



# PESD1ETH1GXLS-Q

ESD protection for In-vehicle networks

2 December 2021

Product data sheet

## 1. General description

Fully OPEN Alliance IEEE 100BASE-T1 and 1000BASE-T1 compliant ElectroStatic Discharge (ESD) protection device in a small DFN1006BD-2 (SOD882BD) surface-mounted plastic package, designed to protect one automotive in-vehicle network bus line from the damage caused by ESD and other transients.

## 2. Features and benefits

- Fully OPEN Alliance IEEE 100BASE-T1 and 1000BASE-T1 compliant
- High trigger voltage:  $V_{t1} = 100$  V min
- Low capacitance:  $C_d < 1.2$  pF
- ESD protection up to 30 kV (IEC 61000-4-2; ISO10605)
- 1000 contact discharges (OPEN Alliance specification) with 15 kV (IEC 61000-4-2)
- Qualified according to AEC-Q101 and recommended for use in automotive applications

## 3. Applications

ESD protection for In-vehicle network lines in automotive environments

- OPEN Alliance IEEE 100/1000BASE-T1 Ethernet
- Low-Voltage Differential Signaling (LVDS) automotive

## 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		-	-	24	V
$C_d$	diode capacitance	$f = 1$ MHz; $V_R = 0$ V; $T_{amb} = 25$ °C		-	0.9	1.2	pF
$V_{t1}$	trigger voltage	$T_{amb} = 25$ °C	[1]	100	140	-	V
$V_{ESD}$	electrostatic discharge voltage	ISO 10605; contact discharge; $C = 150$ pF; $R = 330$ Ω	[2] [3]	30	-	-	kV
		ISO 10605; contact discharge; $C = 330$ pF; $R = 330$ Ω	[2] [3]	30	-	-	kV
		1000 contact discharges (IEC 61000-4-2); OPEN Alliance specification	[3]	15	-	-	kV

[1] Non-repetitive current pulse, Transmission Line Pulse (TLP); square pulse; ANSI / ESD STM5.5.1-2008

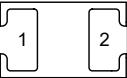
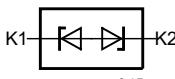
[2] Device stressed with ten non-repetitive ESD pulses.

[3] Measured from pin 1 to pin 2.

**nexperia**

## 5. Pinning information

**Table 2. Pinning information**

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K1	cathode (diode 1)	 Transparent top view	 sym045
2	K2	cathode (diode 2)		

## 6. Ordering information

**Table 3. Ordering information**

Type number	Package		
	Name	Description	Version
PESD1ETH1GXLS-Q	DFN1006BD-2	Leadless ultra small plastic package with side-wettable flanks (SWF); 2 terminals; 0.65 mm pitch; 1 mm x 0.6 mm x 0.47 mm body	SOD882BD

## 7. Marking

**Table 4. Marking codes**

Type number	Marking code
PESD1ETH1GXLS-Q	HNH

## 8. Limiting values

**Table 5. Limiting values**

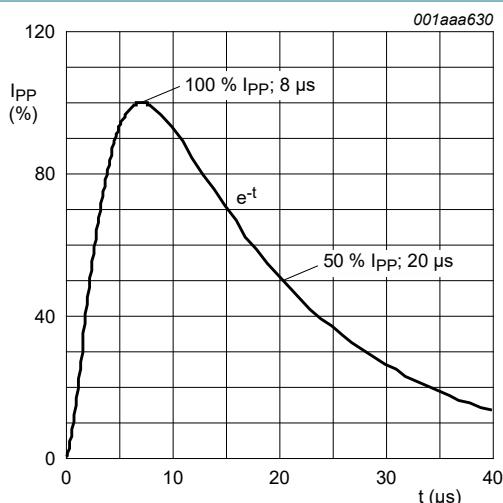
In accordance with the Absolute Maximum Rating System (IEC60134)

Symbol	Parameter	Conditions		Min	Max	Unit
$I_{PPM}$	rated peak pulse current	$t_p = 8/20 \mu s$	[1]	-	2.3	A
$T_j$	junction temperature			-	150	°C
$T_{amb}$	ambient temperature			-55	150	°C
$T_{stg}$	storage temperature			-65	150	°C
$V_{ESD}$	electrostatic discharge voltage	IEC 61000-4-2; contact discharge	[2] [3]	30	-	kV
		ISO 10605; contact discharge; $C = 150 \text{ pF}$ ; $R = 330 \Omega$	[2] [3]	30	-	kV
		ISO 10605; contact discharge; $C = 330 \text{ pF}$ ; $R = 330 \Omega$	[2] [3]	30	-	kV
		1000 contact discharges (IEC 61000-4-2); OPEN Alliance specification	[3]	15	-	kV

