



# PESD1ETH10L-Q

## ESD protection for in-vehicle networks

31 January 2025

Product data sheet

## 1. General description

Fully OPEN Alliance IEEE 10BASE-T1s, 100BASE-T1 and 1000BASE-T1 compliant ElectroStatic Discharge (ESD) protection device in a compact DFN1006-2 (SOD882) surface-mounted plastic package, designed to protect one automotive Ethernet bus line from the damage caused by ESD and other transients.

## 2. Features and benefits

- Fully OPEN Alliance IEEE 10BASE-T1s, 100BASE-T1 and 1000BASE-T1 compliant
- High trigger voltage:  $V_{t1} = 100 \text{ V min}$
- Low max capacitance:  $C_d = 0.4 \text{ pF}$
- ESD protection up to 18 kV (IEC 61000-4-2)
- 1000 contact discharges (OPEN Alliance specification) up to 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 10BASE-T1s, 100BASE-T1 and 1000BASE-T1 automotive 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	$T_{amb} = 25 \text{ }^\circ\text{C}$		-	-	75	V
$C_d$	diode capacitance	$f = 1 \text{ MHz}; V_R = 0 \text{ V}; T_{amb} = 25 \text{ }^\circ\text{C}$		0.3	0.35	0.4	pF
$V_{t1}$	trigger voltage	$t_p = 100 \text{ ns}; T_{amb} = 25 \text{ }^\circ\text{C}$	[1]	100	140	-	V
$V_{ESD}$	electrostatic discharge voltage	ISO 10605; contact discharge; $C = 150 \text{ pF}; R = 330 \text{ }^\Omega$	[2] [3]	18	-	-	kV
		IEC 61000-4-2; contact discharge	[2] [3]	18	-	-	kV
		1000 contact discharges (IEC 61000-4-2); OPEN Alliance specification	[3]	15	-	-	kV

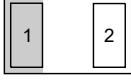
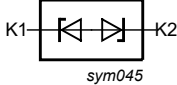
[1] Non-repetitive current pulse, Transmission Line Pulse (TLP); square pulse; ANSI / ESD STM5.5.1-2008

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

[3] Measured from pin 1 to pin 2.

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K1	cathode (diode 1)	 <p>Transparent top view</p> <p><b>DFN1006-2 (SOD882)</b></p>	 <p><i>sym045</i></p>
2	K2	cathode (diode 2)		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PESD1ETH10L-Q	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
PESD1ETH10L-Q	S8S

