



# PESD6V5C1USF

Ultra low capacitance unidirectional ESD protection diode

17 December 2017

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 DSN0603-2 (SOD962) leadless ultra small Surface-Mounted Device (SMD) package. The TrEOS Protection family is optimized for safeguarding very sensitive high-speed interfaces against ESD pulses with a high level of robustness.

## 2. Features and benefits

- Unidirectional ESD protection of one line
- Extremely low diode capacitance  $C_d = 0.45$  pF
- ESD protection up to  $\pm 20$  kV according to IEC 61000-4-2
- Ultra small SMD package

## 3. Applications

ESD and surge protection for:

- ultra high speed datalines
- very sensitive interfaces 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	-	0.45	0.5	pF
$V_{RWM}$	reverse standoff voltage	$T_{amb} = 25$ °C	-	-	6.5	V

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode <sup>[1]</sup>	 <p>Transparent top view <b>DSN0603-2 (SOD962-2)</b></p>	  <i>sym035</i>
2	A	anode		

[1] The marking bar indicates the cathode.

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PESD6V5C1USF	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
PESD6V5C1USF	R

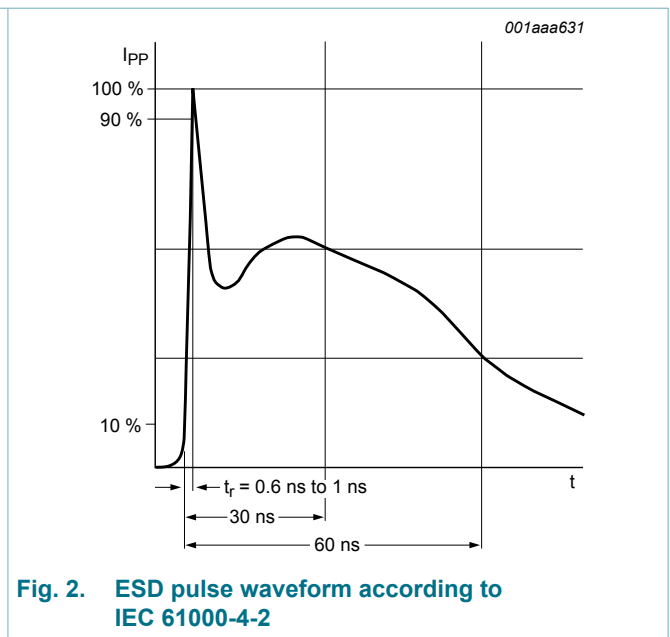
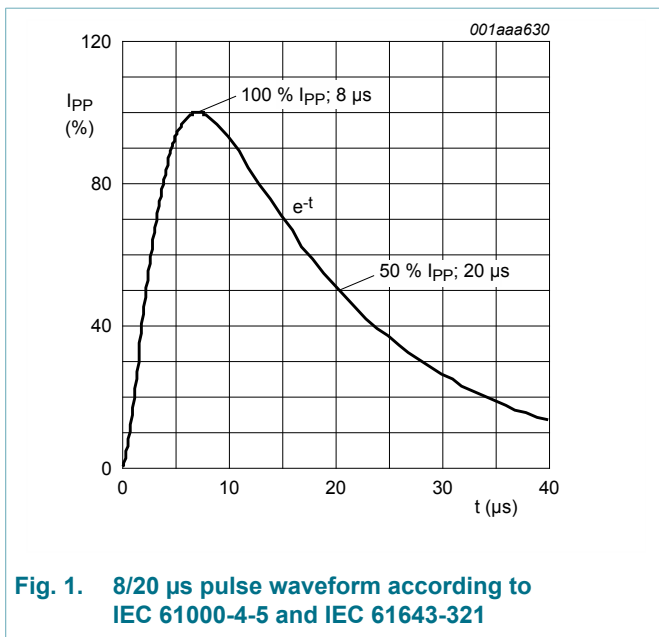
## 8. Limiting values

**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]	-	9	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)	[1]	-	20	kV
		IEC 61000-4-2 (air discharge)	[1]	-	20	kV

