



PESD5V0C1ULS-Q

Extremely low clamping unidirectional ESD protection diode

4 April 2022

Product data sheet

1. General description

Ultra low capacitance unidirectional ElectroStatic Discharge (ESD) protection diode, part of the TrEOS Protection family. This device is housed in a small leadless DFN1006BD-2 (SOD882BD) Surface-Mounted Device (SMD) plastic package with side-wettable flanks. The device is designed to protect one automotive in-vehicle network bus line from the damage caused by ESD and other transients.

2. Features and benefits

- Unidirectional ESD protection of one line
- Ultra low capacitance: $C_d < 0.6$ pF
- ESD protection starting from 15 kV (IEC 61000-4-2; ISO10605)
- Deep snap-back combined with dynamic resistance of 0.3 Ohm
- DFN1006BD-2 package with side-wettable flanks
- Qualified according to AEC-Q101 and recommended for use in automotive applications

3. Applications

ESD protection for In-vehicle network lines in automotive environments

- Ultra high-speed data lines such as USB 3.2 or HDMI 2.0
- Low-Voltage Differential Signaling (LVDS) automotive
- Automotive A/V monitors, display and cameras

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	V
I_{PPM}	rated peak pulse current	$t_p = 8/20\text{ }\mu\text{s}$	[1]	-	-	6.5	A
C_d	diode capacitance	$f = 1\text{ MHz}; V_R = 0\text{ V}; T_{amb} = 25\text{ }^{\circ}\text{C}$	[2]	-	-	0.6	pF

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

[2] Measured from pin 1 to pin 2.

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode	 Transparent top view DFN1006BD-2 (SOD882BD)	 <i>sym035</i>
2	A	anode		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PESD5V0C1ULS-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
PESD5V0C1ULS-Q	8R

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	$t_p = 8/20\ \mu s$	[1]	-	6.5	A
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; contact discharge	[2] [3]	-	15	kV
		ISO 10605: contact discharge; C = 330 pF, R = 330 Ω	[2] [3]	-	15	kV
		ISO 10605: contact discharge; C = 150 pF, R = 330 Ω	[2] [3]	-	15	kV

- [1] Device stressed with 8/20 μs 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.

