



# PESD5V0C1USF

Ultra low capacitance unidirectional ESD protection diode

21 January 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 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 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 | $T_{amb} = 25\text{ }^{\circ}\text{C}$                                     | -   | -    | 5   | V    |
| $C_d$     | diode capacitance        | $f = 1\text{ MHz}; V_R = 0\text{ V}; T_{amb} = 25\text{ }^{\circ}\text{C}$ | -   | 0.45 | 0.5 | pF   |

5. Pinning information

Table 2. Pinning information

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

6. Ordering information

Table 3. Ordering information

| Type number  | Package   |   |          |
|--------------|-----------|---|----------|
|              | Name      | Description   | Version  |
| PESD5V0C1USF | 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 |
|--------------|--------------|
| PESD5V0C1USF | R            |

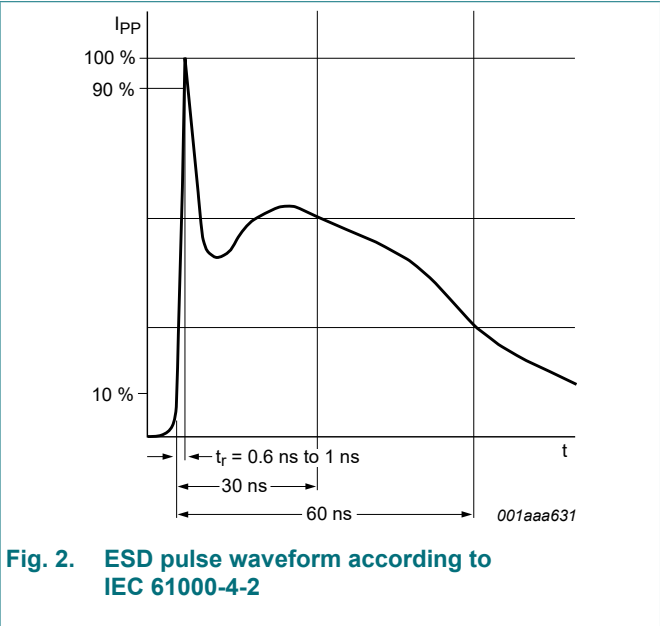
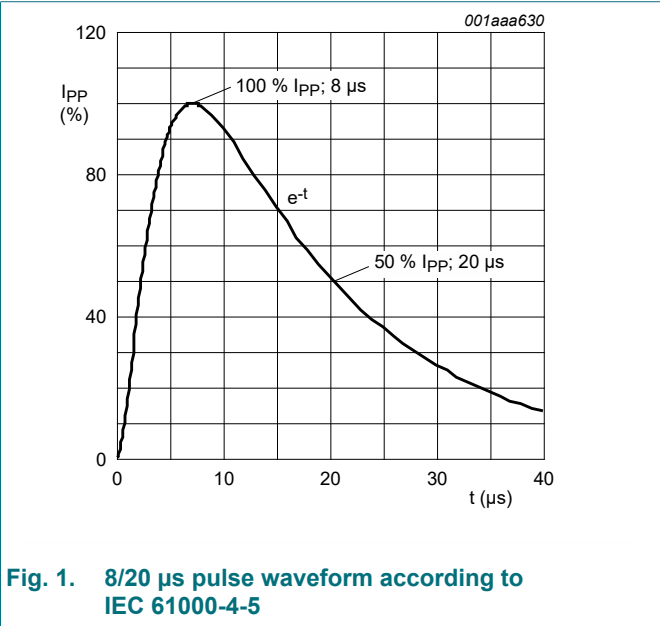
8. Limiting values

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   |
| ESD maximum ratings |                                 |                                  |     |     |     |      |
| $V_{ESD}$           | 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.

