



# PESD3V3U1BCSF

Ultra low clamping bidirectional ESD protection diode

29 September 2016

Product data sheet

## 1. General description

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

## 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);  $I_{PPM} = 6.4$  A (average measured)
- Very low clamping voltage:  $V_{CL} = 9$  V max for 5.4 A, 8/20  $\mu$ s pulse
- Ultra low leakage current:  $I_{RM} < 1$  nA
- ESD protection up to 20 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


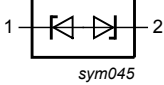
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$C_d$	diode capacitance	$f = 1$ MHz; $V_R = 0$ V; $T_{amb} = 25$ °C	-	5.3	6	pF
$I_{PPM}$	rated peak pulse current	$t_p = 8/20$ $\mu$ s	[1][2]	-	5.4	A
$V_{RWM}$	reverse standoff voltage	$T_{amb} = 25$ °C	-	-	3.3	V

[1] According to IEC 61000-4-5 .

[2] Average measured  $I_{PPM} = 6.4$  A.

## 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
PESD3V3U1BCSF	DSN0603-2	Leadless ultra small package; 2 terminals; body 0.6 x 0.3 x 0.3 mm	SOD962-2

## 7. Marking

Table 4. Marking codes

Type number	Marking code
PESD3V3U1BCSF	Q

## 8. Limiting values

**Table 5. Limiting values**

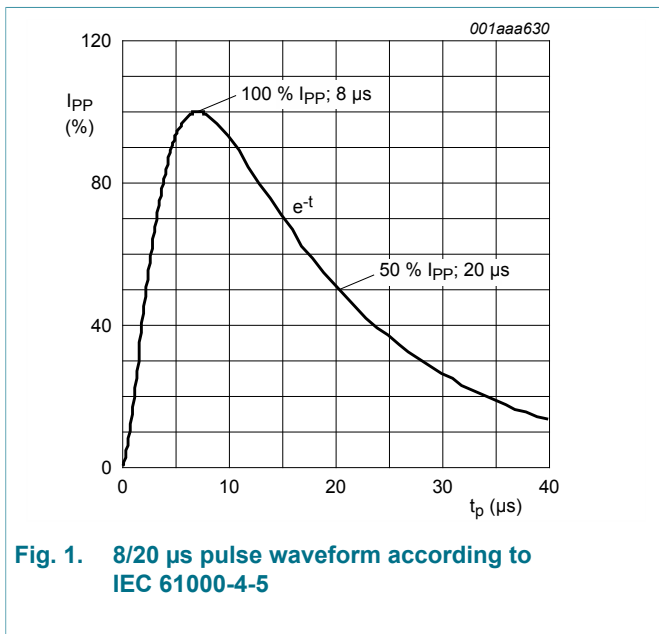
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
$I_{PPM}$	rated peak pulse current	$t_p = 8/20 \mu s$	[1][2]	-	5.4	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	[3]	-	20	kV
		IEC 61000-4-2; air discharge	[3]	-	20	kV

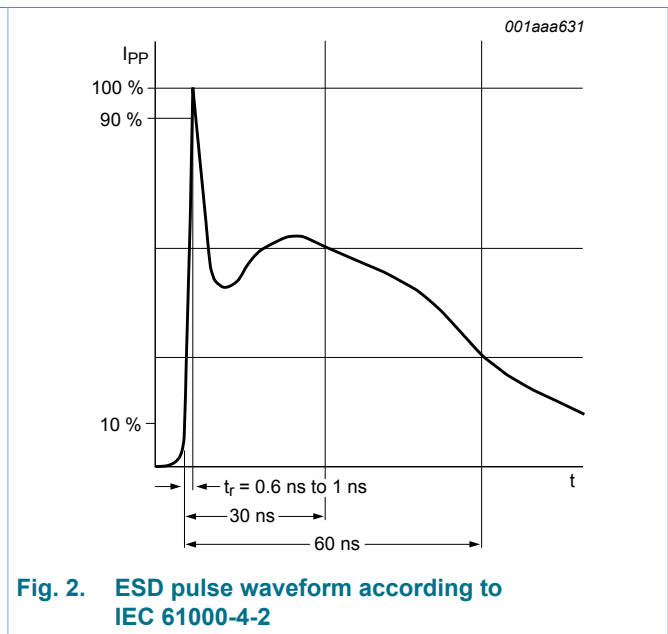
[1] According to IEC 61000-4-5 .

