



PESD3V3Z1BZF

Extremely low capacitance bidirectional ESD protection diode

23 March 2017

Product data sheet

1. General description

Extremely low capacitance bidirectional ElectroStatic Discharge (ESD) protection diode, part of the TrEOS protection family, designed to protect one signal line from the damage caused by ESD and other transients. The device is housed in a leadless ultra small and full encapsulated DFN0603-2 (SOD972) Surface-Mounted Device (SMD) package.

2. Features and benefits

- Bidirectional ESD protection of one line
- Extremely low diode capacitance $C_d = 0.28$ pF
- Extremely low clamping to protect sensitive I/Os
- ESD protection up to ± 20 kV according to IEC 61000-4-2
- Leadless ultra small and full encapsulated SMD package

3. Applications

ESD and surge protection for:

- ultra high-speed datalines
- very sensitive interface lines
- generic interface lines

in portable electronics, communication, consumer and computing devices.

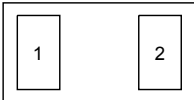
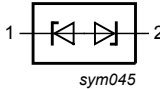
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{RWM}	reverse standoff voltage	$T_{amb} = 25^\circ\text{C}$	-	-	3.3	V
C_d	diode capacitance	$f = 1\text{ MHz}; V_R = 0\text{ V}; T_{amb} = 25^\circ\text{C}$	-	0.28	0.4	pF
		$f = 1\text{ MHz}; V_R = 1.5\text{ V}; T_{amb} = 25^\circ\text{C}$	-	0.25	-	pF

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K1	cathode	 <p>Transparent top view DFN0603-2 (SOD972)</p>	 <p>sym045</p>
2	K2	cathode		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PESD3V3Z1BZF	DFN0603-2	Ultra small and leadless full encapsulated package; 2 terminals; body 0.63 x 0.33 x 0.2 mm	SOD972

7. Marking

Table 4. Marking codes

Type number	Marking code
PESD3V3Z1BZF	H

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]	-	8	A
T_j	junction temperature			-	150	°C
T_{amb}	ambient temperature			-40	125	°C
T_{stg}	storage temperature			-65	150	°C
ESD maximum ratings						
V_{ESD}	electrostatic discharge voltage	IEC 61000-4-2; contact discharge	[2]	-	20	kV
		IEC 61000-4-2; air discharge	[2]	-	20	kV