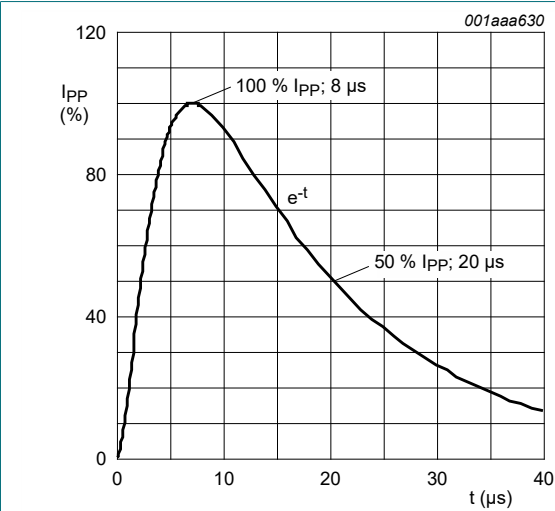


Fig. 1. 8/20 μs pulse waveform according to IEC 61000-4-5

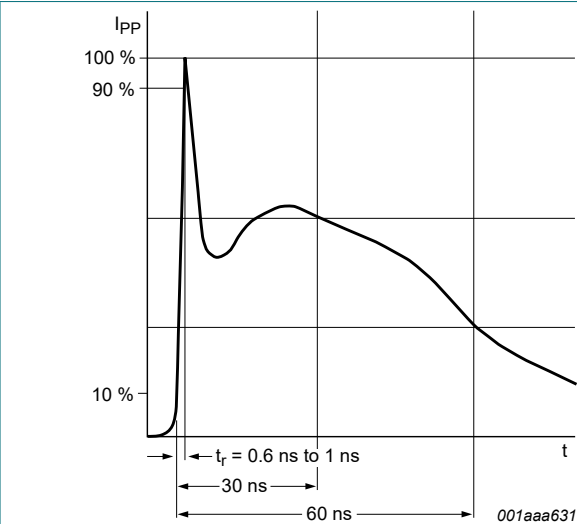


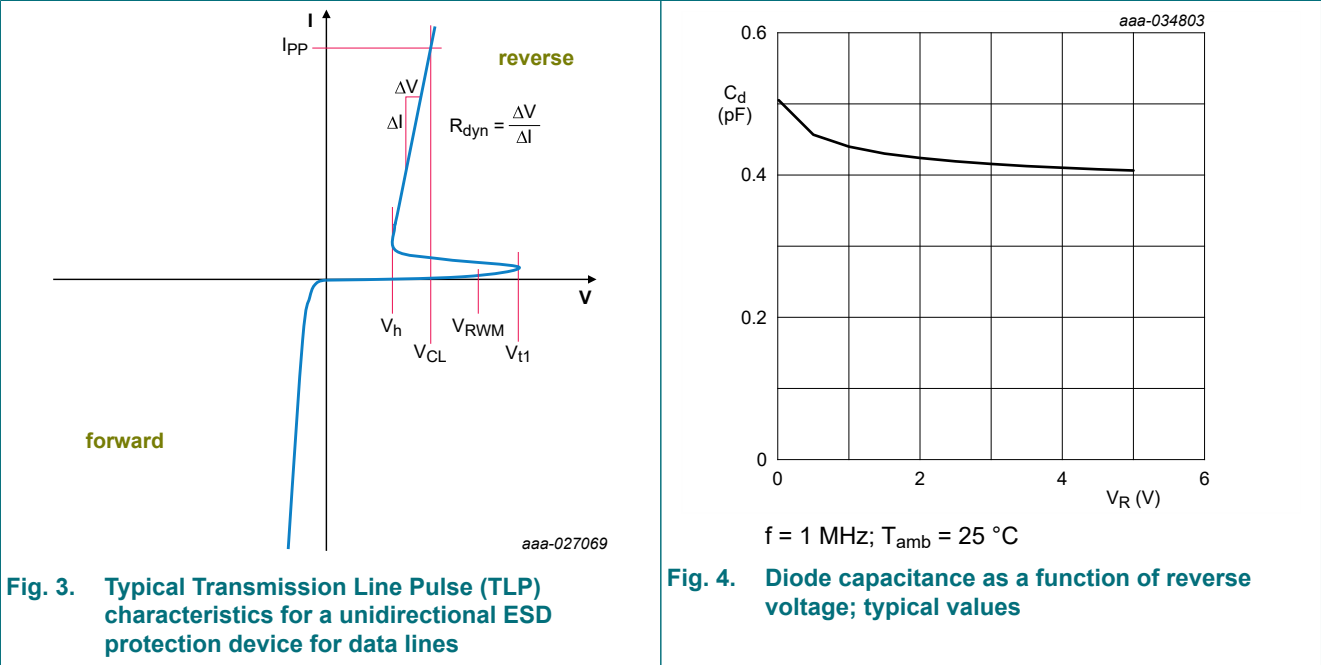
Fig. 2. ESD pulse waveform according to IEC 61000-4-2

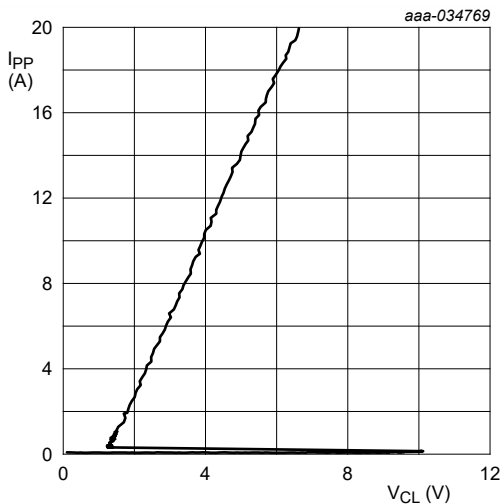
9. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V _{RWM}	reverse standoff voltage	T _{amb} = 25 °C		-	-	5	V
V _{BR}	breakdown voltage	I _R = 1 mA; T _{amb} = 25 °C	[1]	7	9	-	V
I _{RM}	reverse leakage current	V _{RWM} = 5 V; T _{amb} = 25 °C	[1]	-	1	100	nA
C _d	diode capacitance	f = 1 MHz; V _R = 0 V; T _{amb} = 25 °C	[1]	-	-	0.6	pF
V _{CL}	clamping voltage	I _{PP} = 8 A; t _p = TLP; T _{amb} = 25 °C	[2] [1]	-	3.5	-	V
R _{dyn}	dynamic resistance	I _R = 10 A; T _{amb} = 25 °C	[2] [1]	-	0.3	-	Ω