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



### 9. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{RWM}$	reverse standoff voltage	$T_{amb} = 25\text{ }^{\circ}\text{C}$	-	-	6.5	V
$V_{BR}$	breakdown voltage	$I_R = 1\text{ mA}; T_{amb} = 25\text{ }^{\circ}\text{C}$	7	8	11	V
$I_{RM}$	reverse leakage current	$V_{RWM} = 6.5\text{ V}; T_{amb} = 25\text{ }^{\circ}\text{C}$	-	1	50	nA
$C_d$	diode capacitance	$f = 1\text{ MHz}; V_R = 0\text{ V}; T_{amb} = 25\text{ }^{\circ}\text{C}$	-	0.45	0.5	pF
$V_{CL}$	clamping voltage	$I_{PPM} = 9\text{ A}; t_p = 8/20\text{ }\mu\text{s}; T_{amb} = 25\text{ }^{\circ}\text{C}$ [1]	-	-	3	V
		$I_{PP} = 8\text{ A}; t_p = \text{TLP}; T_{amb} = 25\text{ }^{\circ}\text{C}$ [2]	-	2.2	-	V
		$I_{PP} = 16\text{ A}; t_p = \text{TLP}; T_{amb} = 25\text{ }^{\circ}\text{C}$ [2]	-	3	-	V
$R_{dyn}$	dynamic resistance	$I_R = 10\text{ A}; T_{amb} = 25\text{ }^{\circ}\text{C}$ [2]	-	0.1	-	$\Omega$

[1] According to IEC 61000-4-5 and IEC 61643-321.

[2] Non-repetitive current pulse, Transmission Line Pulse (TLP)  $t_p = 100\text{ ns}$ ; square pulse; ANSI / ESD STM5.5.1-2008.

