



# PESD3V3L1BSF

Very low clamping bidirectional ESD protection diode

2 November 2022

Product data sheet

## 1. General description

Very low clamping bidirectional ElectroStatic Discharge (ESD) protection diode designed to protect one signal line from the damage caused by ESD and other transients. The device is housed in a leadless ultra small DSN0603-2 (SOD962) Surface-Mounted Device (SMD) package.

## 2. Features and benefits

- Bidirectional ESD protection of one line
- Ultra small leadless package with a height of 0.3 mm
- IEC 61000-4-5 (surge):  $I_{PP} = 24$  A peak pulse (average measured)
- Very low clamping voltage:  $V_{CL} = 4.6$  V typical at 16 A for a TLP pulse
- Ultra low leakage current:  $I_{RM} = 1$  nA (average measured)
- ESD protection up to 30 kV

## 3. Applications

ESD and surge protection for:

- very sensitive interface lines
- generic interface lines

in portable electronics, communication, consumer and computing devices.

## 4. Quick reference data

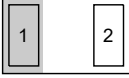
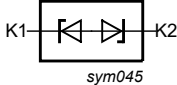
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{RWM}$	reverse standoff voltage	$T_{amb} = 25$ °C		-	-	3.3	V
$I_{PPM}$	rated peak pulse current	$t_p = 8/20$ $\mu$ s	[1]	-	-	20	A
$V_{CL}$	clamping voltage	$I_{PPM} = 20$ A; $t_p = 8/20$ $\mu$ s; $T_{amb} = 25$ °C	[1]	-	5.6	-	V

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

## 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>DSN0603-2 (SOD962-2)</b></p>	 <p>sym045</p>
2	K2	cathode (diode 2)		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PESD3V3L1BSF	DSN0603-2	silicon, leadless ultra small package; 2 terminals; 0.4 mm pitch; 0.6 mm x 0.3 mm x 0.3 mm body	SOD962-2