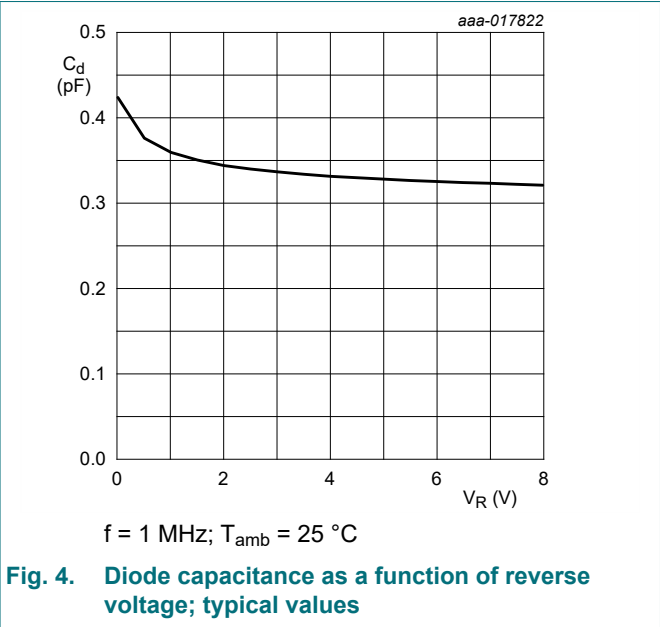
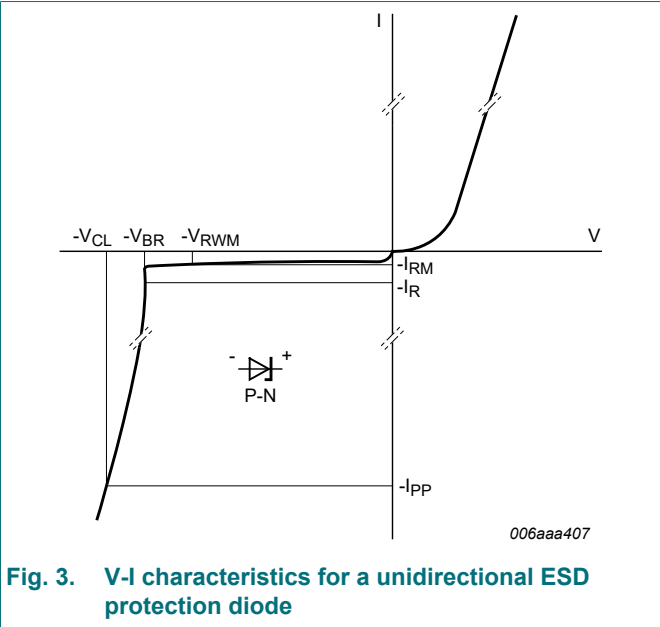


9. Characteristics

Table 6. Characteristics

| Symbol    | Parameter                | Conditions  | Min | Typ  | Max | Unit     |
|-----------|--------------------------|---|-----|------|-----|----------|
| $V_{RWM}$ | reverse standoff voltage | $T_{amb} = 25\text{ }^{\circ}\text{C}$  | -   | -    | 5   | V        |
| $V_{BR}$  | breakdown voltage        | $I_R = 1\text{ mA}; T_{amb} = 25\text{ }^{\circ}\text{C}$                                       | 5.5 | 9    | -   | V        |
| $I_{RM}$  | reverse leakage current  | $V_R = 5\text{ V}; T_{amb} = 25\text{ }^{\circ}\text{C}$  | -   | 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.  
[2] Non-repetitive current pulse, Transmission Line Pulse (TLP)  $t_p = 100\text{ ns}$ ; square pulse; ANSI / ESD STM5.5.1-2008.