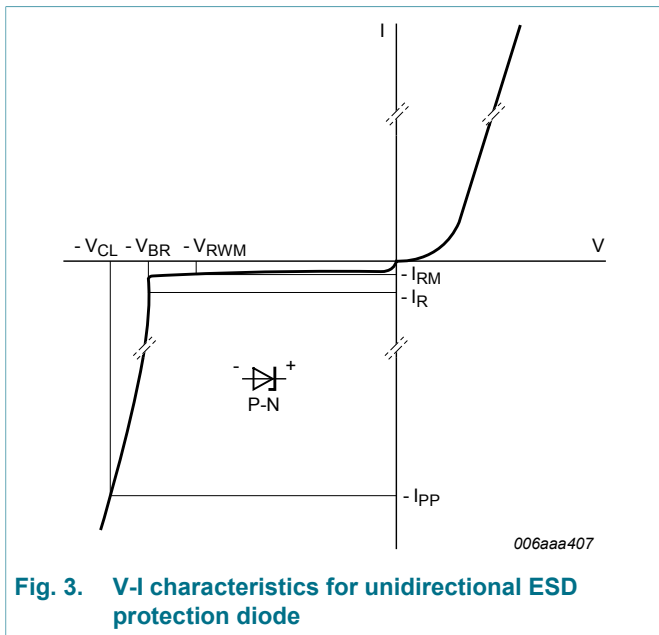


Fig. 3. V-I characteristics for unidirectional ESD protection diode

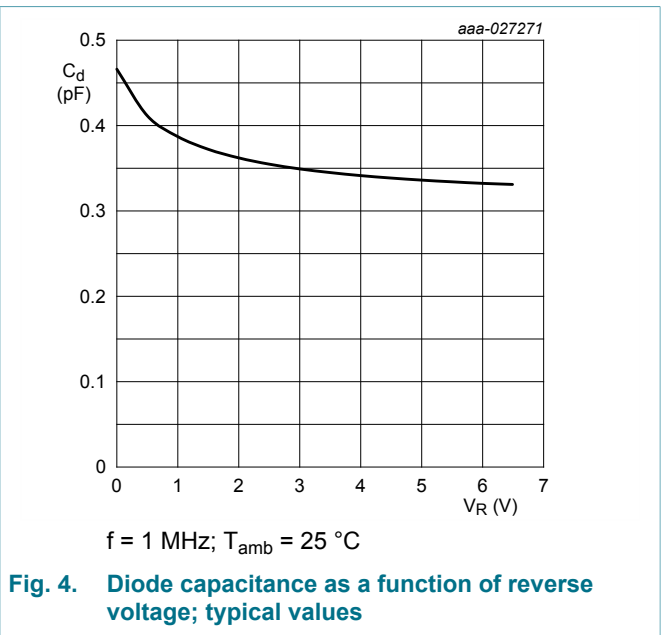


Fig. 4. Diode capacitance as a function of reverse voltage; typical values

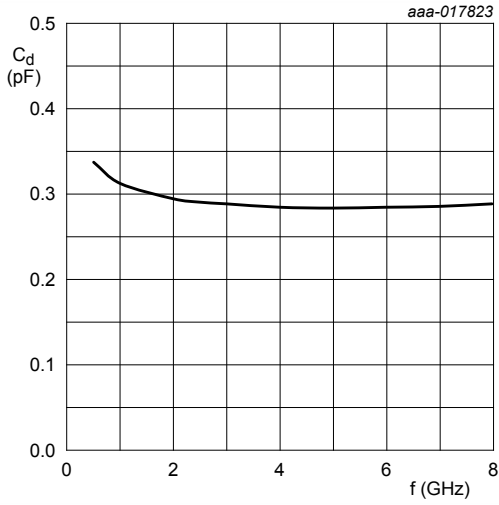


Fig. 5. Diode capacitance as a function of frequency; typical values

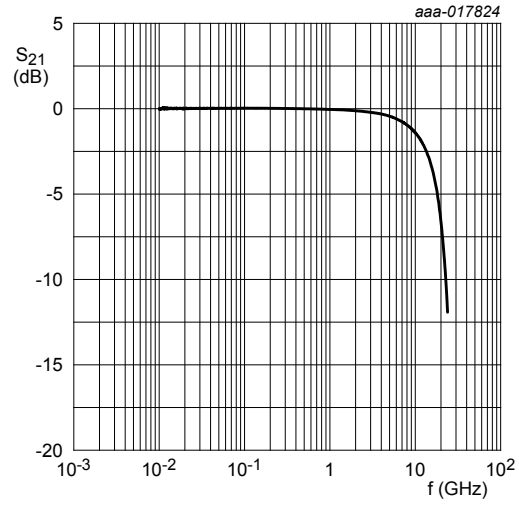
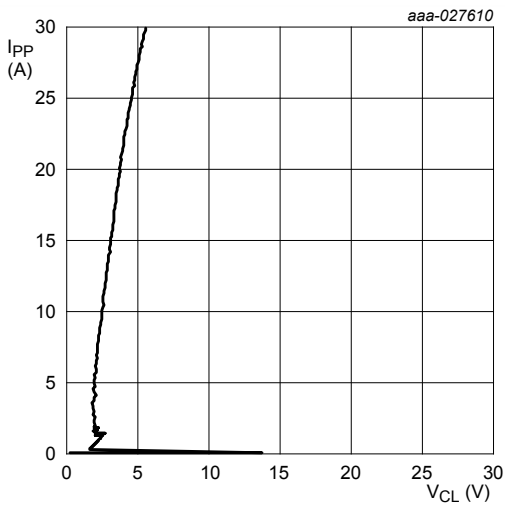
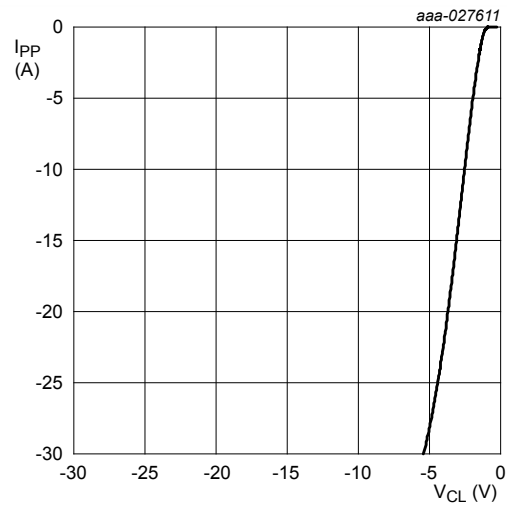


