



MMBZ27VBQB-Q

Low capacitance bidirectional dual line ESD protection diode

18 July 2024

Product data sheet

1. General description

ESD protection device in an ultra small DFN1110D-3 (SOT8015) leadless Surface-Mounted Device (SMD) plastic package with side wettable flanks, designed to protect two lines from the damage caused by ElectroStatic discharge (ESD) and other transients.

2. Features and benefits

- Reverse stand-off voltage: $V_{RWM} = 24\text{ V}$
- Low clamping voltage: $V_{CL} = 33\text{ V}$ at $I_{PP} = 2.6\text{ A}$
- ESD protection up to 23 kV (IEC 61000-4-2)
- ESD protection up to 23 kV (ISO 10605)
- Low capacitance: $C_d = 8\text{ pF}$
- Qualified according to AEC-Q101 and recommended for use in automotive applications

3. Applications

- Computers and peripherals
- Audio and video equipment
- Cellular handsets and accessories
- Automotive electronic control units
- Portable electronics

4. Quick reference data

Table 1. Quick reference data

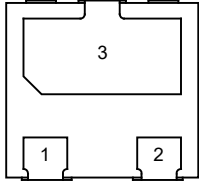
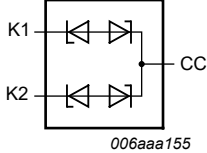
| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|-----------|--------------------------|---|---------|-----|-----|-----|------|
| V_{RWM} | reverse standoff voltage | $T_{amb} = 25\text{ °C}$ | | - | - | 24 | V |
| I_{PPM} | rated peak pulse current | $t_p = 8/20\text{ }\mu\text{s}$ | [1] [2] | - | - | 2.6 | A |
| V_{CL} | clamping voltage | $I_{PPM} = 2.6\text{ A}$; $t_p = 8/20\text{ }\mu\text{s}$; $T_{amb} = 25\text{ °C}$ | [1] [2] | - | 33 | 44 | V |

[1] Measured from pin 1 or 2 to pin 3

[2] Device stressed with 8/20 μs 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 DFN1110D-3 (SOT8015)</p> |  <p>006aaa155</p> |
| 2 | K2 | cathode (diode 2) | | |
| 3 | CC | common cathode | | |

6. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|--------------|------------|--|---------|
| | Name | Description | Version |
| MMBZ27VBQB-Q | DFN1110D-3 | plastic, leadless extremely thin small outline package with side-wettable flanks (SWF); 3 terminals; 0.65 mm pitch; 1.1 mm x 1 mm x 0.48 mm body | SOT8015 |

7. Marking

Table 4. Marking codes

| Type number | Marking code |
|--------------|--------------|
| MMBZ27VBQB-Q | QG |

