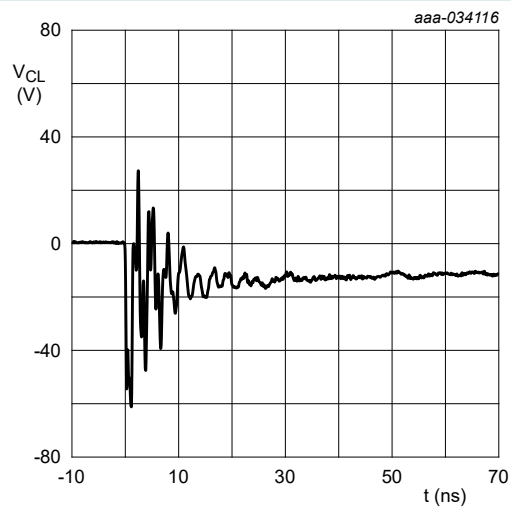


Fig. 6. Clamped -8 kV ESD pulse waveform (IEC 61000-4-2 network)

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.

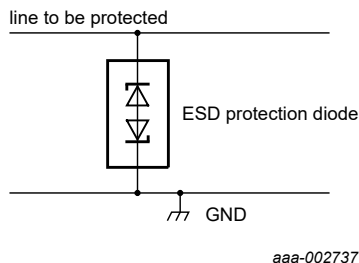


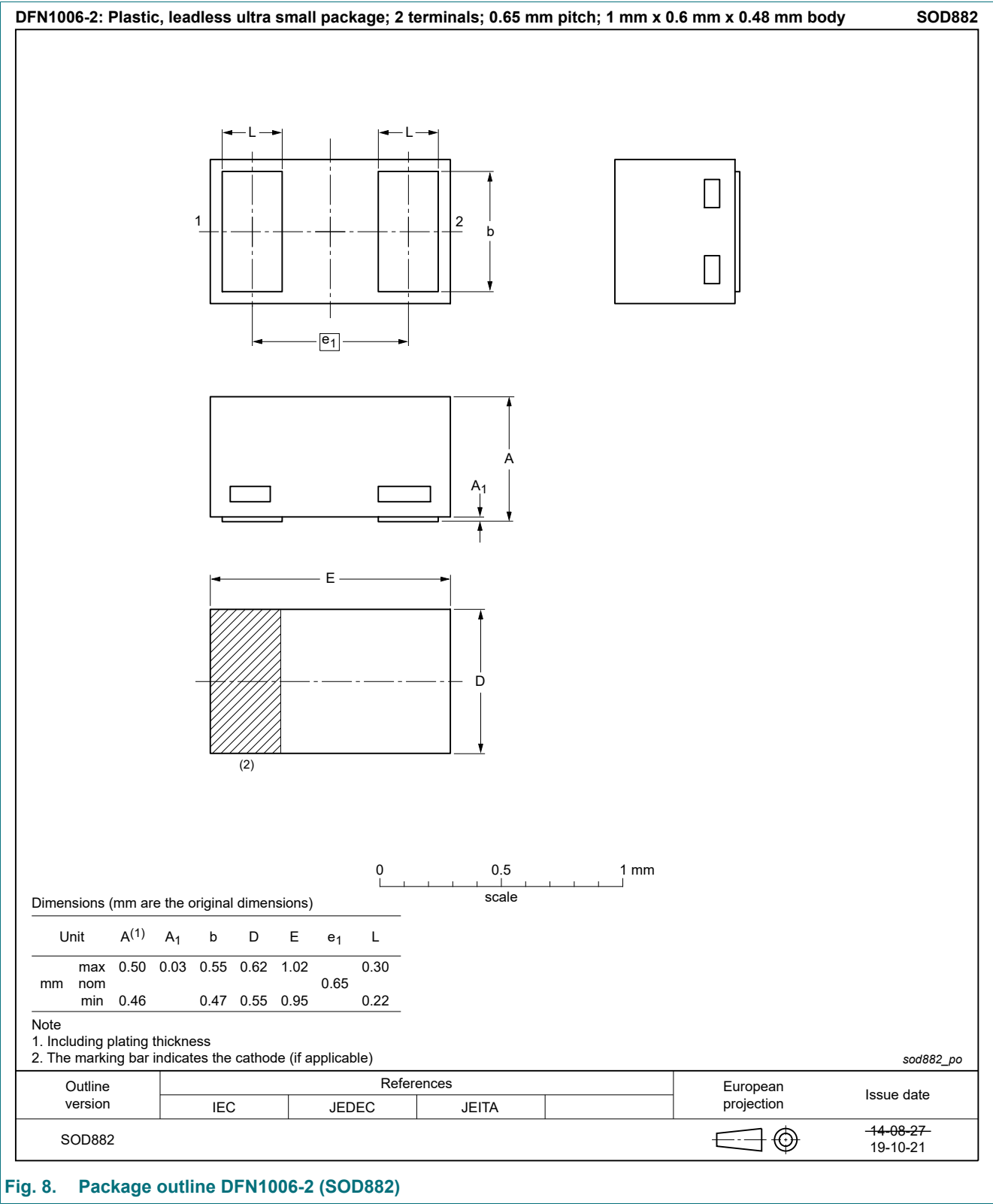
Fig. 7. Application diagram

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. Package outline



12. Soldering

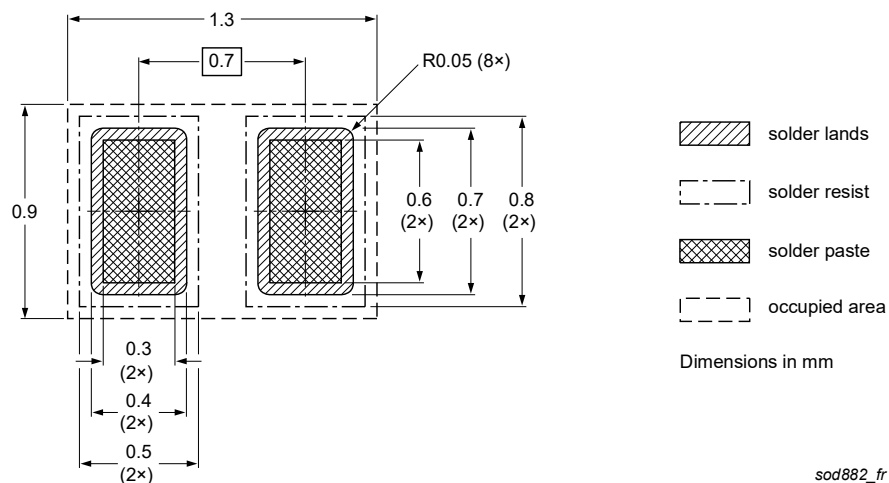


Fig. 9. Reflow soldering footprint for DFN1006-2 (SOD882)

13. Revision history

Table 7. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PESD5V0X1BCAL v.3	20230411	Product data sheet	-	PESD5V0X1BCAL v.2
Modifications:	Product changed to non-automotive qualification. Please refer to nexperia.com for automotive (-Q) product alternative(s).			
PESD5V0X1BCAL v.2	20180606	Product data sheet	-	PESD5V0X1BCAL v.1
PESD5V0X1BCAL v.1	20120201	Product data sheet	-	-

14. 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".
- [3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the internet at <https://www.nexperia.com>.

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