Fig. 6. Insertion loss; typical values



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

Fig. 7. Dynamic resistance with positive clamping voltage



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

Fig. 8. Dynamic resistance with negative clamping voltage

Ultra low capacitance unidirectional ESD protection diode

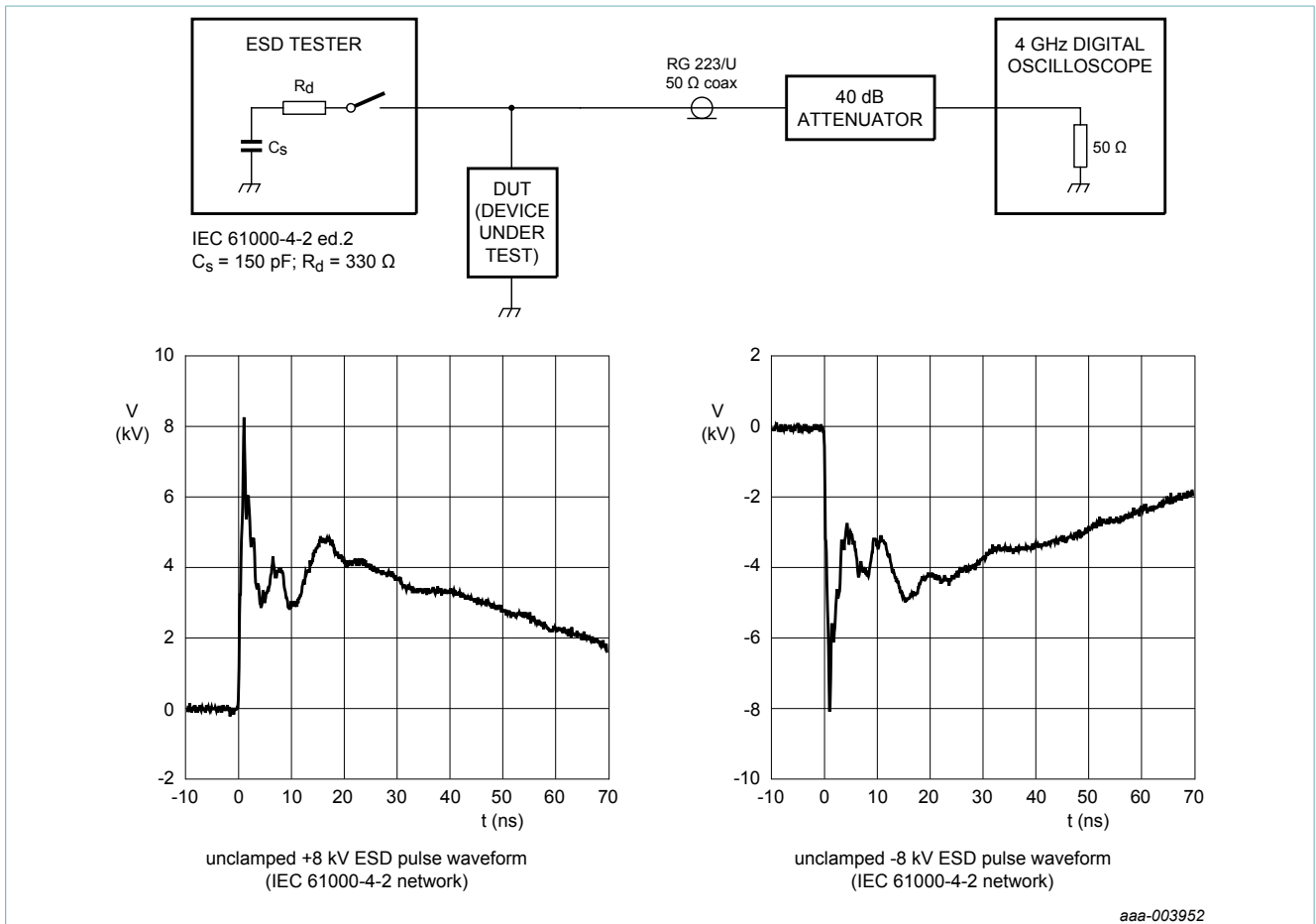


Fig. 9. ESD clamping test setup and waveforms

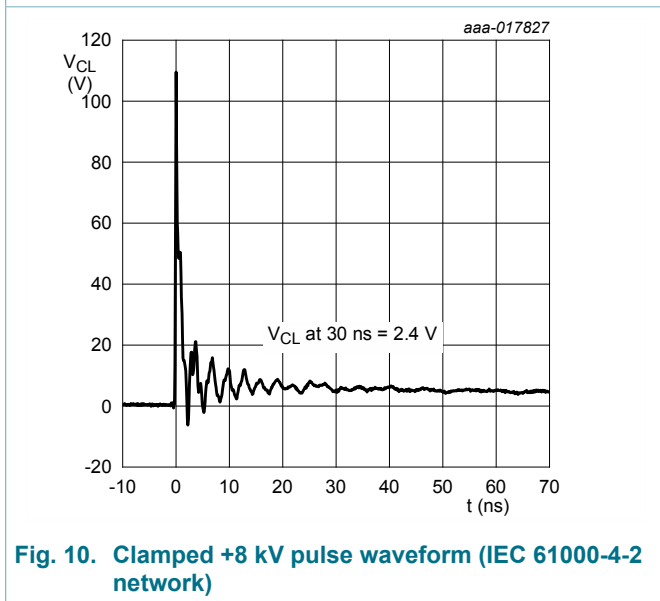