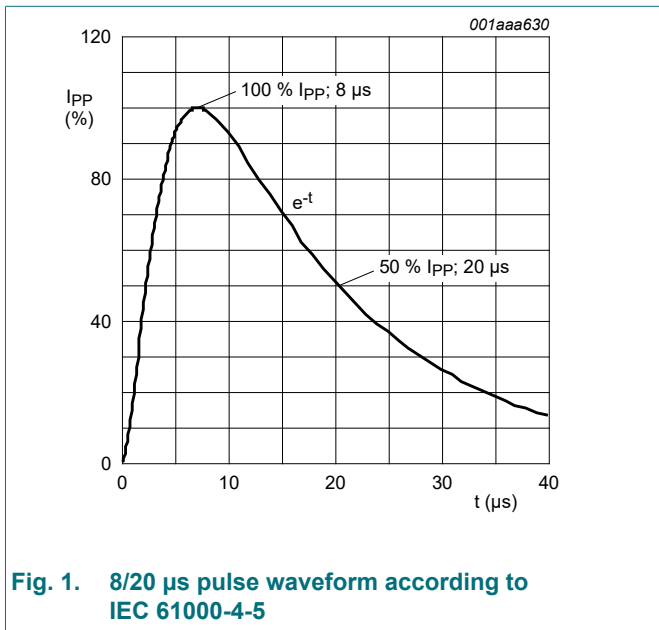
## 8. Limiting values

**Table 5. Limiting values**

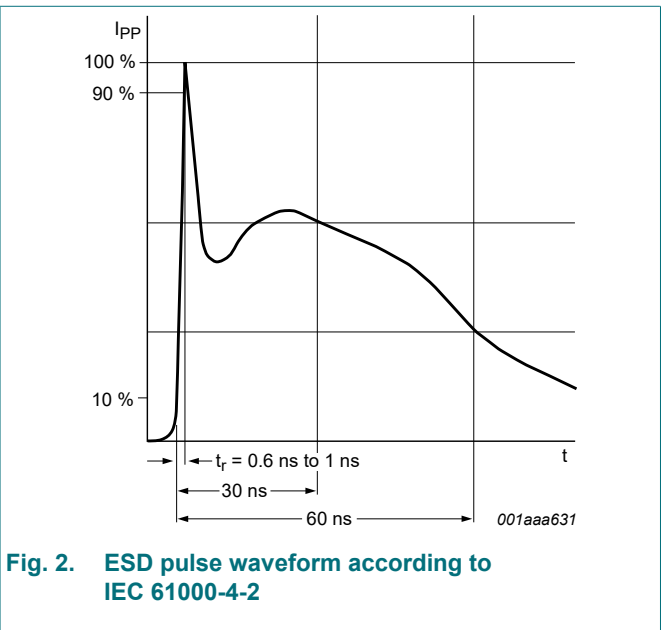
In accordance with the Absolute Maximum Rating System (IEC60134)

Symbol	Parameter	Conditions		Min	Max	Unit
$P_{PPM}$	rated peak pulse power	$t_p = 8/20 \mu s$	[1]	-	94	W
$I_{PPM}$	rated peak pulse current		[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]	18	-	kV
		ISO 10605; contact discharge; C = 150 pF; R = 330 $\Omega$	[2] [3]	18	-	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**