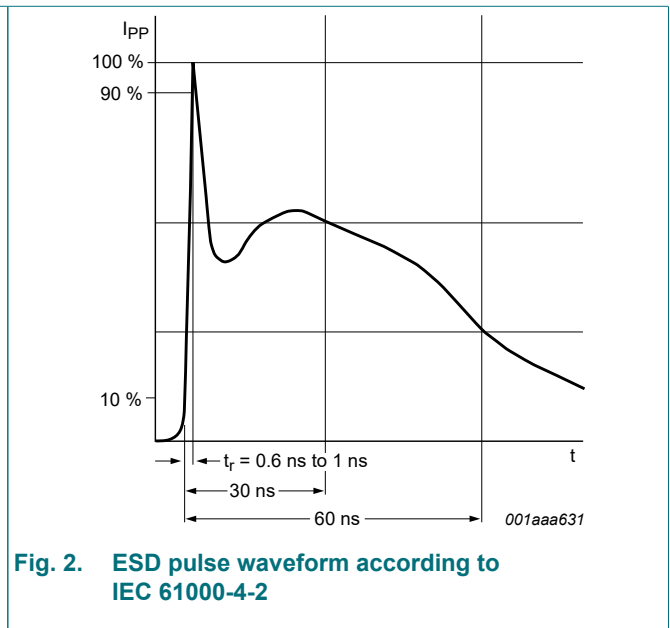
8. Limiting values

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] | - | 2.6 | A |
| T_j | junction temperature | | | - | 150 | °C |
| T_{amb} | ambient temperature | | | -55 | 150 | °C |
| T_{stg} | storage temperature | | | -65 | 150 | °C |
| ESD maximum ratings | | | | | | |
| V_{ESD} | electrostatic discharge voltage | IEC 61000-4-2 (contact discharge) | [3] [1] | - | 23 | kV |
| | | ISO10605; contact discharge; C = 330 pF, R = 330 Ω | [3] [1] | - | 20 | kV |
| | | ISO10605; contact discharge; C = 150 pF, R = 330 Ω | [3] [1] | - | 23 | kV |

- [1] Measured from pin 1 or 2 to pin 3
- [2] Device stressed with 8/20 μs exponential decay waveform according to IEC 61000-4-5
- [3] 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 | $T_{amb} = 25\text{ }^{\circ}\text{C}$ | | - | - | 24 | V |
| V_{BR} | breakdown voltage | $I_R = 10\text{ mA}; T_{amb} = 25\text{ }^{\circ}\text{C}$ | [1] | 25.5 | - | 30.5 | V |
| I_{RM} | reverse leakage current | $V_{RWM} = 24\text{ V}; T_{amb} = 25\text{ }^{\circ}\text{C}$ | [1] | - | 1 | 50 | nA |
| C_d | diode capacitance | $f = 1\text{ MHz}; V_R = 0\text{ V}; T_{amb} = 25\text{ }^{\circ}\text{C}$ | [1] | - | 6 | 8 | pF |
| V_{CL} | clamping voltage | $I_{PPM} = 2.6\text{ A}; t_p = 8/20\text{ }\mu\text{s}; T_{amb} = 25\text{ }^{\circ}\text{C}$ | [1] [2] | - | 33 | 44 | V |
| | | $I_{PP} = 16\text{ A}; t_p = 100\text{ ns}; T_{amb} = 25\text{ }^{\circ}\text{C}$ | [1] [3] | - | 33 | - | V |

- [1] Measured from pin 1 or 2 to pin 3
- [2] Device stressed with 8/20 μs exponential decay waveform according to IEC 61000-4-5
- [3] Non-repetitive current pulse, Transmission Line Pulse (TLP); square pulse; ANSI / ESD STM5.5.1-2008