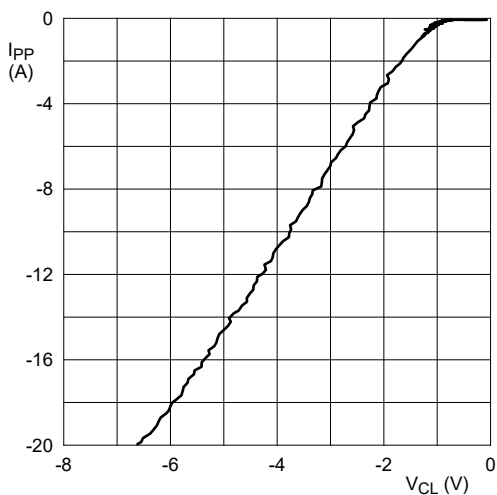
- [1] Measured from pin 1 to pin 2.
[2] Non-repetitive current pulse, Transmission Line Pulse (TLP) t_p = 100 ns; square pulse; ANSI / ESD STM5.5.1-2008.





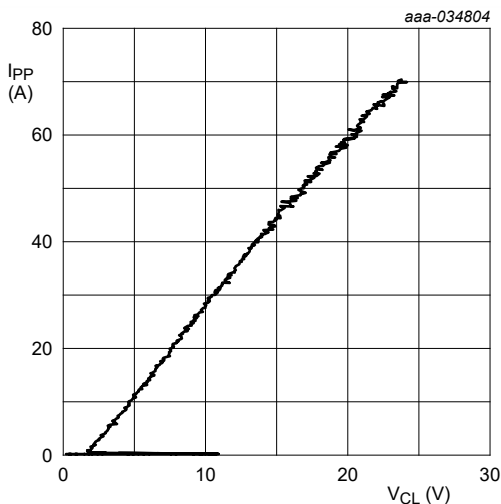
Transmission Line Pulse (TLP);
 $t_p = 100\text{ ns}$; $t_r = 1\text{ ns}$

Fig. 5. Dynamic resistance with positive clamping; typical values



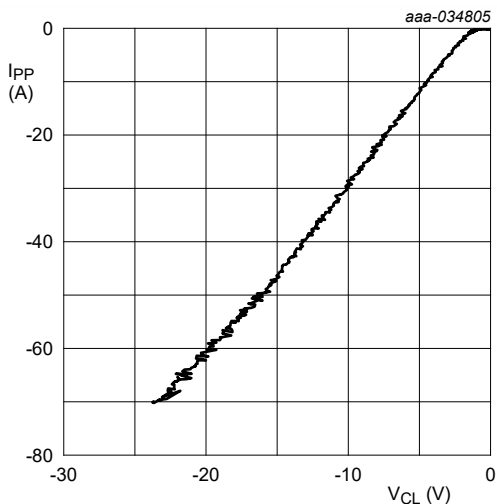
Transmission Line Pulse (TLP);
 $t_p = 100\text{ ns}$; $t_r = 1\text{ ns}$

Fig. 6. Dynamic resistance with negative clamping; typical values



Very-Fast Transmission Line Pulse (VF-TLP);
 $t_p = 5\text{ ns}$; $t_r = 600\text{ ps}$

Fig. 7. Dynamic resistance with positive clamping; typical values



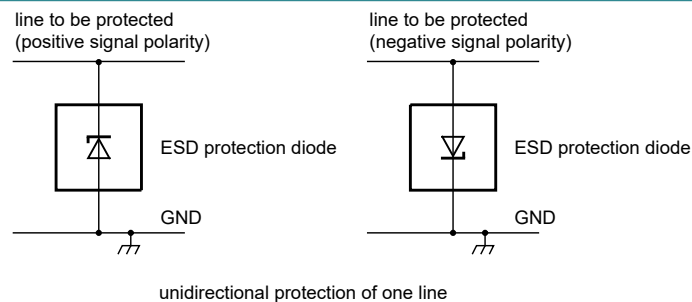
Very-Fast Transmission Line Pulse (VF-TLP);
 $t_p = 5\text{ ns}$; $t_r = 600\text{ ps}$

Fig. 8. Dynamic resistance with negative clamping; typical values

10. Application information

The device is designed for the protection of one 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.