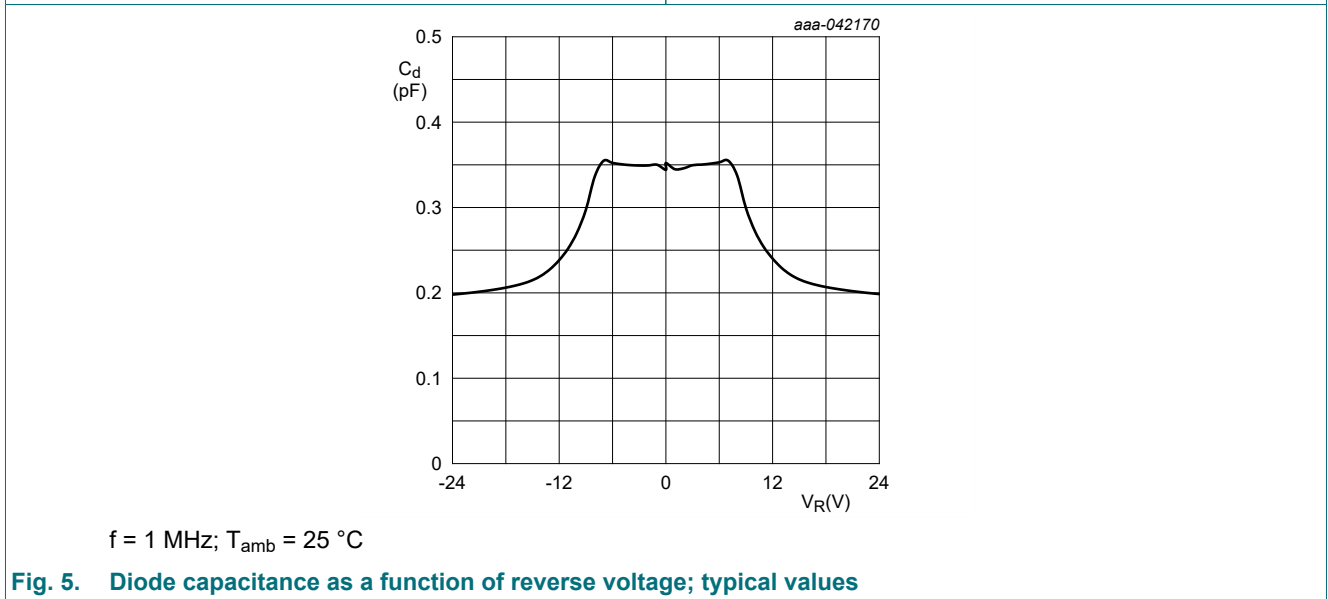
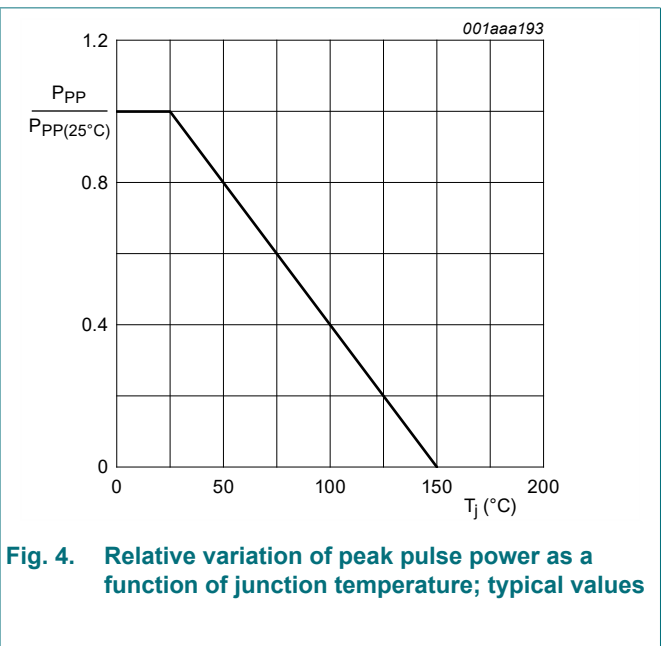
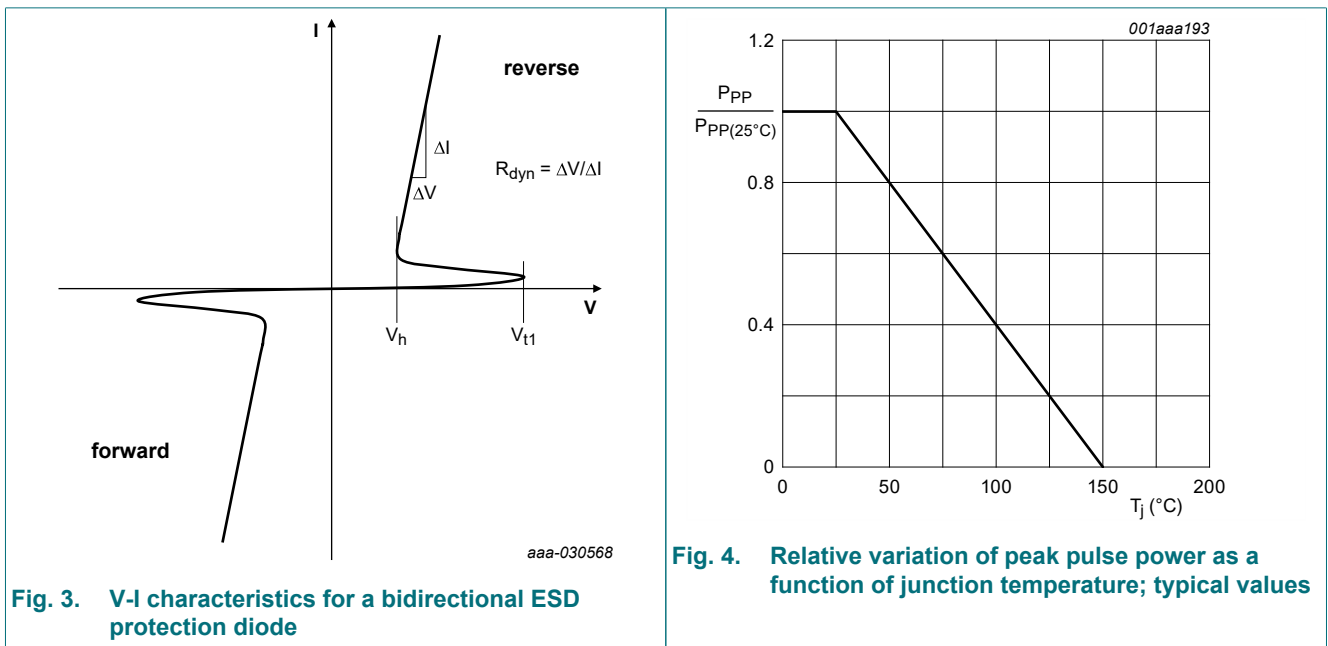
**Fig. 2. ESD pulse waveform according to IEC 61000-4-2**