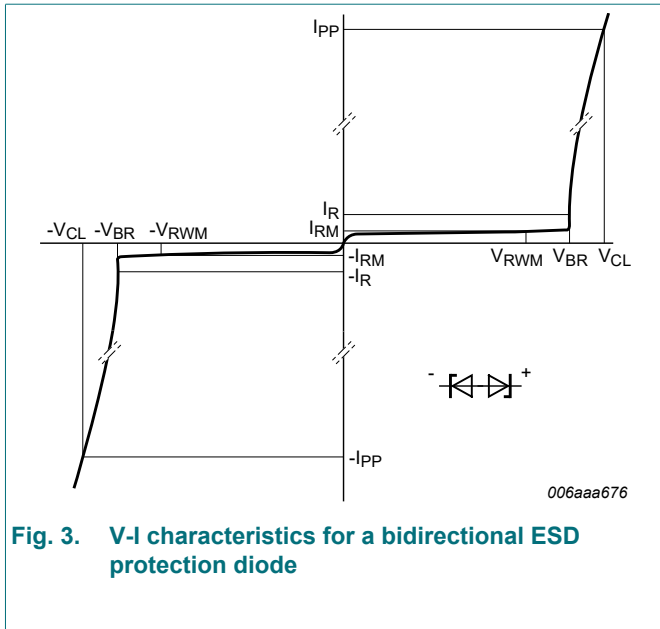


Fig. 3. V-I characteristics for a bidirectional ESD protection diode

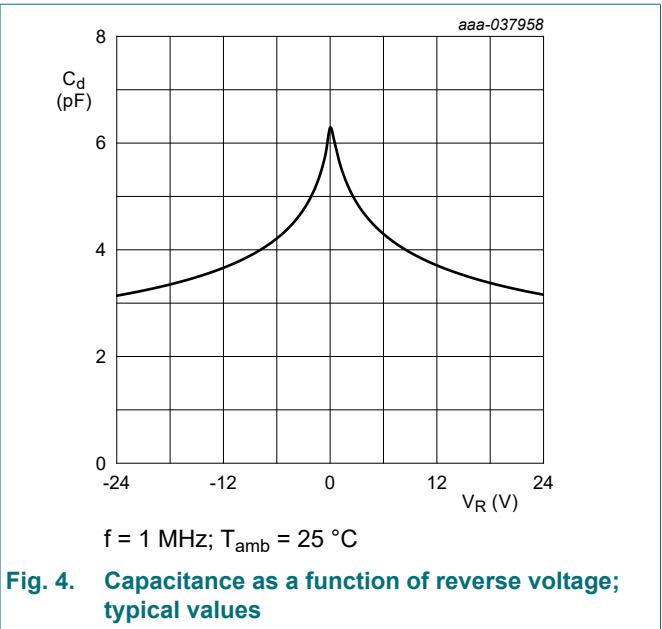
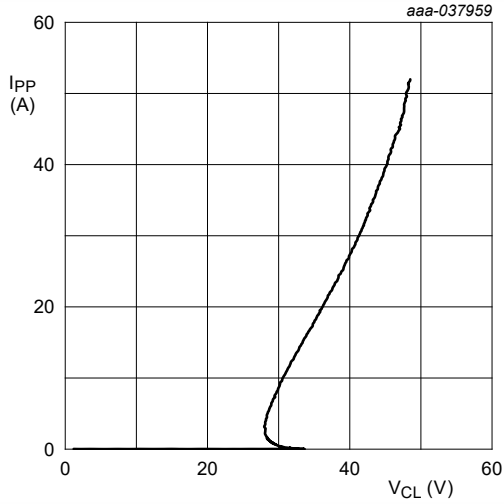
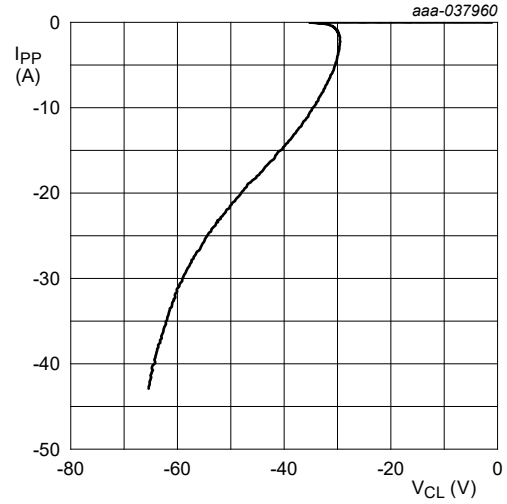


Fig. 4. Capacitance as a function of reverse voltage; typical values



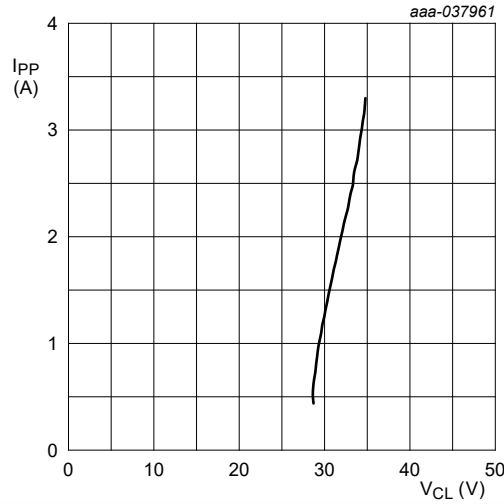
Transmission Line Pulse (TLP);
 $t_p = 100 \text{ ns}$; $t_r = 1 \text{ ns}$

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



Transmission Line Pulse (TLP);
 $t_p = 100 \text{ ns}$; $t_r = 1 \text{ ns}$

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



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

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

10. Application information

The device is designed for the protection of two lines from the damage caused by ESD and surge pulses.