[2] Average measured  $I_{PPM} = 6.4$  A.

[3] 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	$T_{amb} = 25 \text{ }^\circ\text{C}$		-	-	3.3	V
$V_{BR}$	breakdown voltage	$I_R = 5 \text{ mA}; T_{amb} = 25 \text{ }^\circ\text{C}$		4.5	5.5	8	V
$I_{RM}$	reverse leakage current	$V_R = 3.3 \text{ V}; T_{amb} = 25 \text{ }^\circ\text{C}$		-	0.1	50	nA
$C_d$	diode capacitance	$f = 1 \text{ MHz}; V_R = 0 \text{ V}; T_{amb} = 25 \text{ }^\circ\text{C}$		-	5.3	6	pF

Ultra low clamping bidirectional ESD protection diode

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>CL</sub>	clamping voltage	I <sub>PPM</sub> = 5.4 A; T <sub>amb</sub> = 25 °C; t <sub>p</sub> = 8/20 μs [1]	-	-	9	V
		I <sub>PP</sub> = 8 A; T <sub>amb</sub> = 25 °C; t <sub>p</sub> = TLP [2]	-	7.8	9	V
		I <sub>PP</sub> = 16 A; T <sub>amb</sub> = 25 °C; t <sub>p</sub> = TLP [2]	-	9.7	12	V
R <sub>dyn</sub>	dynamic resistance	I <sub>R</sub> = 10 A; T <sub>amb</sub> = 25 °C [2]	-	0.24	-	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); square pulse; ANSI / ESD STM5.1-2008.