Fig. 10. Clamped +8 kV pulse waveform (IEC 61000-4-2 network)

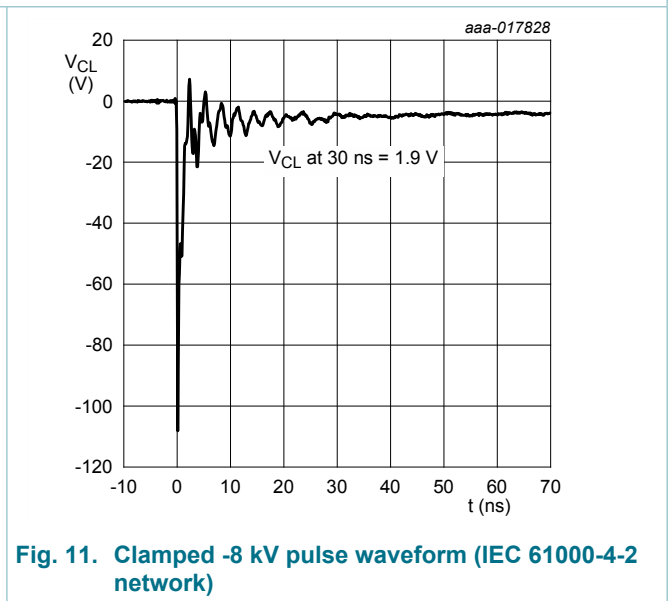


Fig. 11. Clamped -8 kV pulse waveform (IEC 61000-4-2 network)

## 10. Application information

The device is designed for protection of one unidirectional data or signal line from the damage caused by ESD and surge pulses. The device may be used on lines where the signal polarities are either positive or negative with respect to ground. The device is not designed to be used on lines connected to a DC supply.