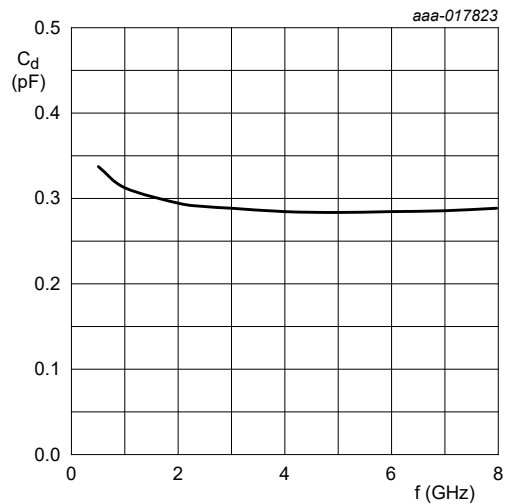


Fig. 5. Diode capacitance as a function of frequency; typical values

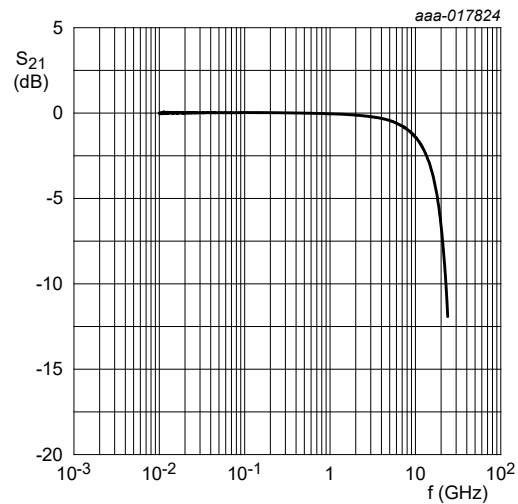
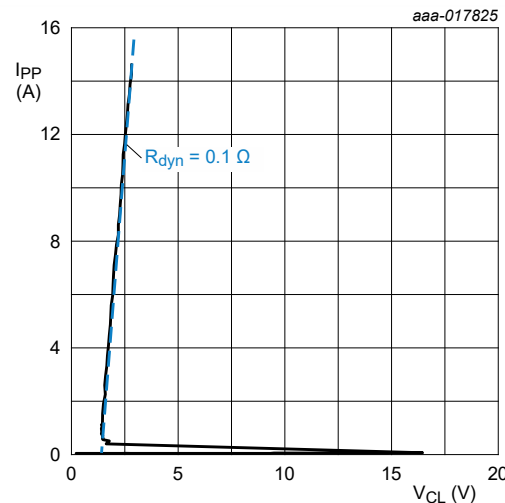
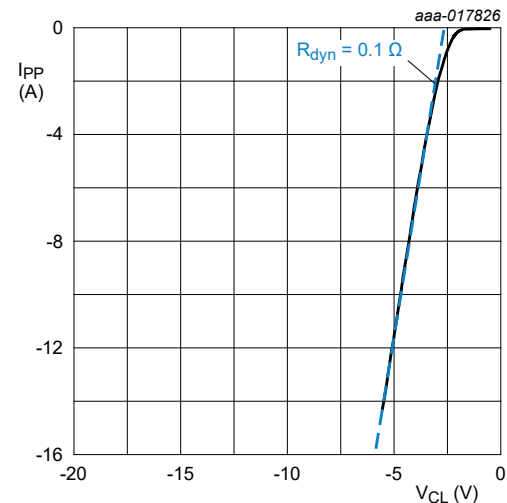