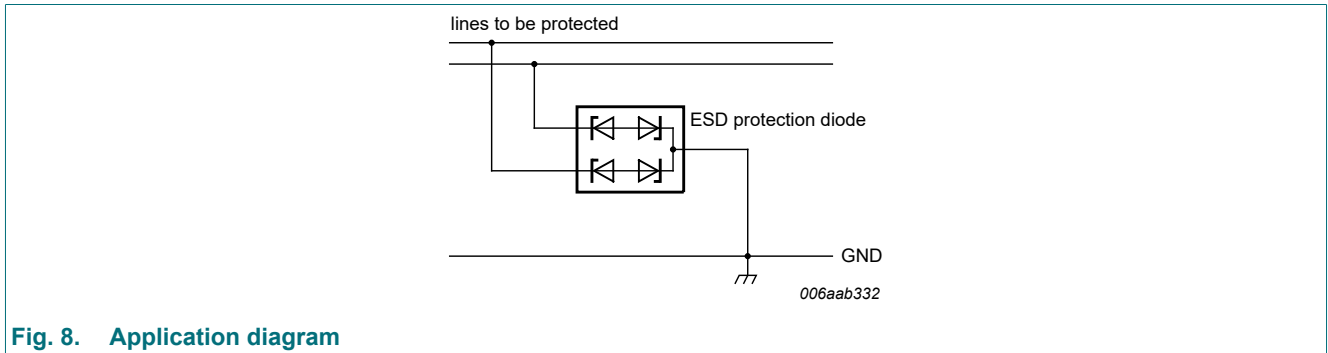


Fig. 8. Application diagram

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. Test information

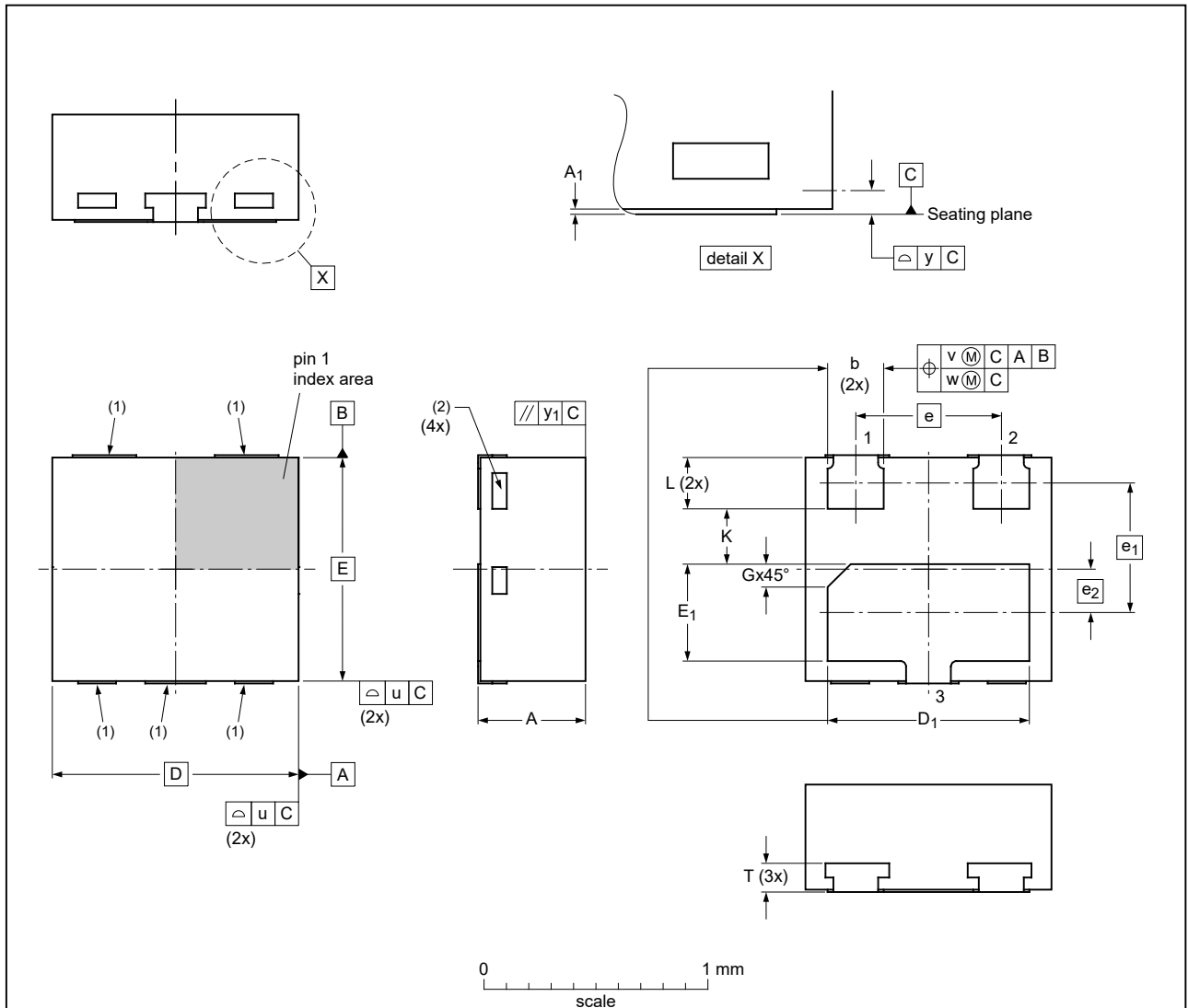
Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - *Stress test qualification for discrete semiconductors*, and is suitable for use in automotive applications.