[1] According to IEC 61000-4-5

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

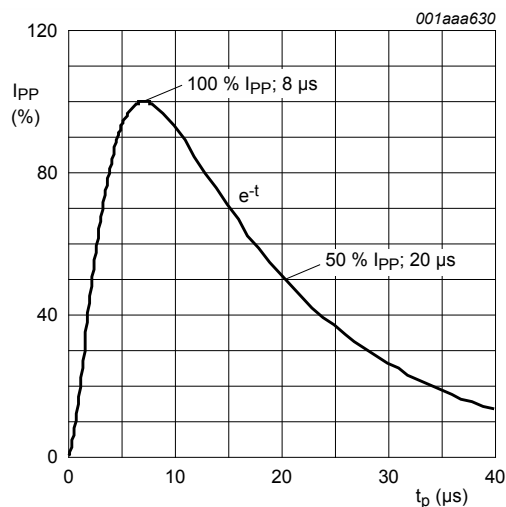


Fig. 1. 8/20 μ s pulse waveform according to IEC 61000-4-5

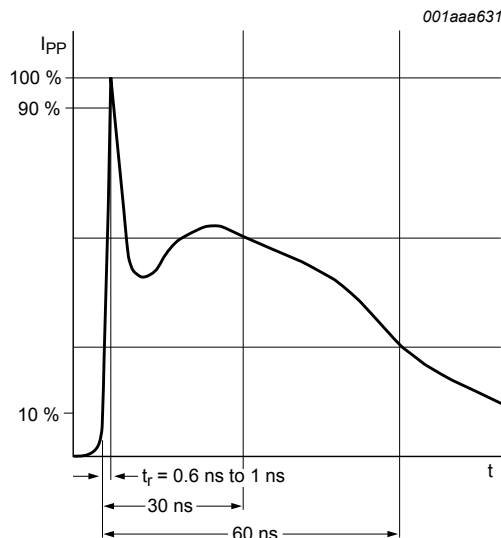


Fig. 2. ESD pulse waveform according to IEC 61000-4-2

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	$I_R = 1\text{ mA}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$	-	6.9	8	V
I_{RM}	reverse leakage current	$V_{RWM} = 3.3\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$	-	1	50	nA
C_d	diode capacitance	$f = 1\text{ MHz}$; $V_R = 0\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$	-	0.28	0.4	pF
		$f = 1\text{ MHz}$; $V_R = 1.5\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$	-	0.25	-	pF
V_{CL}	clamping voltage	$I_{PPM} = 8\text{ A}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$ [1]	-	4.6	6	V
		$I_{PP} = 1\text{ A}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; $t_p = \text{TLP}$ [2]	-	3	-	V
		$I_{PP} = 16\text{ A}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; $t_p = \text{TLP}$ [2]	-	6	-	V
R_{dyn}	dynamic resistance	$4\text{ A} \leq I_R \leq 16\text{ A}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$ [2]	-	0.19	-	Ω

[1] Non-repetitive current pulse 8/20 μ s exponential decay waveform according to IEC 61000-4-5.

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

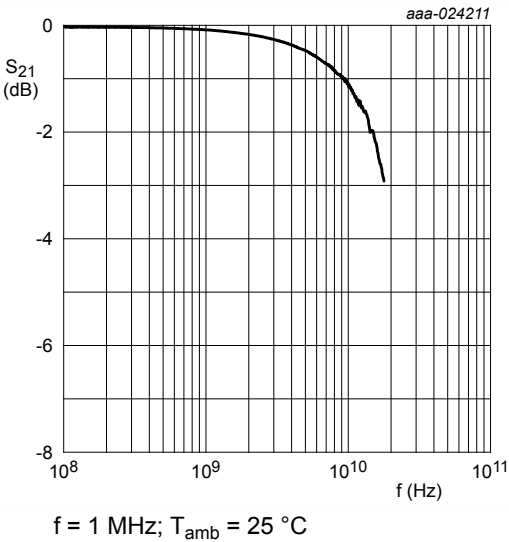


Fig. 3. Insertion loss; typical values

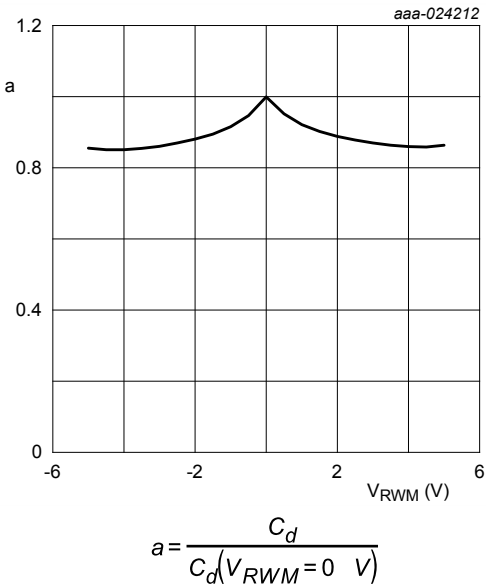


Fig. 4. Relative capacitance as a function of reverse standoff voltage; typical values