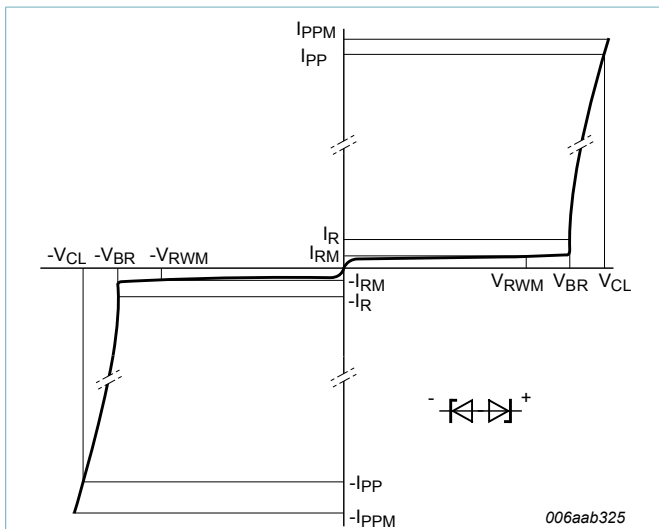


Fig. 3. V-I characteristics for a bidirectional ESD protection diode

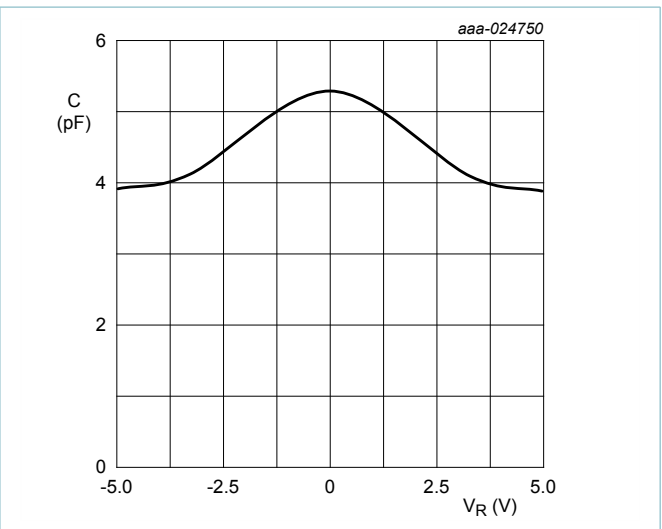


Fig. 4. Diode capacitance as a function of reverse voltage; typical values

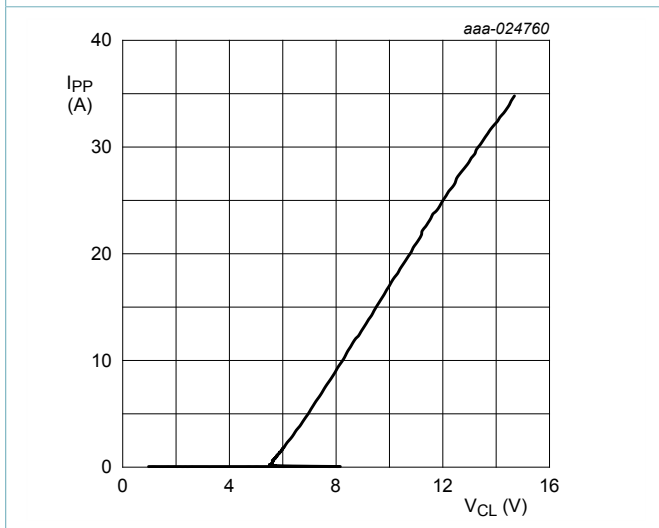


Fig. 5. Positive clamping voltage (TLP); typical values  
t<sub>p</sub> = 100 ns; Transmission Line Pulse (TLP)

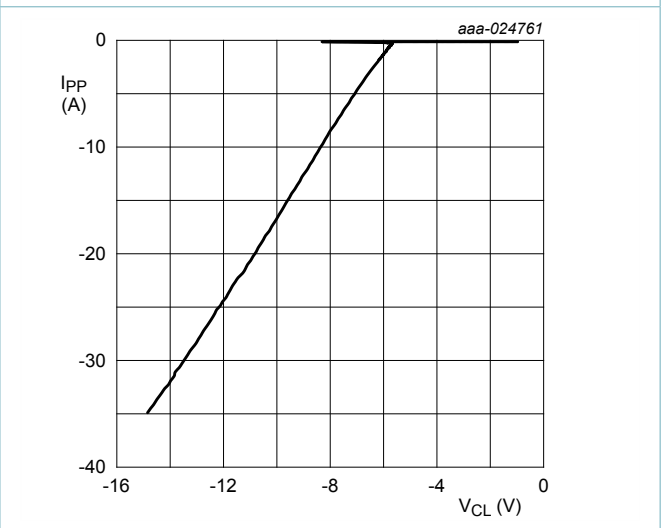


Fig. 6. Negative clamping voltage (TLP); typical values  
t<sub>p</sub> = 100 ns; Transmission Line Pulse (TLP)