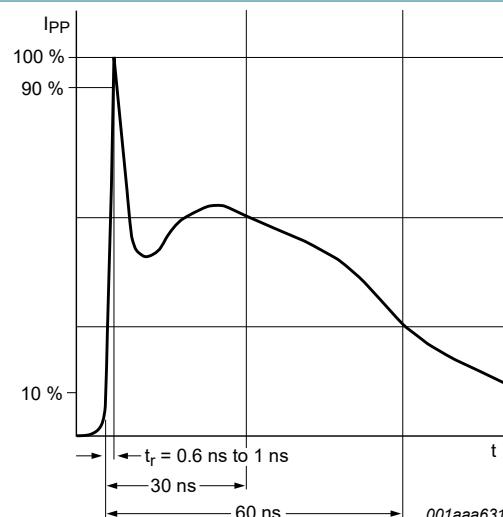
[1] Device stressed with 8/20  $\mu s$  exponential decay waveform according to IEC 61000-4-5.

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

[3] Measured from pin 1 to pin 2.



**Fig. 1. 8/20  $\mu s$  pulse waveform according to IEC 61000-4-5**



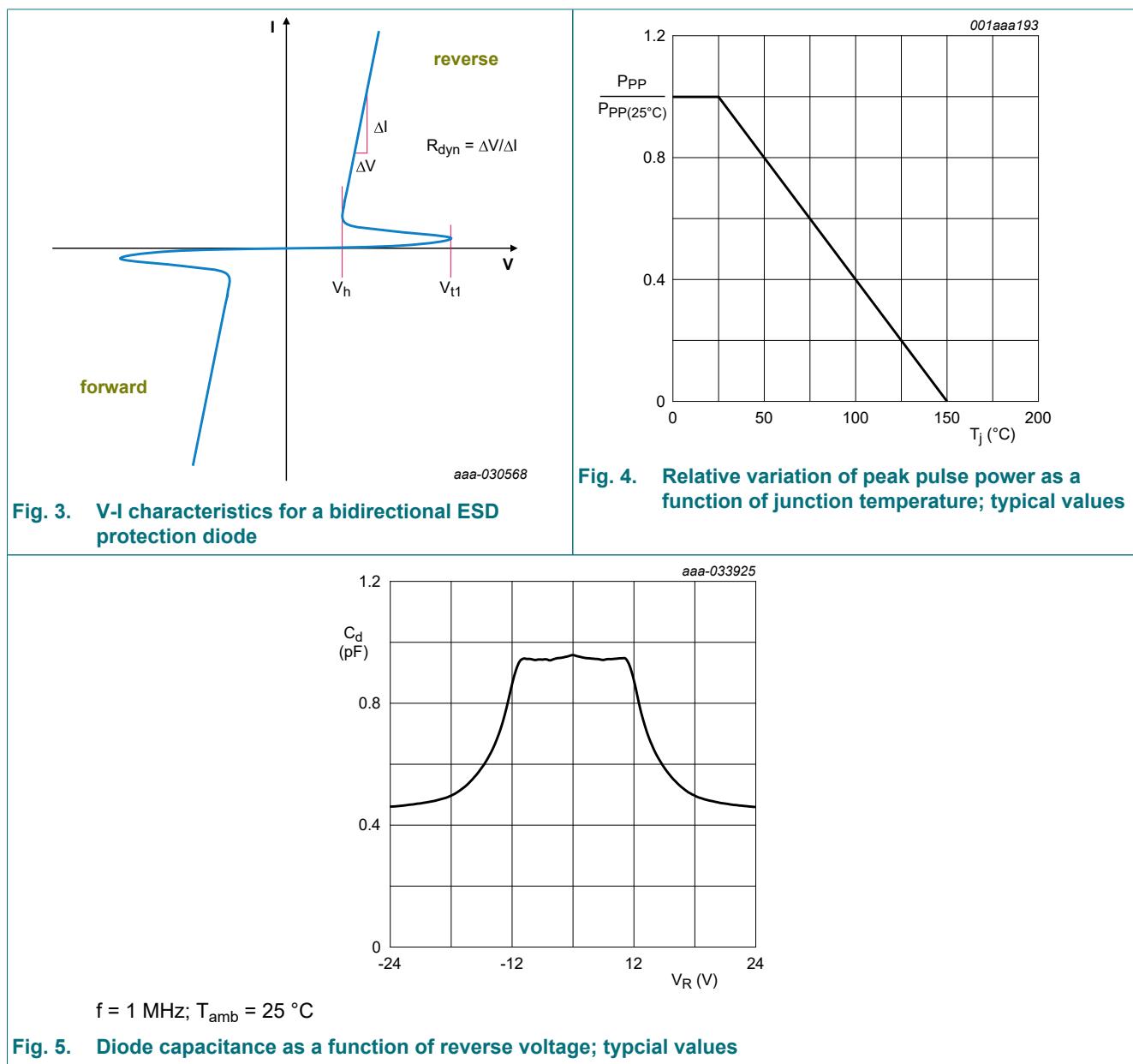
**Fig. 2. ESD pulse waveform according to IEC 61000-4-2**