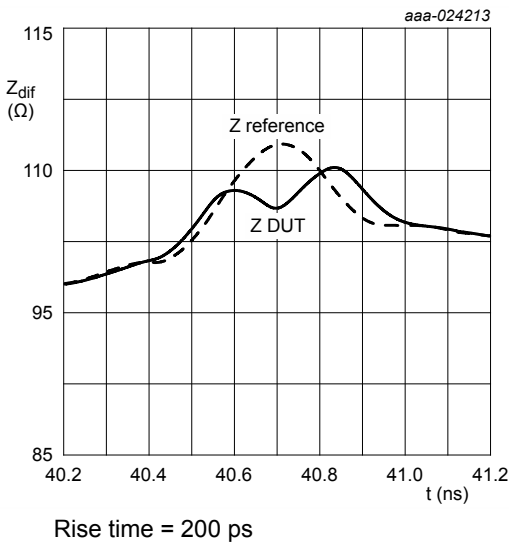


Fig. 5. Differential Time Domain Reflectometer (TDR) plot; typical values

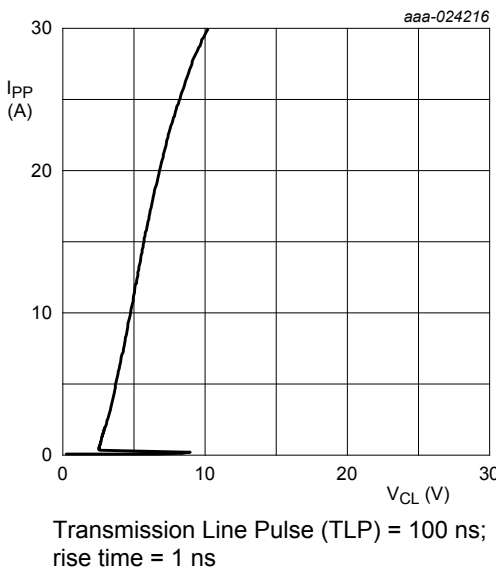
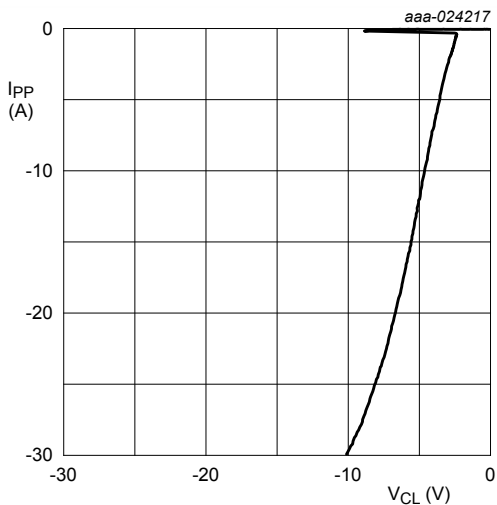
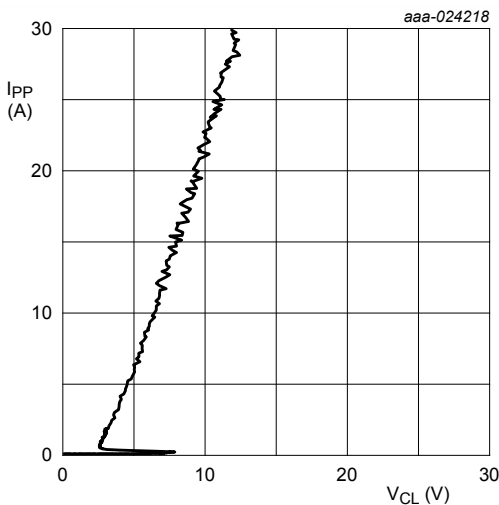


Fig. 6. Positive clamping voltage (TLP); typical values



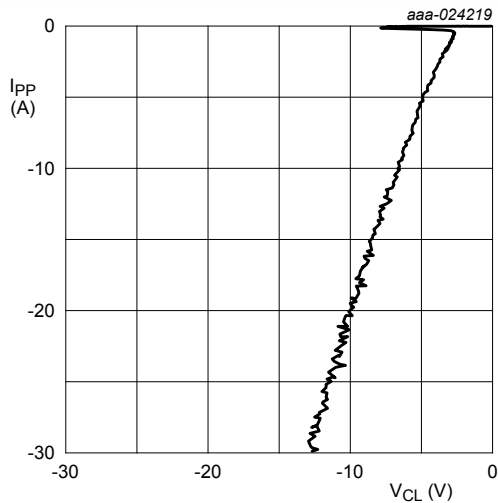
Transmission Line Pulse (TLP) = 100 ns;
rise time = 1 ns

Fig. 7. Negative clamping voltage (TLP); typical values



Very Fast Transmission Line Pulse (VF-TLP) = 5 ns

Fig. 8. Positive clamping voltage (VF-TLP); typical values



Very Fast Transmission Line Pulse (VF-TLP) = 5 ns

Fig. 9. Negative clamping voltage (VF-TLP); 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. The device is not designed to be used on lines connected to a DC supply.