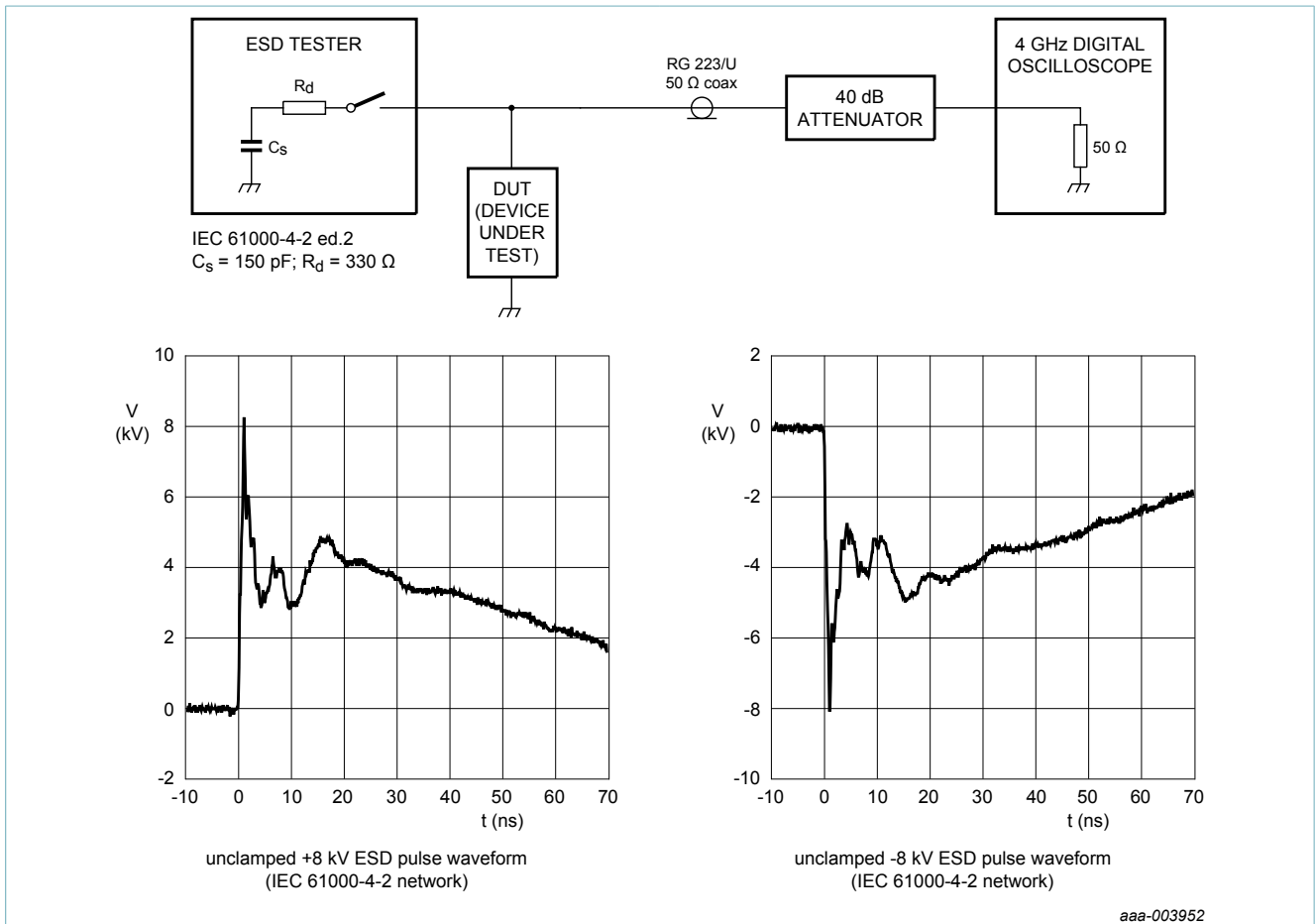


Fig. 7. ESD clamping test setup and waveforms

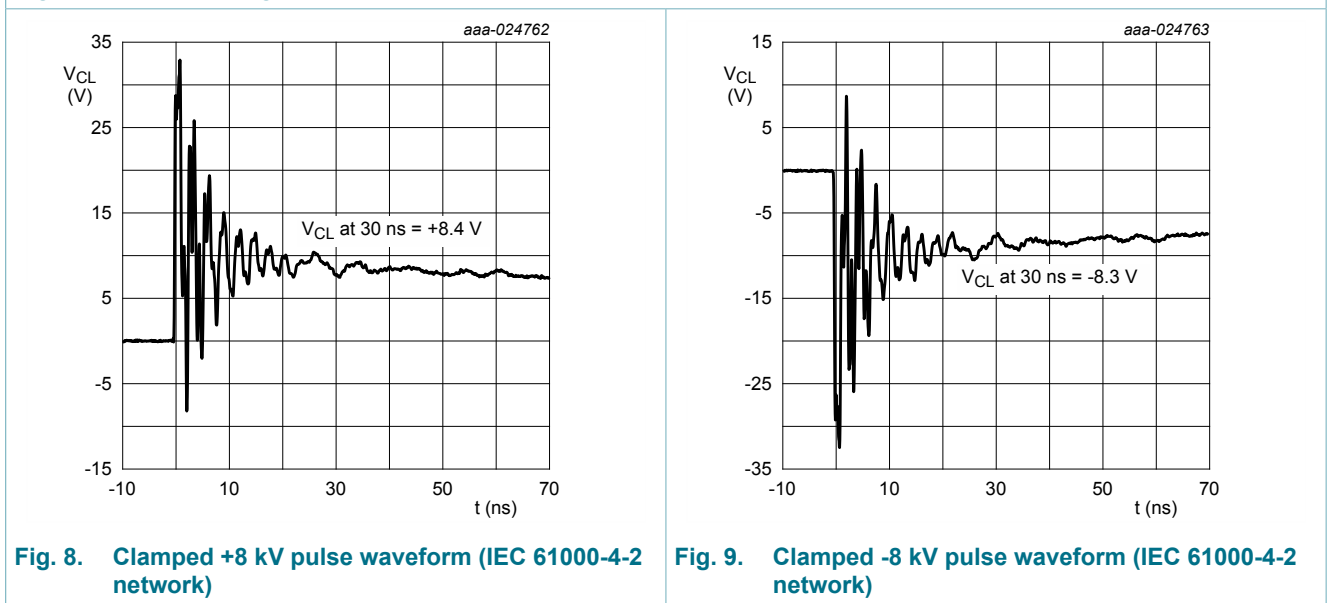


Fig. 8. Clamped +8 kV pulse waveform (IEC 61000-4-2 network)

Fig. 9. Clamped -8 kV 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. The device