12. Package outline

DFN1110D-3: plastic, leadless extremely thin small outline package with side-wettable flanks (SWF); 3 terminals; 0.65 mm pitch; 1.1 mm x 1 mm x 0.48 mm body

SOT8015



Dimensions (mm are the original dimensions)

| Unit | A | A ₁ | b | D | D ₁ | E | E ₁ | e | e ₁ | e ₂ | G | K | L | T | u | v | w | y | y ₁ |
|------|------|----------------|------|-----|----------------|---|----------------|------|----------------|----------------|-------|-----|------|------|------|-----|------|------|----------------|
| max | 0.50 | 0.040 | 0.30 | | 0.95 | | 0.48 | | | | | | 0.27 | 0.22 | | | | | |
| nom | 0.47 | 0.020 | 0.25 | 1.1 | 0.90 | 1 | 0.43 | 0.65 | 0.58 | 0.19 | 0.09 | | 0.23 | 0.16 | 0.05 | 0.1 | 0.05 | 0.05 | 0.05 |
| min | 0.44 | 0.005 | 0.22 | | 0.87 | | 0.40 | | | | (ref) | 0.2 | 0.20 | 0.10 | | | | | |

Note

- Side Wettable Flank, protrusion max. 0.02 mm.
 - Visible depend upon used manufacturing technology.
- Dimension A and T are including plating thickness.

sot8015_po

| Outline version | References | | | | European projection | Issue date |
|-----------------|------------|----------|-------|--|---------------------|----------------------|
| | IEC | JEDEC | JEITA | | | |
| SOT8015 | | MO-340BA | | | | 19-12-02 19-12-04 |

Fig. 9. Package outline DFN1110D-3 (SOT8015)