## 7. Marking

Table 4. Marking codes

Type number	Marking code
PESD3V3L1BSF	4D

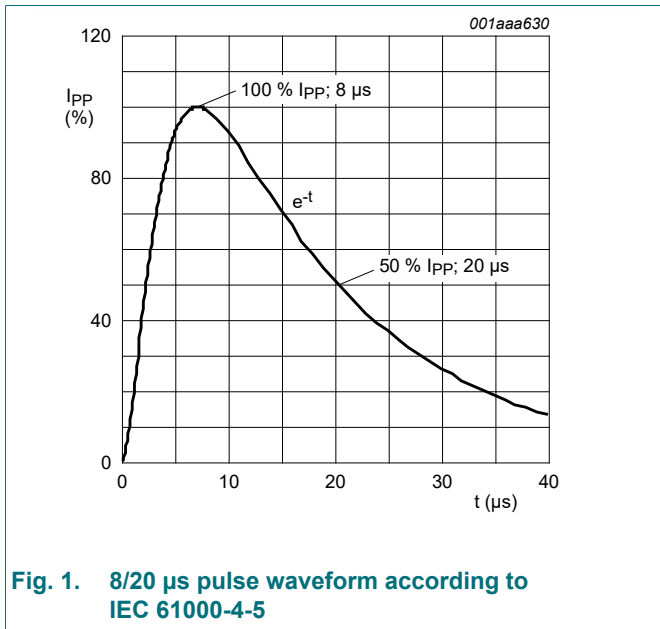
## 8. Limiting values

**Table 5. Limiting values**

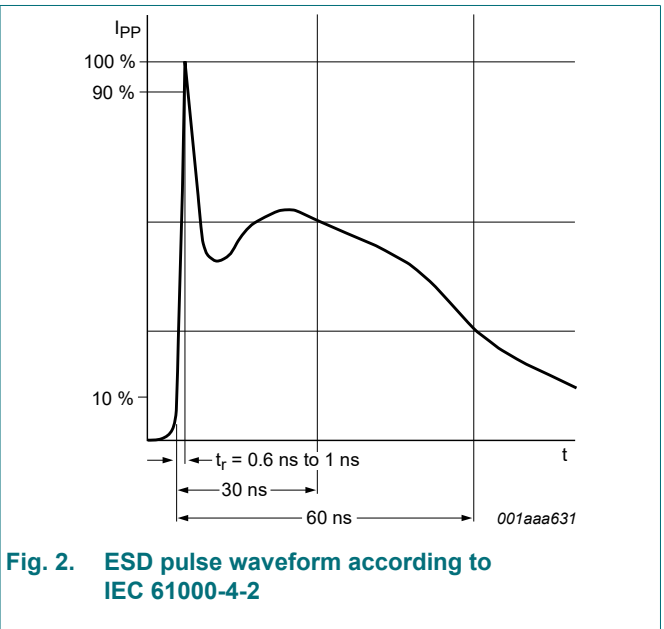
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
$I_{PPM}$	rated peak pulse current	$t_p = 8/20 \mu s$	[1]	-	20	A
$T_j$	junction temperature			-	150	°C
$T_{amb}$	ambient temperature			-40	125	°C
$T_{stg}$	storage temperature			-65	150	°C
<b>ESD maximum ratings</b>						
$V_{ESD}$	electrostatic discharge voltage	IEC 61000-4-2; contact discharge	[2]	-	30	kV
		IEC 61000-4-2; air discharge	[2]	-	30	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.



**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	$T_{amb} = 25\text{ °C}$		-	-	3.3	V
$V_h$	holding voltage	$I_T = 100\text{ mA}; t_p = 100\text{ ns}; T_{amb} = 25\text{ °C}$	[1]	-	3.7	-	V
$V_{t1}$	trigger voltage	$t_p = 100\text{ ns}; T_{amb} = 25\text{ °C}$	[1]	-	7.3	-	V
$I_{RM}$	reverse leakage current	$V_{RWM} = 3.3\text{ V}; T_{amb} = 25\text{ °C}$		-	1	50	nA
$C_d$	diode capacitance	$f = 1\text{ MHz}; V_R = 0\text{ V}; T_{amb} = 25\text{ °C}$		-	32.5	-	pF
$V_{CL}$	clamping voltage	$I_{PP} = 5\text{ A}; t_p = 8/20\text{ }\mu\text{s}; T_{amb} = 25\text{ °C}$	[2]	-	3.8	-	V
		$I_{PPM} = 20\text{ A}; t_p = 8/20\text{ }\mu\text{s}; T_{amb} = 25\text{ °C}$	[2]	-	5.6	-	V
		$I_{PP} = 16\text{ A}; t_p = 100\text{ ns}; T_{amb} = 25\text{ °C}$	[1]	-	4.6	-	V
$R_{dyn}$	dynamic resistance	$I_R = 20\text{ A}; t_p = 100\text{ ns}; T_{amb} = 25\text{ °C}$	[1]	-	0.05	-	$\Omega$

- [1] Non-repetitive current pulse, Transmission Line Pulse (TLP); square pulse; ANSI / ESD STM5.5.1-2008.
- [2] Device stressed with 8/20  $\mu\text{s}$  exponential decay waveform according to IEC 61000-4-5.