is not designed to be used on lines connected to a DC supply.

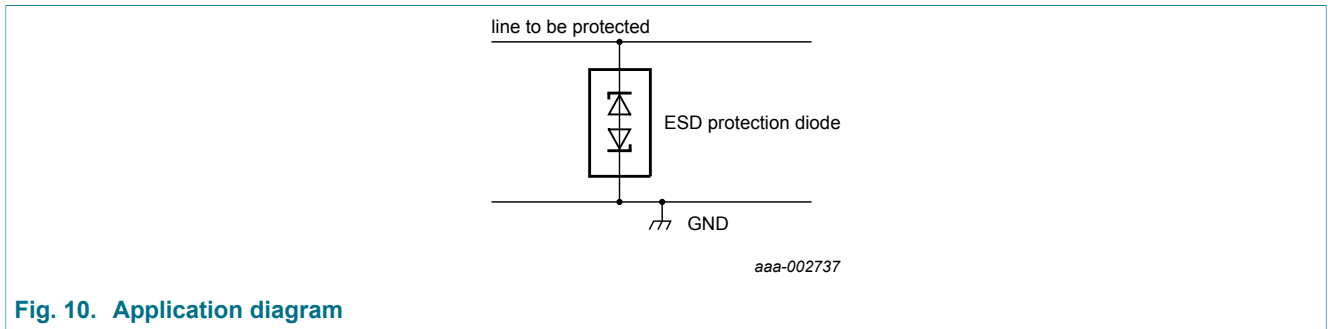


Fig. 10. Application diagram

### 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

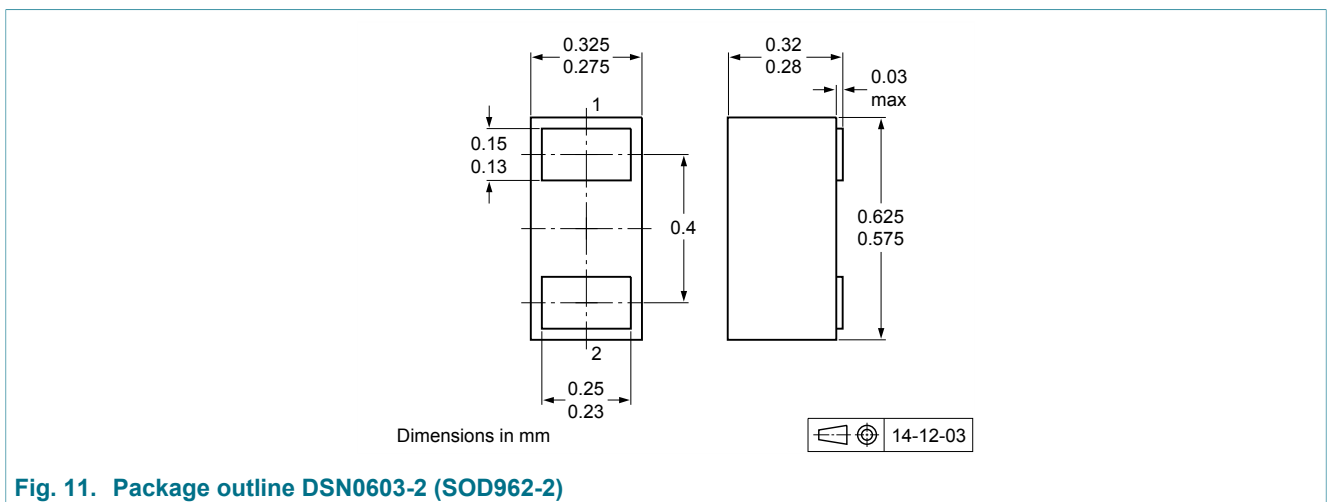


Fig. 11. Package outline DSN0603-2 (SOD962-2)