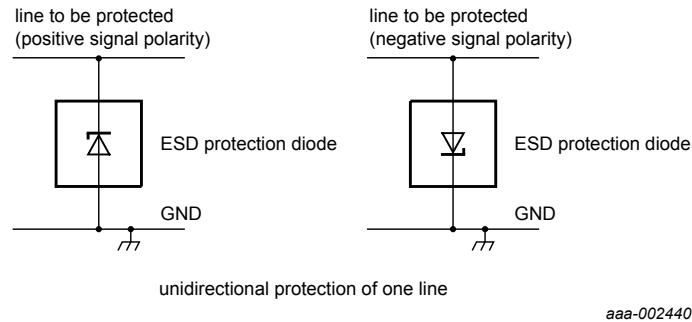


Fig. 12. Application diagram

### 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

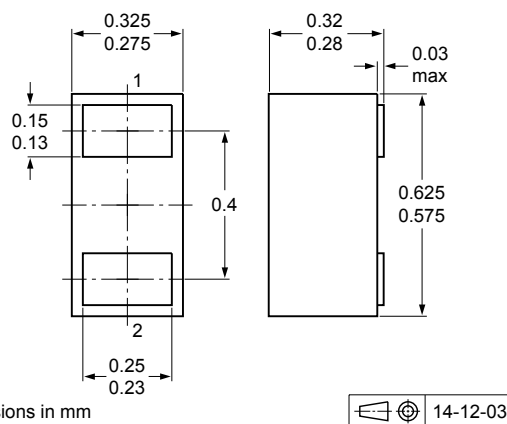
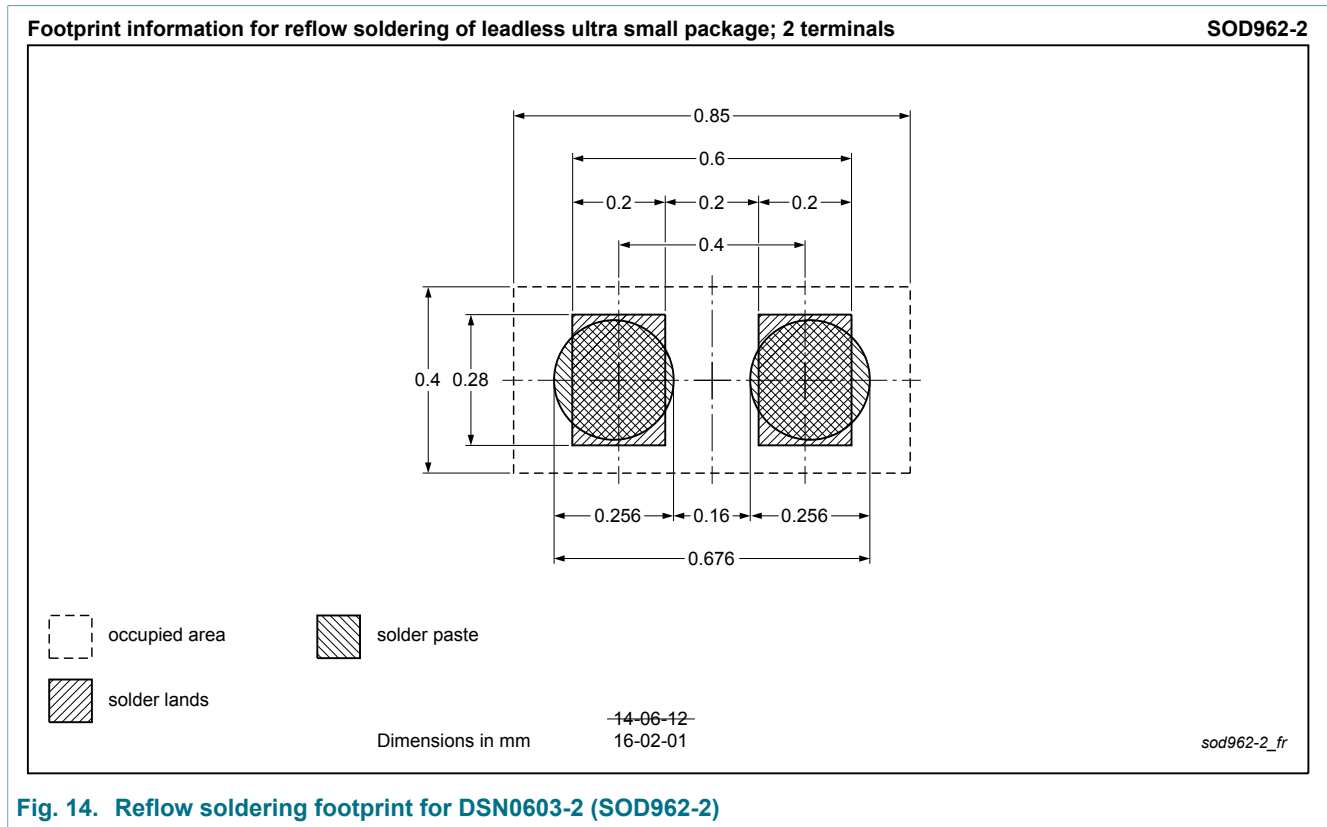


Fig. 13. Package outline DSN0603-2 (SOD962-2)

## 12. Soldering





### 13. Revision history

Table 7. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PESD6V5C1USF v.1	20171217	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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