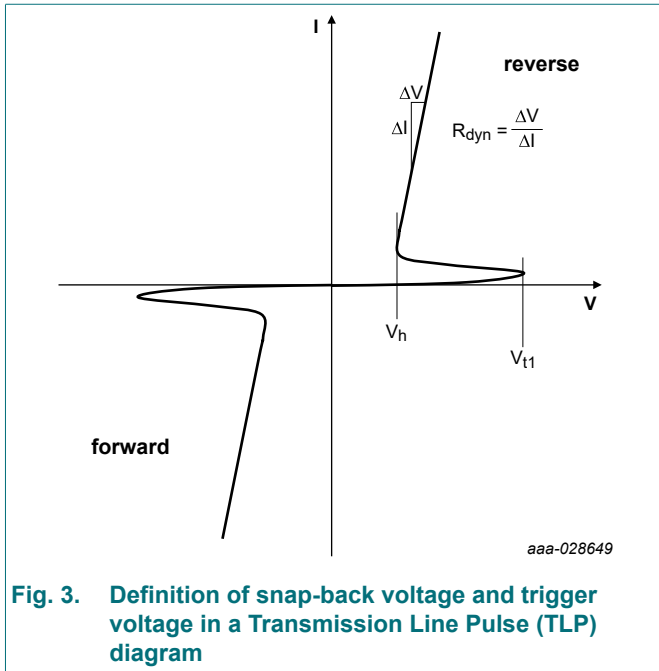


Fig. 3. Definition of snap-back voltage and trigger voltage in a Transmission Line Pulse (TLP) diagram

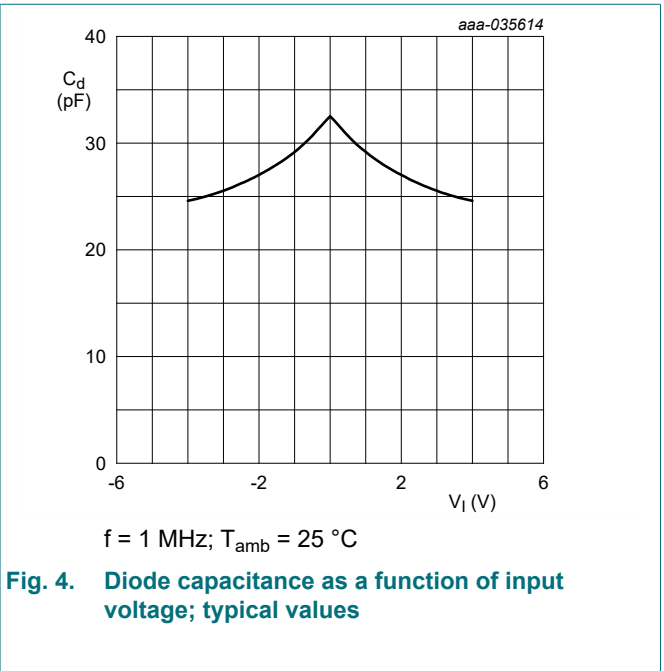
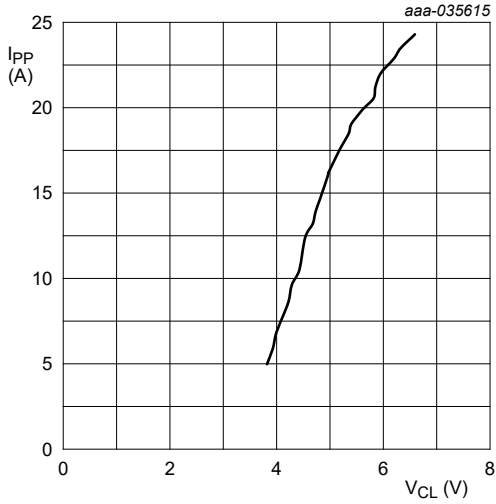
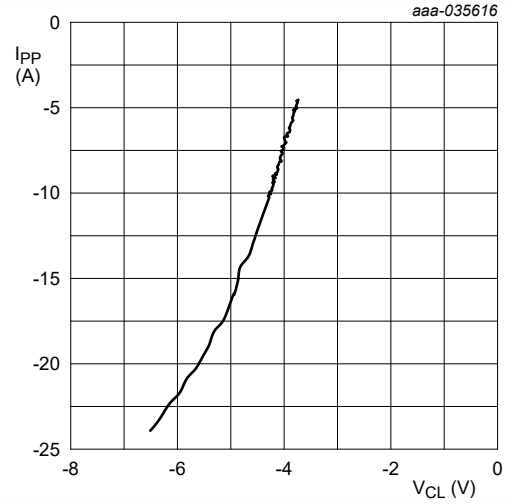