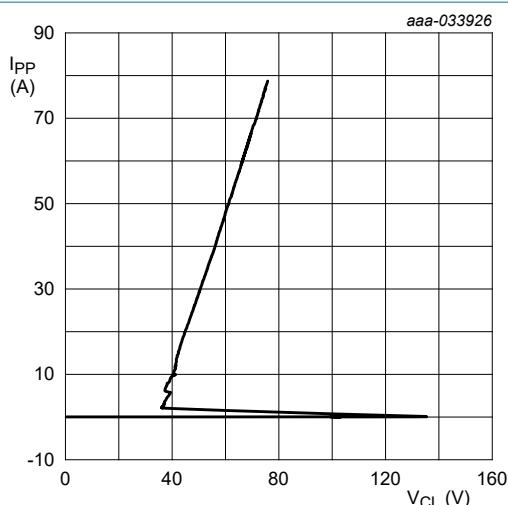
## 9. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{RWM}$	reverse standoff voltage	$T_{amb} = 25^\circ C$		-	-	24	V
$V_h$	holding voltage		[1]	28	-	-	V
$V_{t1}$	trigger voltage		[1]	100	140	-	V
$I_{RM}$	reverse leakage current	$V_{RWM} = 24 V; V_R = 0 V; T_{amb} = 25^\circ C$		-	1	100	nA
$C_d$	diode capacitance	$f = 1 \text{ MHz}; V_R = 0 V; T_{amb} = 25^\circ C$		-	0.9	1.2	pF
$R_{dyn}$	dynamic resistance	$I_R = 40 A; T_{amb} = 25^\circ C$	[1]	-	0.6	-	$\Omega$

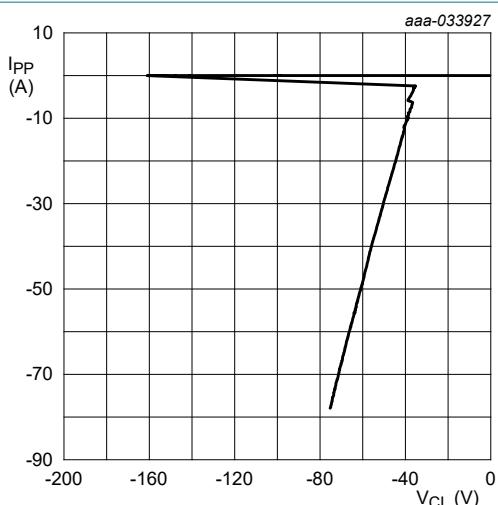
[1] Non-repetitive current pulse, Transmission Line Pulse (TLP); square pulse; ANSI / ESD STM5.5.1-2008





Transmission Line Pulse (TLP);  
 $t_p = 100$  ns;  $t_r = 1$  ns

**Fig. 6. Dynamic resistance with positive clamping; typical values**



Transmission Line Pulse (TLP);  
 $t_p = 100$  ns;  $t_r = 1$  ns

**Fig. 7. Dynamic resistance with negative clamping; typical values**

## 10. Application information

In the IEEE 100BASE-T1 and 1000BASE-T1 EMC Test Specification for ESD suppression devices<sup>1</sup> document (further referred as OPEN Alliance 100/1000BASE-T1 specification), the OPEN Alliance describes four different tests to ensure compliance of ESD suppressor devices and PHYs which are compliant according to the document “*Transceiver EMC Test Specification*”.

The return loss and insertion loss are evaluated using the differential S-parameters  $S_{dd11}$  and  $S_{dd21}$ . These measurements replace the requirement for a certain capacitance value. To ensure symmetry, the differential to common mode rejection is evaluated using the S-parameter  $S_{sd21}$ . This measurement replaces the requirement for a matching of the capacitances per line. To ensure that the device does not degrade and changes behavior after repetitive ESD events, the S-parameter measurements are repeated after discharging 20 times  $\pm 8$  kV ESD on signal lines 1 and 2, with  $C = 150$  pF,  $R = 330$   $\Omega$  according to ISO 10605. Subsequently, the S-parameters are measured again and compared to the original data.