Fig. 6. Insertion loss; typical values



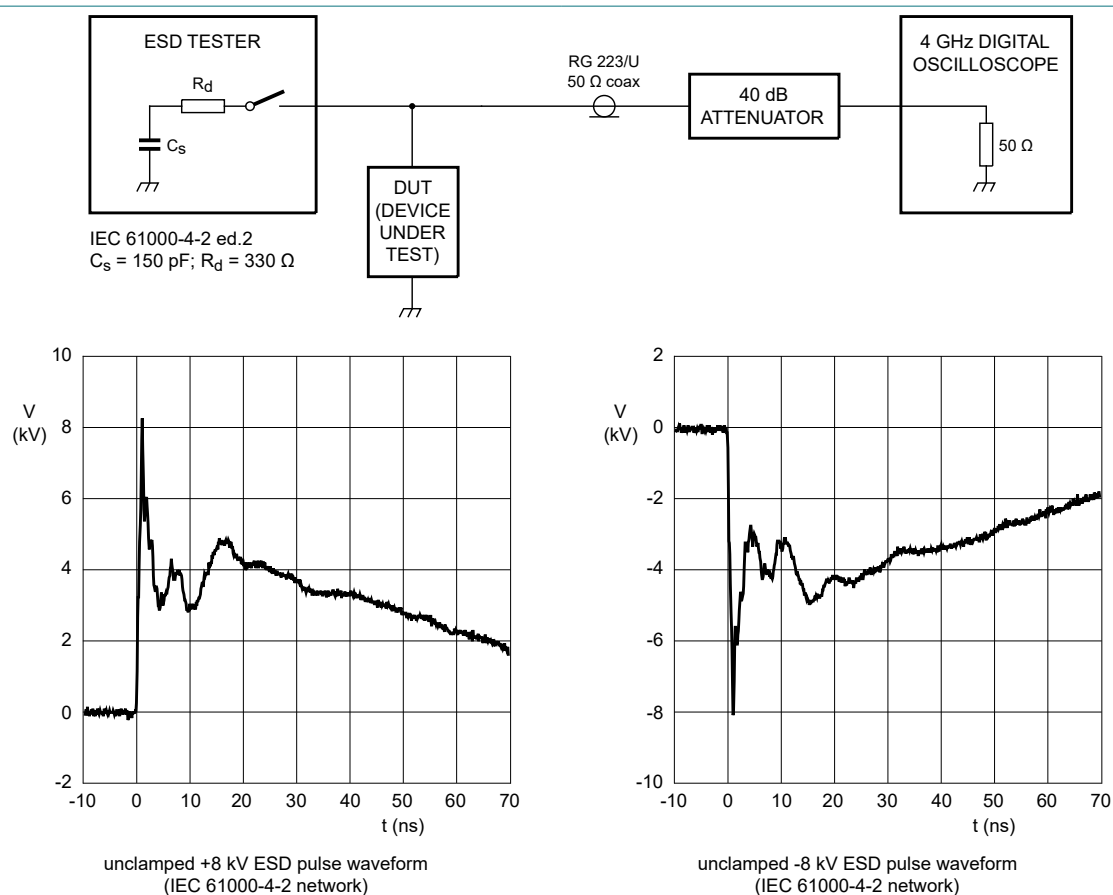
$t_p = 100 \text{ ns}$ ; Transmission Line Pulse (TLP)

Fig. 7. Dynamic resistance with positive clamping voltage

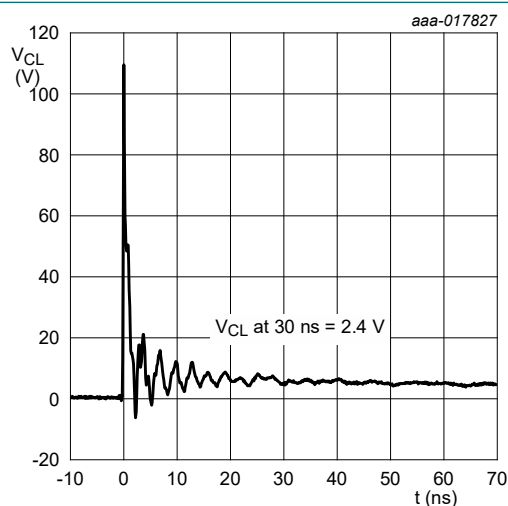


$t_p = 100 \text{ ns}$ ; Transmission Line Pulse (TLP)

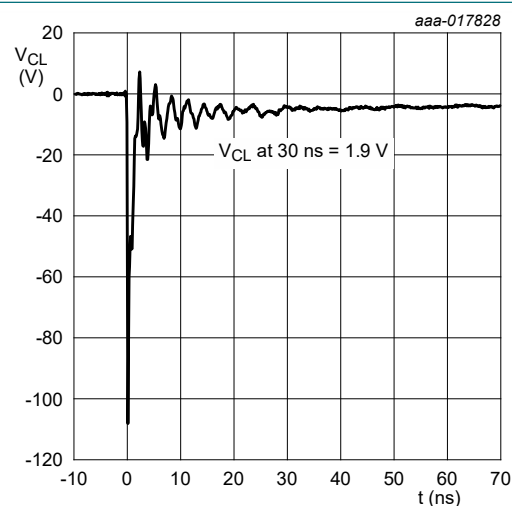
Fig. 8. Dynamic resistance with negative clamping voltage