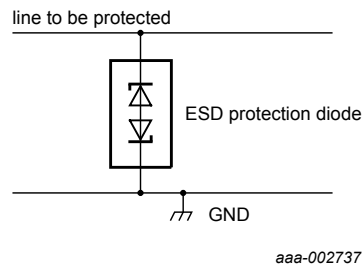


Fig. 10. Application diagram

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

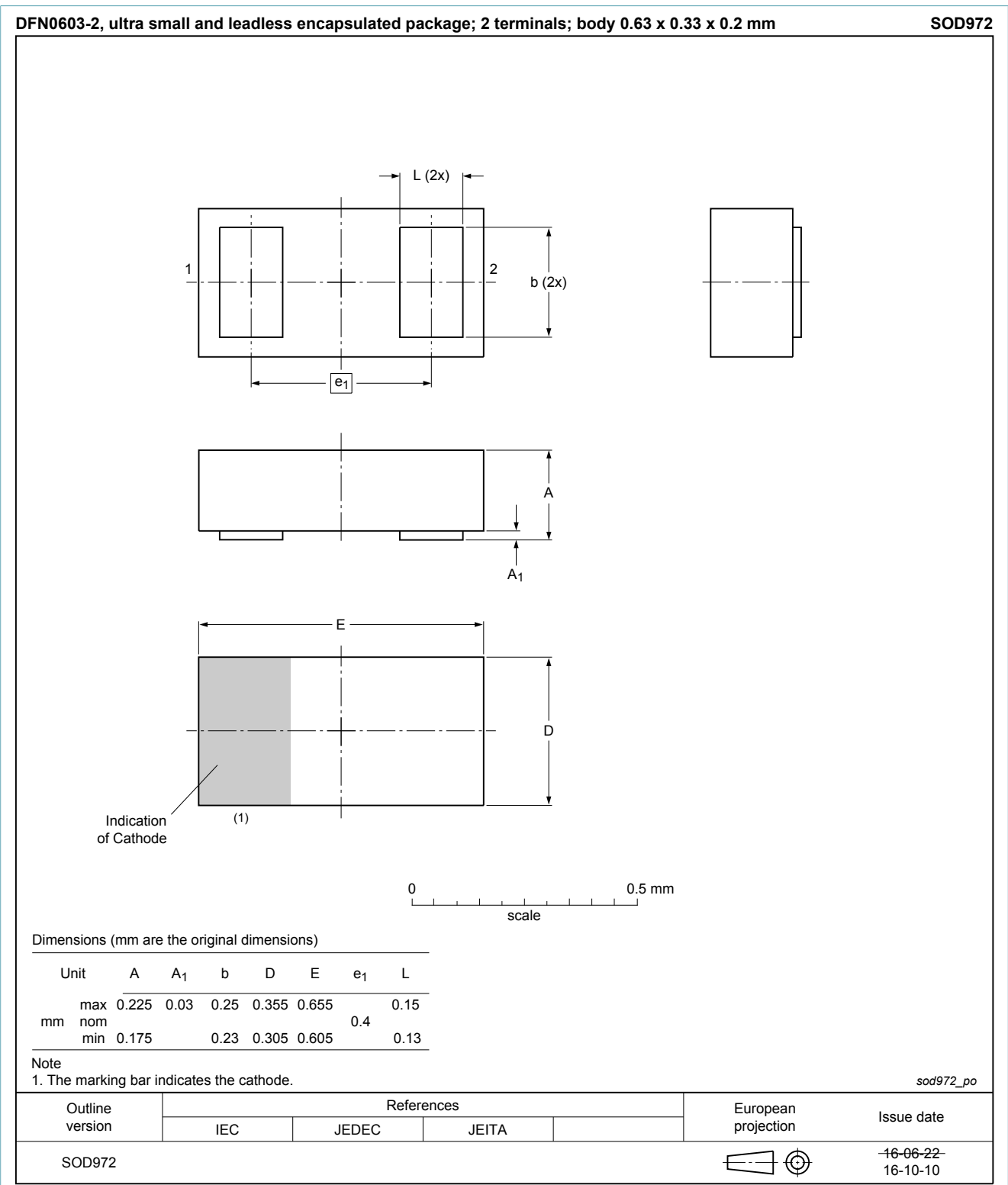


Fig. 11. Package outline DFN0603-2 (SOD972)