To predict if the ESD suppressor device would protect a PHY of a certain robustness class (Class I (JEDEC-HBM 4 kV) and Class II (JEDEC-HBM 2 kV)), the ESD discharge current is measured in a reference circuit according to OPEN Alliance 100/1000BASE-T1 specification for  $\pm 4$  kV and  $\pm 6$  kV according to IEC 61000-4-2 with  $C = 150$  pF and  $R = 330$   $\Omega$ . Unlike in the OPEN Alliance 100BASE-T1 specification of October 29 2017, the „Transceiver Simulation network“ is implemented with 2  $\Omega$  and 50  $\Omega$  resistors.

To ensure that the ESD suppressor device is not impacting the EMC performance of the complete module, the RF clamping test as defined in the OPEN Alliance 100/1000BASE-T1 specification is applied. First a measurement at a reference power level of 25 dBm is conducted in an environment defined by the OPEN Alliance 100/1000BASE-T1 specification. Next, the power is increased to 33 dBm (Class I), 36 dBm (Class II), and 39 dBm (Class III). No change in the measured common mode rejection indicates that the ESD suppressor device is not impacting the modules EMC performance.

Please ask your Nexperia contact for full test report with all details and graphs.

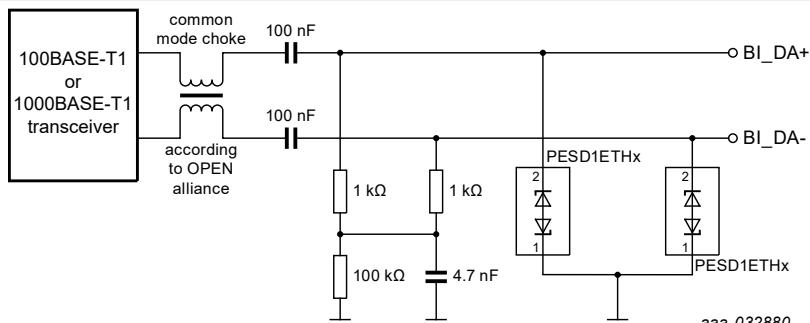


Fig. 8. Application diagram

## 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.

<sup>1</sup> OPEN Alliance: “100BASE-T1 EMC Test Specification for ESD suppression devices”, version 2.0 final, October 30, 2020; “1000BASE-T1 EMC Test Specification for ESD suppression devices”, version 1.0 final, October 30, 2020

## 12. Package outline

DFN1006BD-2 Leadless ultra small plastic package with side-wettable flanks (SWF); 2 terminals;  
0.65 mm pitch; 1 mm x 0.6 mm x 0.47 mm body