Fig. 4. Diode capacitance as a function of input voltage; typical values



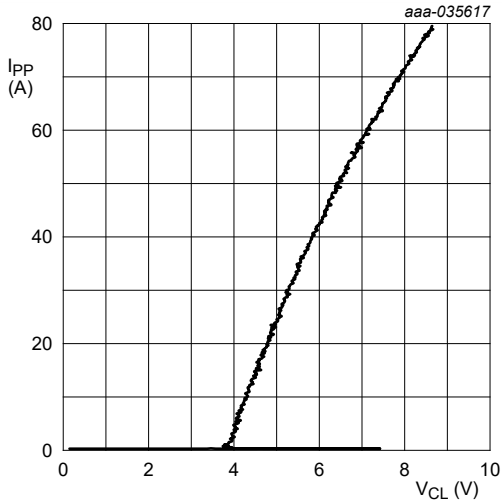
IEC 61000-4-5;  $t_p = 8/20 \mu s$ ; positive pulse

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



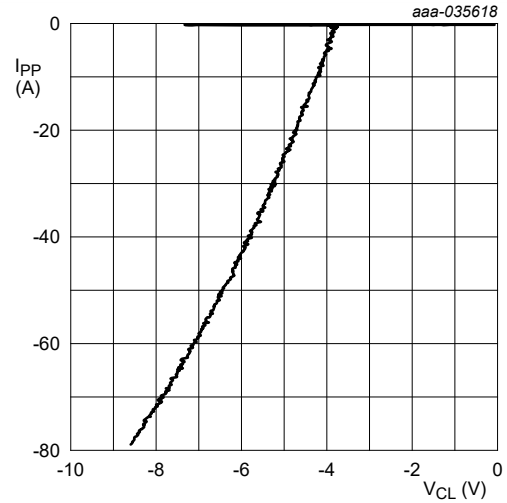
IEC 61000-4-5;  $t_p = 8/20 \mu s$ ; negative pulse

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



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

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

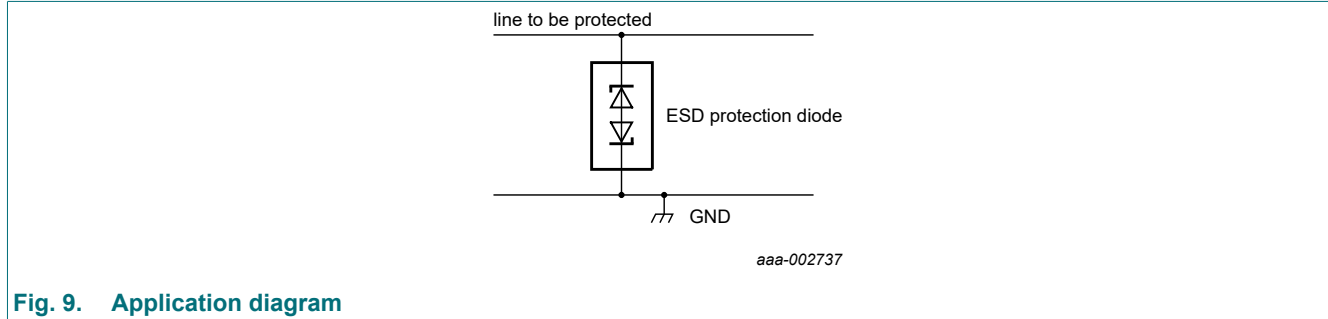


Transmission Line Pulse (TLP);  
 $t_p = 100 ns$ ;  $t_r = 1 ns$

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

## 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. 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. Package outline