13. Soldering

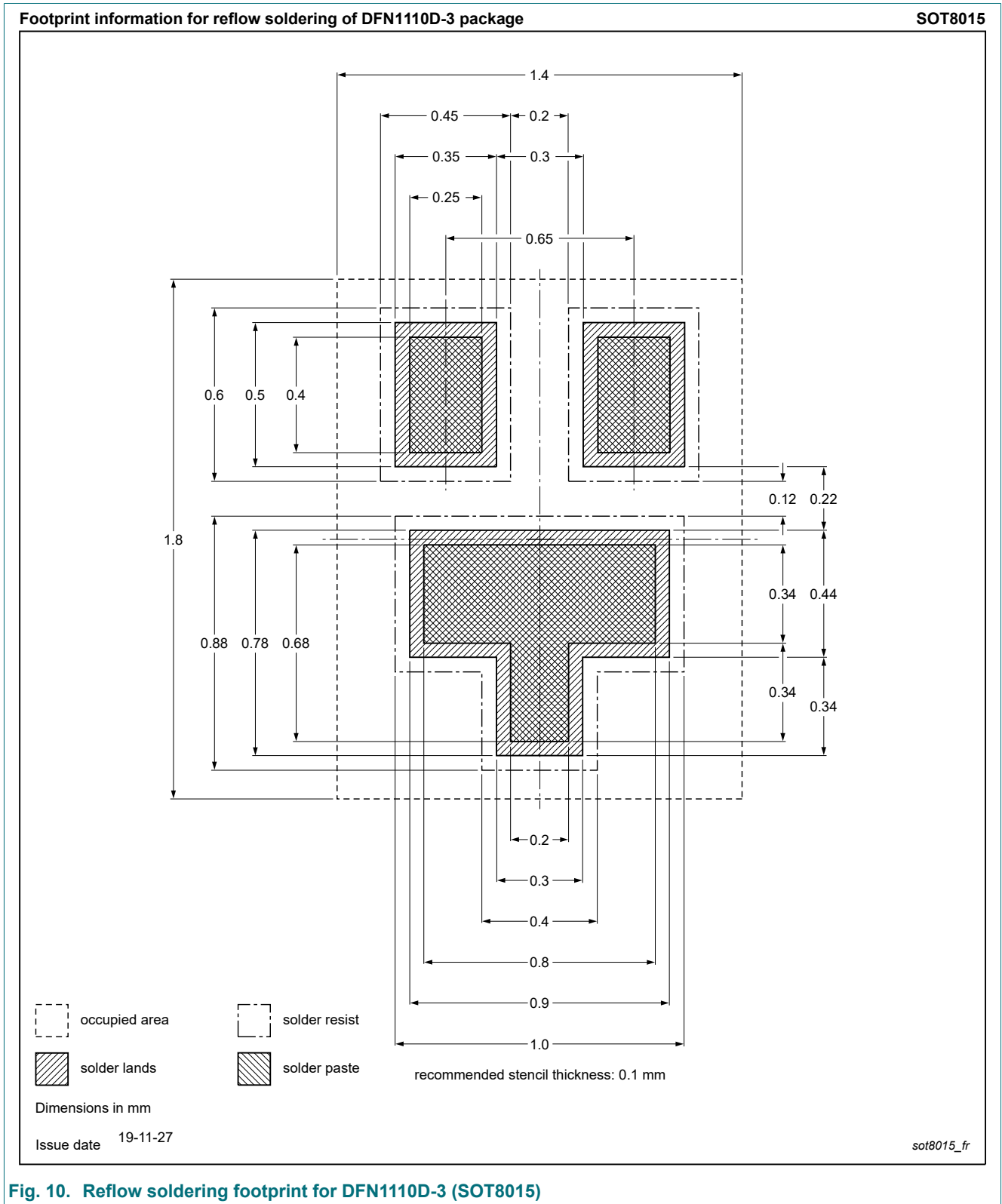


Fig. 10. Reflow soldering footprint for DFN1110D-3 (SOT8015)

14. Revision history

Table 7. Revision history

| Data sheet ID | Release date | Data sheet status | Change notice | Supersedes |
|------------------|--|--------------------|---------------|------------------|
| MMBZ27VBQB-Q v.2 | 20240718 | Product data sheet | - | MMBZ27VBQB-Q v.1 |
| Modifications: | • Chapter "Characteristics": removed figures 8, 9 and 10 | | | |
| MMBZ27VBQB-Q v.1 | 20240404 | Product data sheet | - | - |

15. 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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