SOD882BD

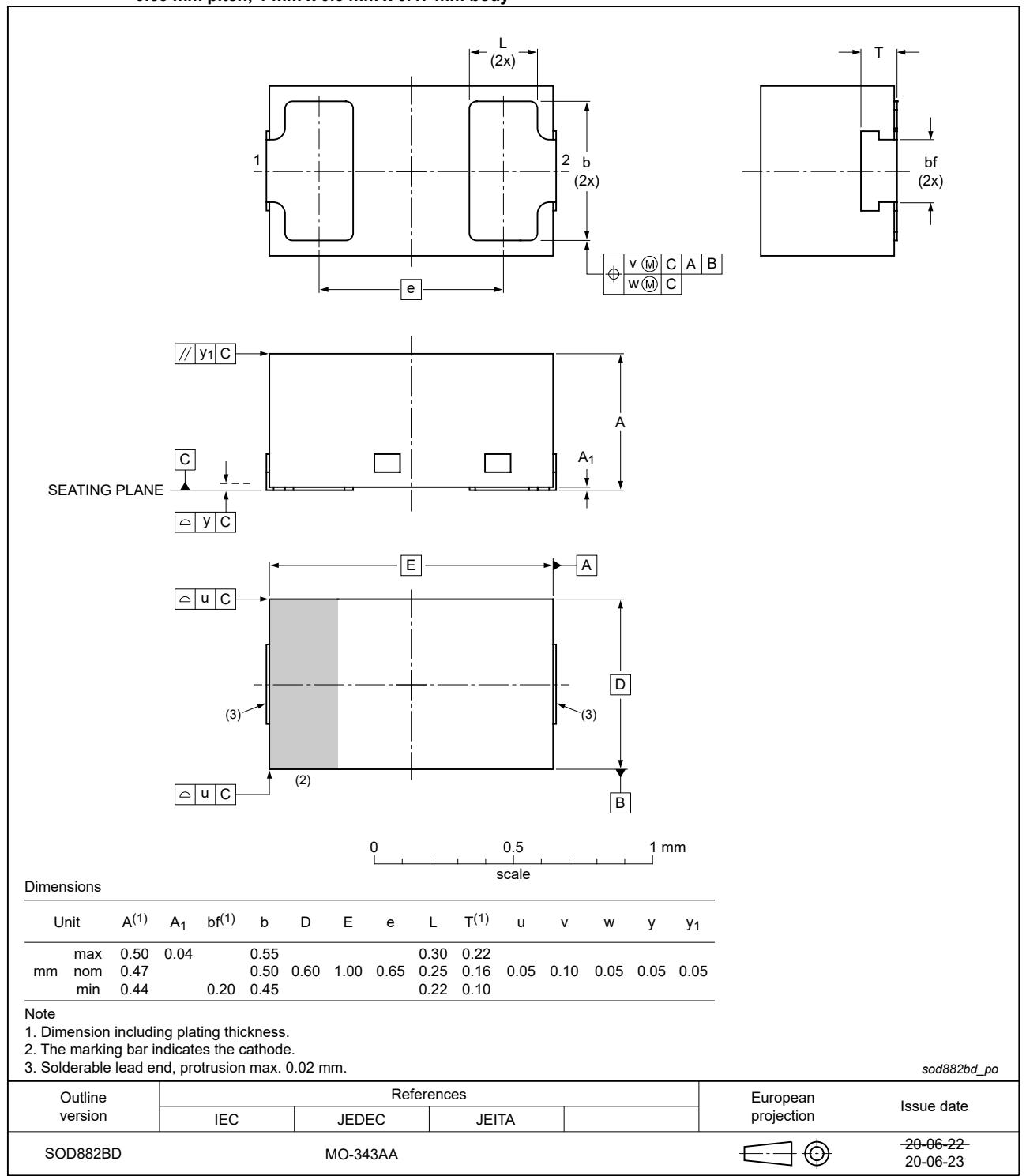
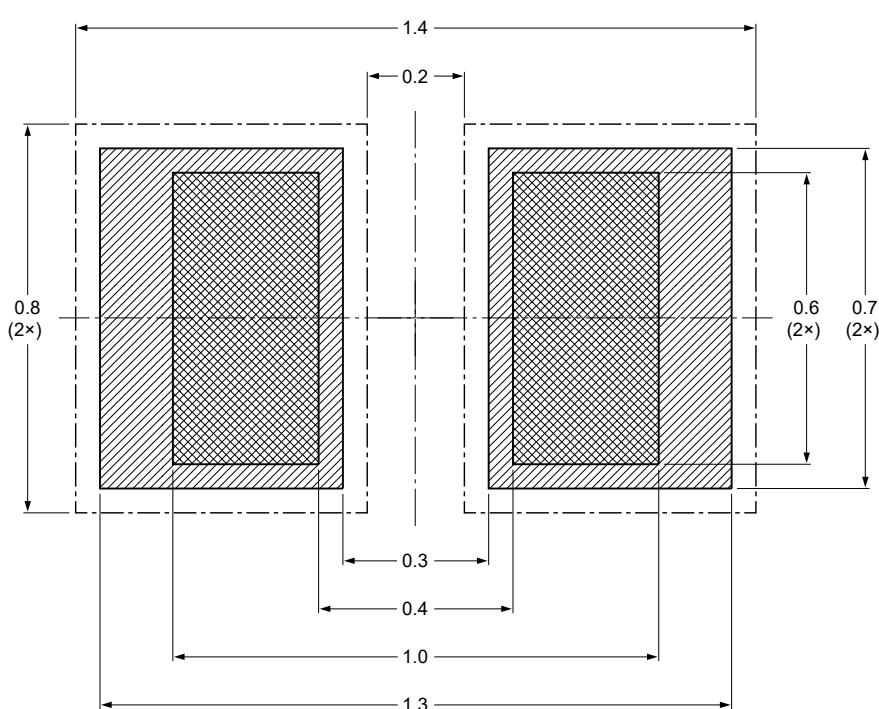


Fig. 9. Package outline DFN1006BD-2 (SOD882BD)

## 13. Soldering

Footprint information for reflow soldering of DFN1006BD-2 package

SOD882BD



 solder resist

 solder paste

 solder lands

Dimensions in mm

Issue date 20-05-01  
20-12-15

sod882bd\_fr

Fig. 10. Reflow soldering footprint for DFN1006BD-2 (SOD882BD)

## 14. Revision history

**Table 7. Revision history**

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PESD1ETH1GXLS-Q v.1	20211202	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.

- [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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