## 12. Soldering

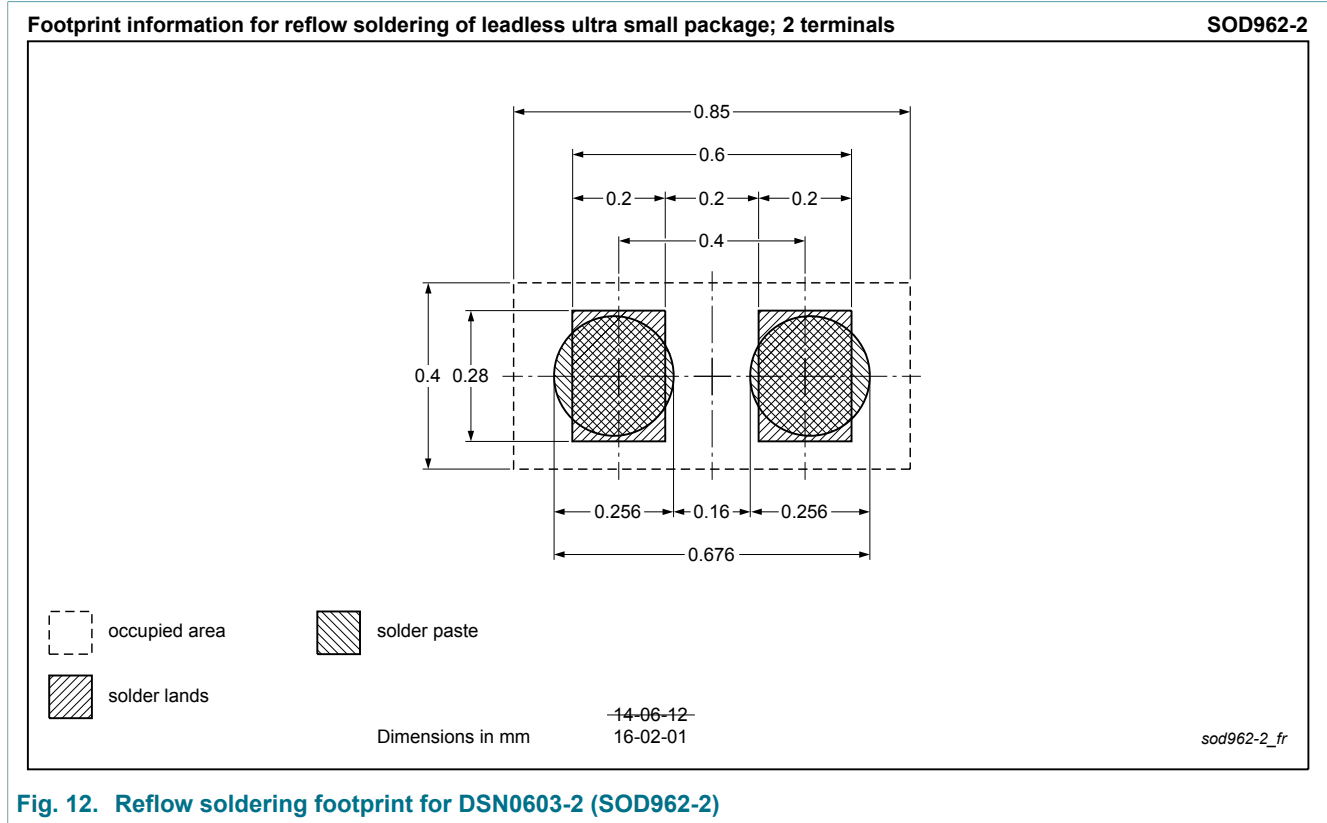


Fig. 12. Reflow soldering footprint for DSN0603-2 (SOD962-2)

### 13. Revision history

Table 7. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PESD3V3U1BCSF v.1	20160929	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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- [2] The term 'short data sheet' is explained in section "Definitions".
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