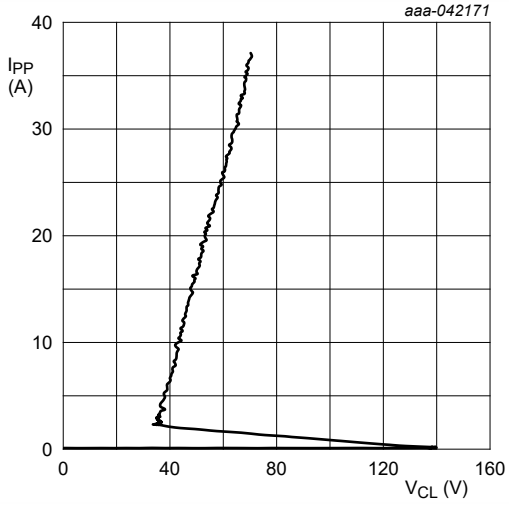
## 9. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{RWM}$	reverse standoff voltage	$T_{amb} = 25\text{ °C}$	-	-	75	V
$V_h$	holding voltage	$t_p = 100\text{ ns}; T_{amb} = 25\text{ °C}$	[1]	32	35	V
$V_{t1}$	trigger voltage		[1]	100	140	V
$I_{RM}$	reverse leakage current	$V_{RWM} = 75\text{ V}; T_{amb} = 25\text{ °C}$	-	1	100	nA
$C_d$	diode capacitance	$f = 1\text{ MHz}; V_R = 0\text{ V}; T_{amb} = 25\text{ °C}$	0.3	0.35	0.4	pF
$R_{dyn}$	dynamic resistance	$I_R = 20\text{ A}; t_p = 100\text{ ns}; T_{amb} = 25\text{ °C}$	[1]	1	-	$\Omega$

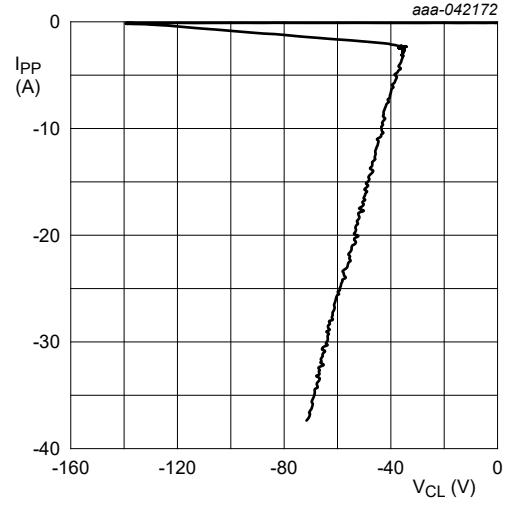
[1] Non-repetitive current pulse, Transmission Line Pulse (TLP); square pulse; ANSI / ESD STM5.5.1-2008





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

This device is an ESD protection diode, specifically designed to protect one line of the OPEN Alliance Ethernet 10BASE-T1s, 100BASE-T1 or 1000BASE-T1 interfaces from damage caused by ESD and surge pulses. This device is a single line ESD protection diode i.e. for differential lines two of these diodes need to be placed on the PCB, one for each line.

The OPEN Alliance Ethernet standard 10BASE-T1s, 100BASE-T1 and 1000BASE-T1 have very specific requirements for an ESD protection diode. These standards use unshielded twisted pairs (unshielded cables) which leads to the requirement of >100V trigger voltage. Additionally, to be fully conform to the Open Alliance specifications, the ESD diode needs to be tested for a variety of criteria. These tests ensure that the ESD diode would sufficiently protect against ESD and integrate well in the overall system without significantly impacting system characteristics such as EMC and data transmission.

The OPEN Alliance test specifications for the afore mentioned standards include following tests (including details on specific test setups required, test procedures and the recommended limits):

- Evaluation of data sheet parameters
- Parasitic capacitance
- S-Parameter measurement mixed mode
- ESD damage test
- Test of unwanted clamping effect at RF immunity tests
- Impact to ESD discharge current in a defined network

For detailed information, please refer to the OPEN Alliance test specifications.

This device is fully tested and certified for use in OPEN Alliance 10BASE-T1s, 100BASE-T1 and 1000BASE-T1 interfaces. Please reach out to your local Nexperia representatives for detailed test reports.