**Fig. 9. ESD clamping test setup and waveforms**



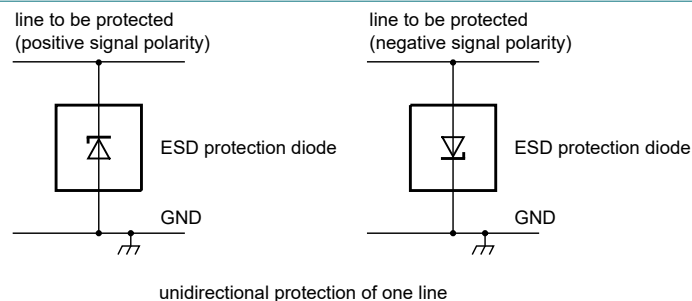
**Fig. 10. Clamped +8 kV pulse waveform (IEC 61000-4-2 network); typical values**



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

## 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.



aaa-002440

**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

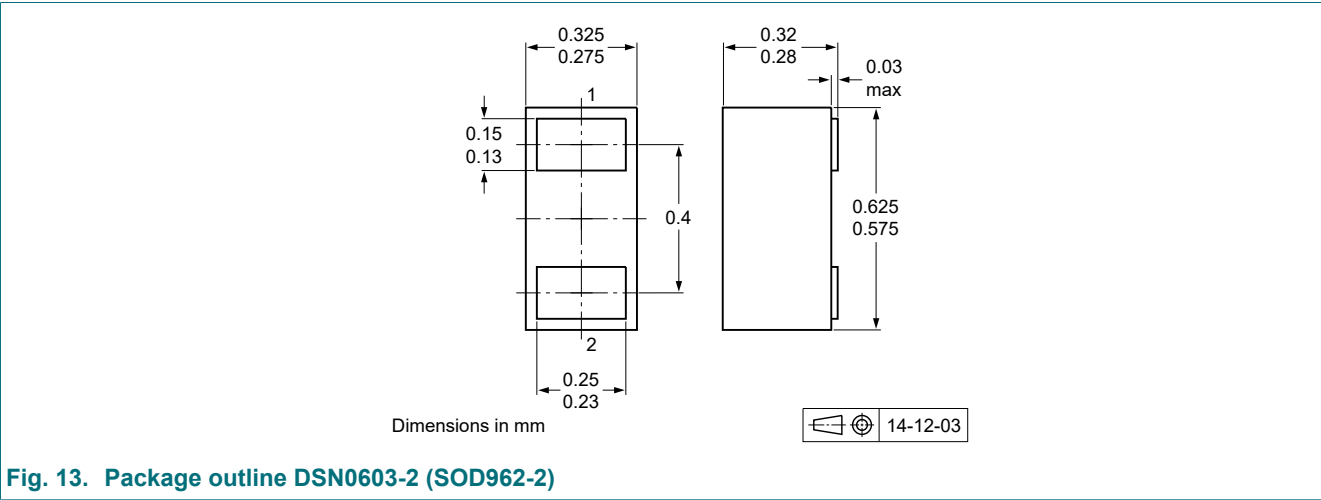


Fig. 13. Package outline DSN0603-2 (SOD962-2)