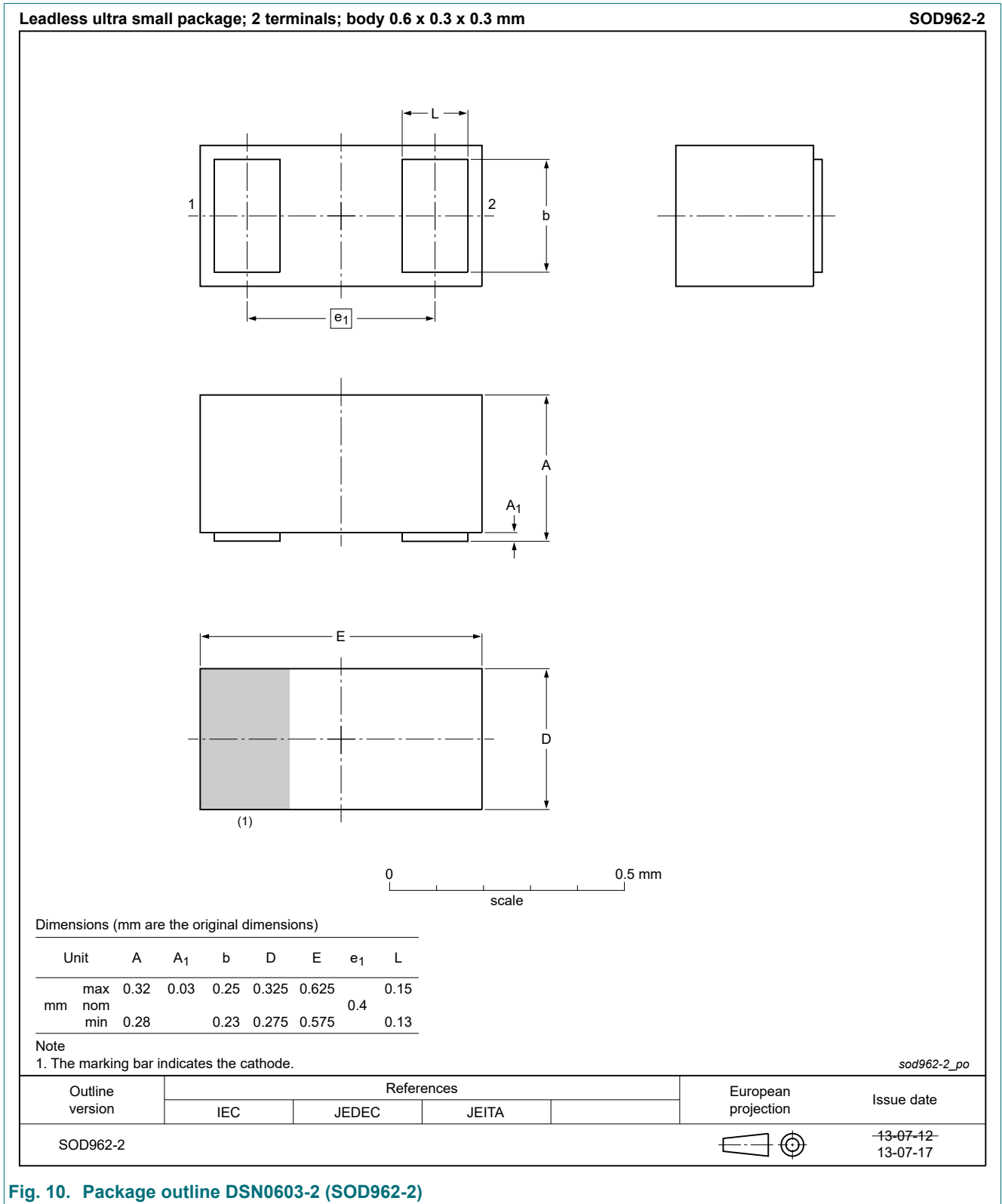
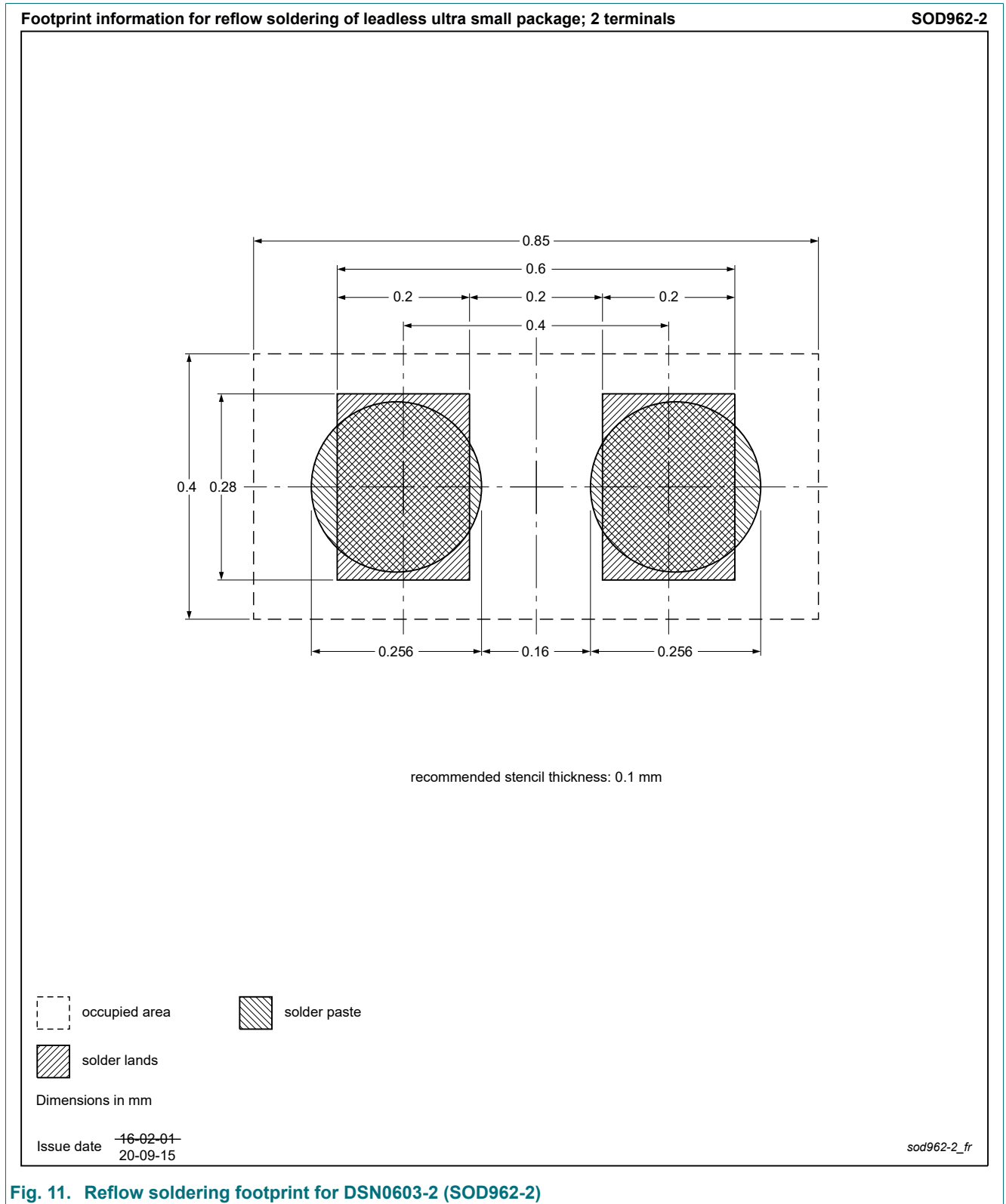


Fig. 10. Package outline DSN0603-2 (SOD962-2)

## 12. Soldering





## 13. Revision history

Table 7. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PESD3V3L1BSF v.1	20221102	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.

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## Contents

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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. Package outline.....	7
12. Soldering.....	8
13. Revision history.....	9
14. Legal information.....	10

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