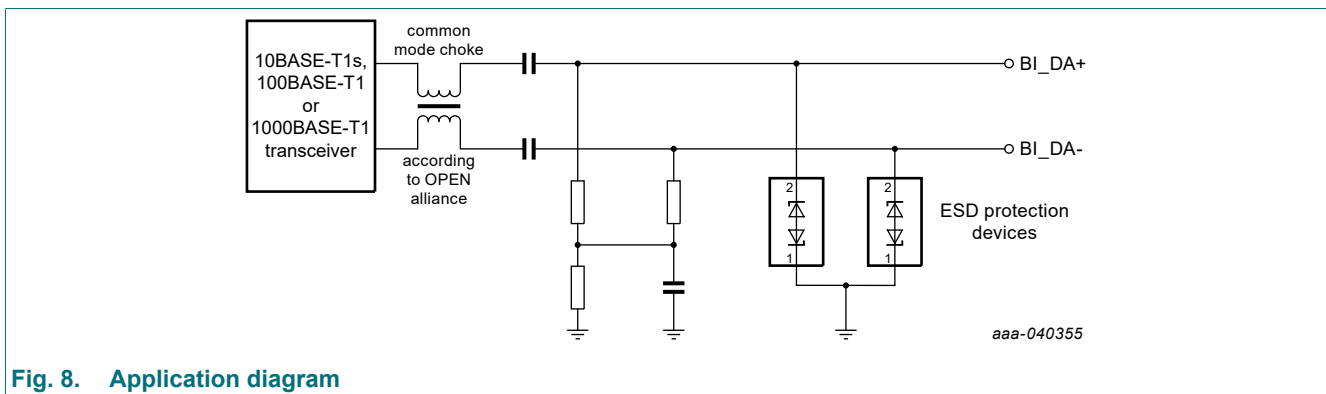


Fig. 8. Application diagram

## 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.

12. Package outline

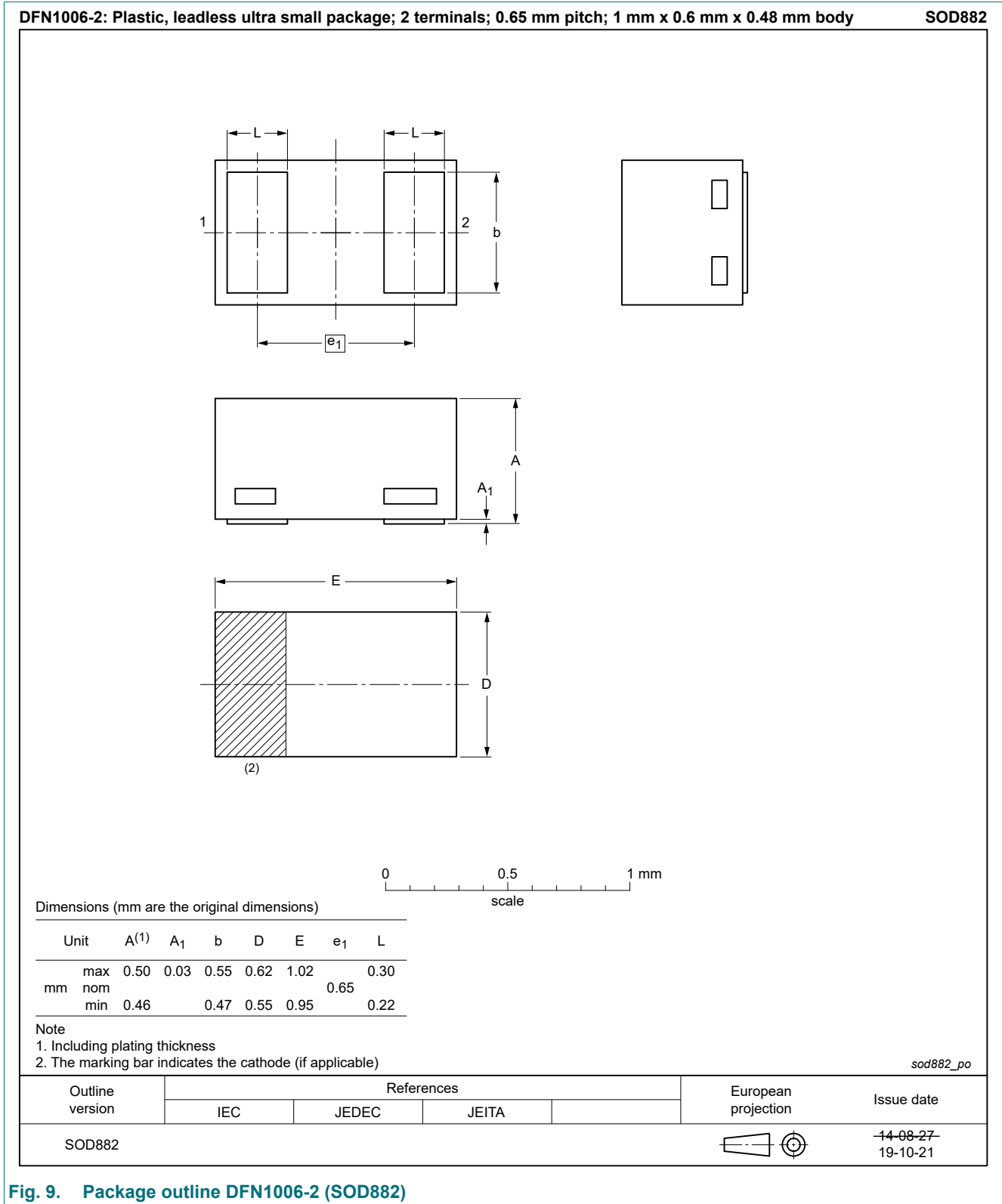


Fig. 9. Package outline DFN1006-2 (SOD882)

### 13. Soldering

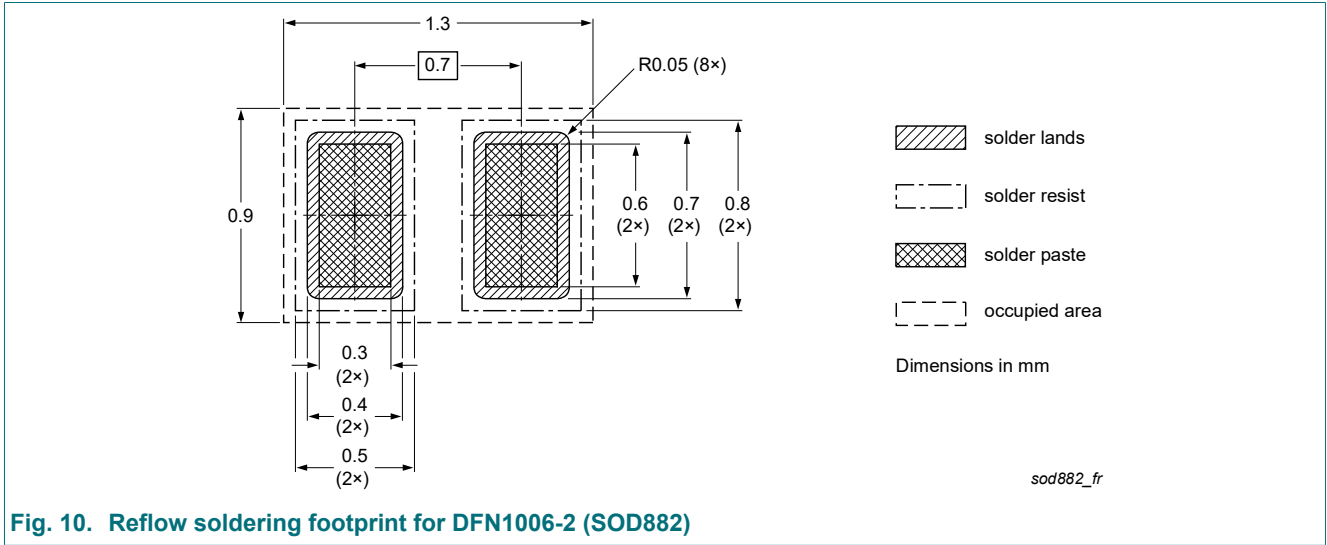


Fig. 10. Reflow soldering footprint for DFN1006-2 (SOD882)



## 14. Revision history

Table 7. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PESD1ETH10L-Q v.1	20250131	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.
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Date of release: 31 January 2025

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