12. Soldering

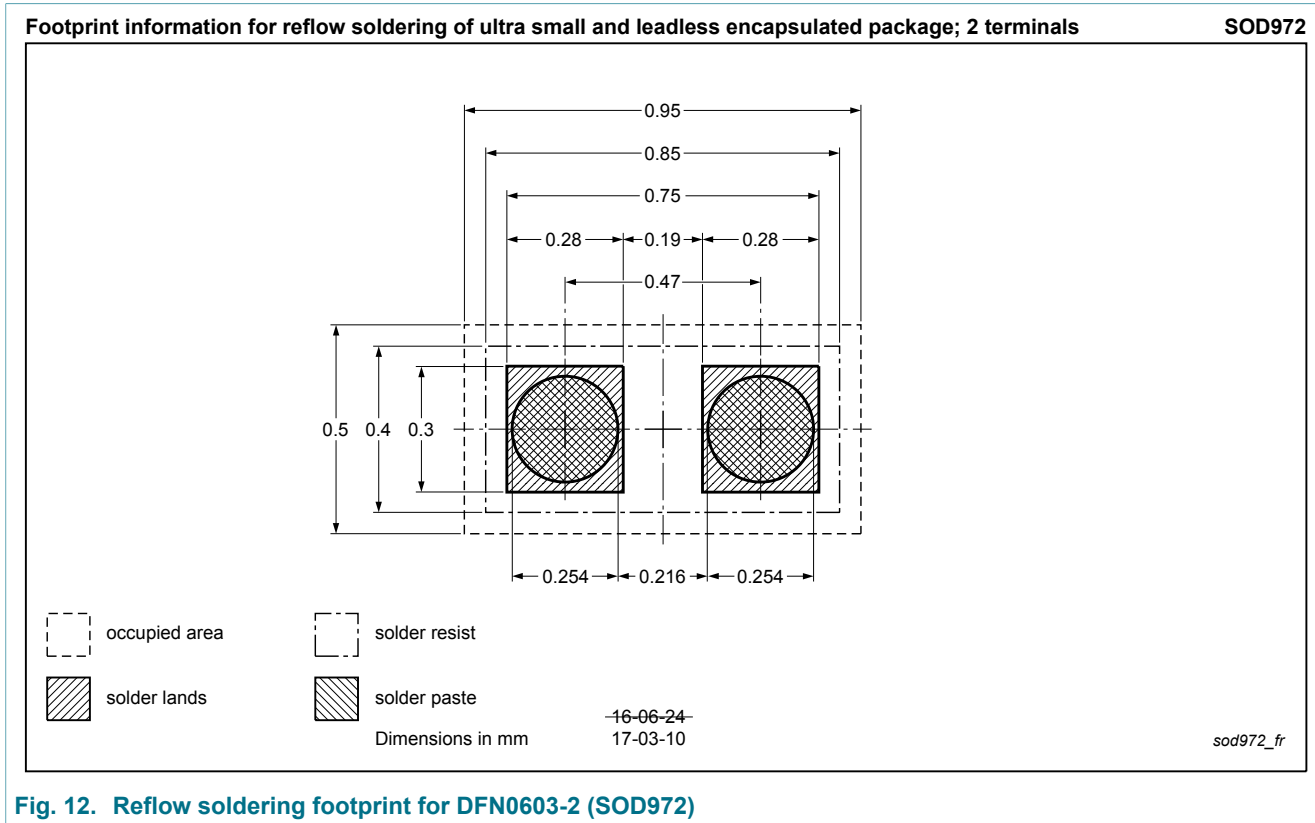


Fig. 12. Reflow soldering footprint for DFN0603-2 (SOD972)

13. Revision history

Table 7. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PESD3V3Z1BZF v.5	20170323	Product data sheet	-	PESD3V3Z1BZF v.4
Modifications:	<ul style="list-style-type: none">Product status changed			
PESD3V3Z1BZF v.4	20161006	Preliminary data sheet	-	PESD3V3Z1BZF v.3
PESD3V3Z1BZF v.3	20160719	Preliminary data sheet	-	PESD3V3Z1BZF v.2
PESD3V3Z1BZF v.2	20160701	Preliminary data sheet	-	PESD3V3Z1BZF v.1
PESD3V3Z1BZF v.1	20160624	Preliminary 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.

- [1] Please consult the most recently issued document before initiating or completing a design.
- [2] The term 'short data sheet' is explained in section "Definitions".
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Date of release: 23 March 2017