12. Soldering

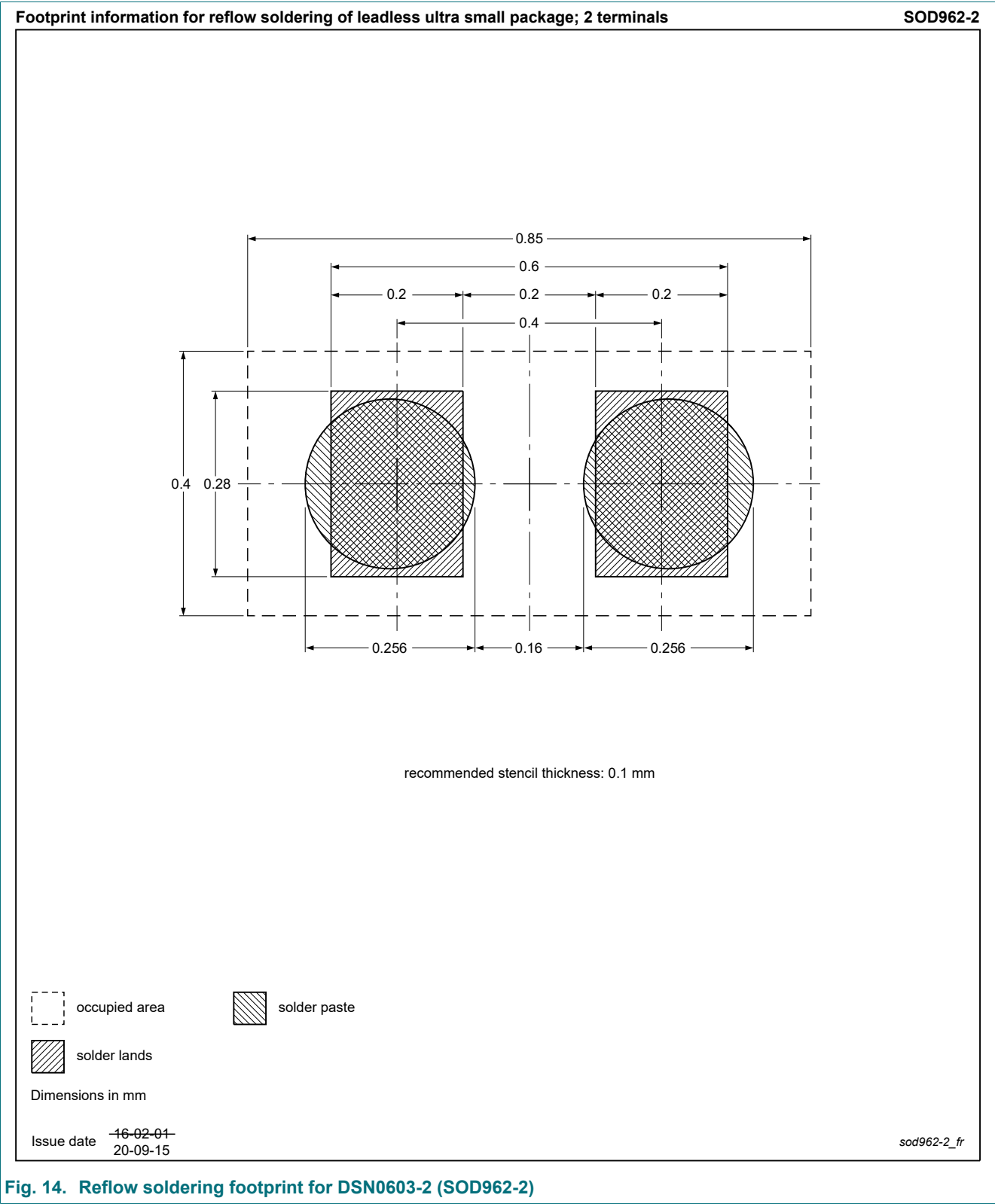


Fig. 14. Reflow soldering footprint for DSN0603-2 (SOD962-2)

## 13. Revision history

Table 7. Revision history

| Data sheet ID    | Release date                                       | Data sheet status      | Change notice | Supersedes       |
|------------------|--|------------------------|---------------|------------------|
| PESD5V0C1USF v.3 | 20220121   | Product data sheet     | -             | PESD5V0C1USF v.2 |
| Modifications:   | • Chapter "Characteristics": $V_{CL}$ data changed |                        |               |                  |
| PESD5V0C1USF v.2 | 20150506   | Product data sheet     | -             | PESD5V0C1USF v.1 |
| PESD5V0C1USF v.1 | 20150424   | 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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