The device uses an advanced clamping structure showing a negative dynamic resistance. This snap-back behavior strongly reduces the clamping voltage to the system behind the ESD protection during an ESD event. Do not connect unlimited DC current sources to the data lines to avoid keeping the ESD protection device in snap-back state after exceeding breakdown voltage (due to an ESD pulse for instance).



aaa-002440

Fig. 9. 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. 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

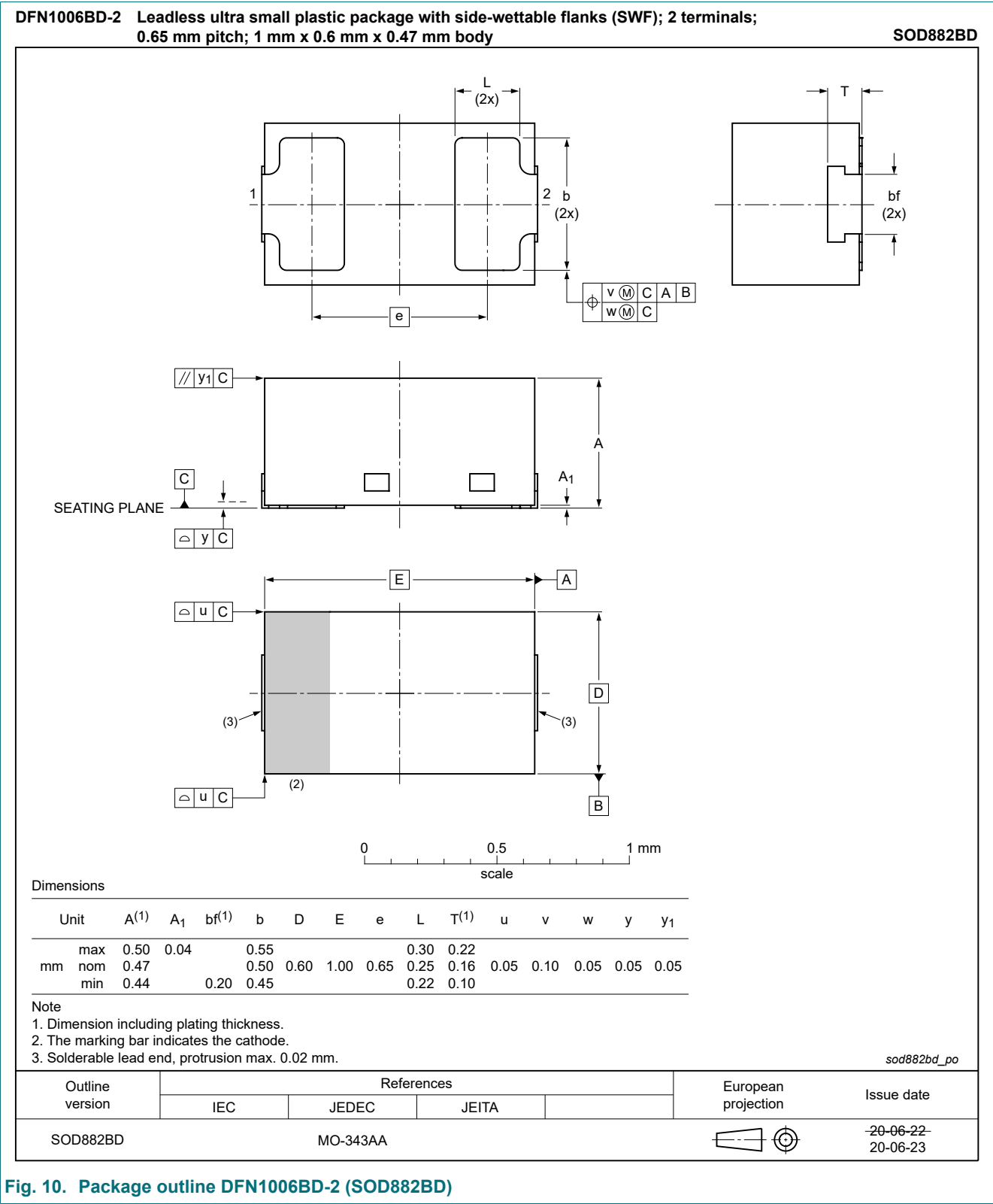
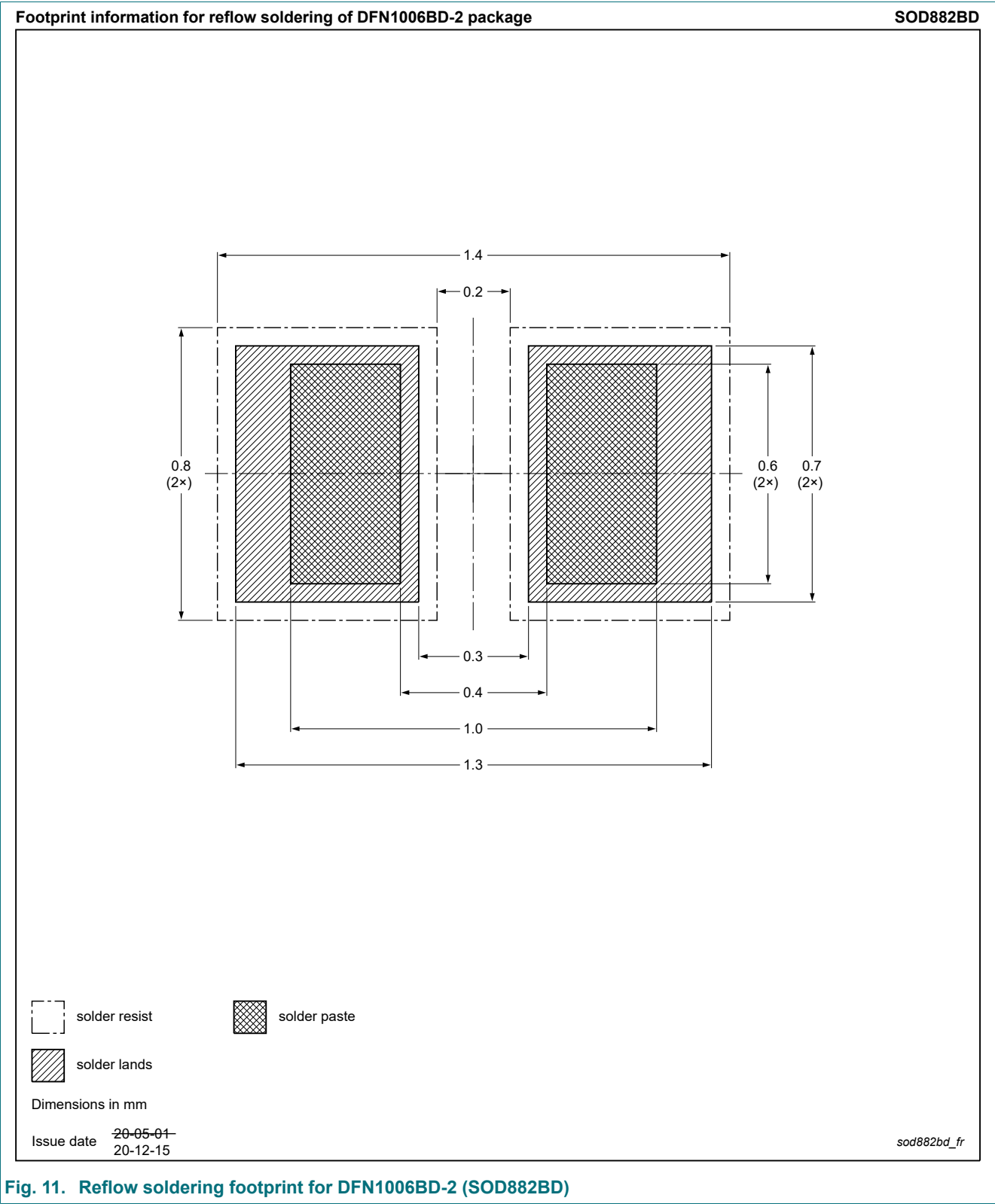


Fig. 10. Package outline DFN1006BD-2 (SOD882BD)

13. Soldering



14. Revision history

Table 7. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PESD5V0C1ULS-Q v.2	20220404	Product data sheet	-	PESD5V0C1ULS-Q v.1
Modifications:	Chapter "Characteristics", clarified condition for parameter V_{BR}			
PESD5V0C1ULS-Q v.1	20220330	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.

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- [2] The term 'short data sheet' is explained in section "Definitions".
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Contents

1. General description..... 1

2. Features and benefits..... 1

3. Applications..... 1

4. Quick reference data..... 1

5. Pinning information.....2

6. Ordering information.....2

7. Marking.....2

8. Limiting values..... 3

9. Characteristics.....4

10. Application information..... 6

11. Test information..... 6

12. Package outline..... 7

13. Soldering..... 8

14. Revision history.....9

15. Legal information.....10

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Date of release: 4 April 2022