



# ES1B

100 V, 1 A hyperfast recovery rectifier in SMA

20 January 2025

Product data sheet

## 1. General description

Hyperfast recovery rectifier, encapsulated in an SMA package.

## 2. Features and benefits

- Reverse voltage:  $V_R \leq 100$  V
- Forward current:  $I_F \leq 1$  A
- Hyperfast recovery time:  $t_{rr} \leq 35$  ns
- Pt doped life time control
- Ideal for automated placement
- Glass passivated chip junction
- High forward surge capability

## 3. Applications

- Rectification
- Reverse polarity protection
- Fast switching
- Freewheeling applications

## 4. Quick reference data

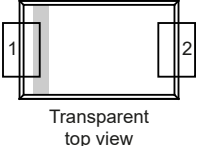
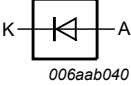
Table 1. Quick reference data

| Symbol      | Parameter                       | Conditions                                                       |     | Min | Typ  | Max  | Unit |
|-------------|---------------------------------|------------------------------------------------------------------|-----|-----|------|------|------|
| $I_{F(AV)}$ | average forward current         | $\delta = 0.5$ ; $f = 20$ kHz; square wave; $T_{sp} \leq 140$ °C |     | -   | -    | 1    | A    |
| $V_{RRM}$   | repetitive peak reverse voltage | $T_j = 25$ °C                                                    |     | -   | -    | 100  | V    |
| $V_R$       | reverse voltage                 |                                                                  |     | -   | -    | 100  | V    |
| $V_F$       | forward voltage                 | $I_F = 1$ A; pulsed; $T_j = 25$ °C                               | [1] | -   | -    | 0.95 | V    |
|             |                                 | $I_F = 1$ A; pulsed; $T_j = 125$ °C                              | [1] | -   | 0.77 | -    | V    |
| $I_R$       | reverse current                 | $V_R = 100$ V; pulsed; $T_j = 25$ °C                             | [1] | -   | -    | 5    | µA   |
|             |                                 | $V_R = 100$ V; pulsed; $T_j = 125$ °C                            | [1] | -   | -    | 150  | µA   |

[1] Very short pulse, in order to maintain a stable junction temperature.

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline                                                                                   | Graphic symbol                                                                                   |
|-----|--------|-------------|------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| 1   | K      | cathode     | <br>SMA (SOD1001-1) | <br>006aab040 |
| 2   | A      | anode       |                                                                                                      |                                                                                                  |

6. Ordering information

Table 3. Ordering information

| Type number          | Package |                                                                                 |                           |
|----------------------|---------|---------------------------------------------------------------------------------|---------------------------|
|                      | Name    | Description                                                                     | Version                   |
| <a href="#">ES1B</a> | SMA     | plastic, surface mounted package; 2 terminals; 4.30 mm x 2.65 mm x 2.10 mm body | <a href="#">SOD1001-1</a> |

7. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| ES1B        | BT8          |

8. Limiting values

Table 5. Limiting values

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

| Symbol      | Parameter                           | Conditions                                                                                                                             |     | Min | Max  | Unit               |
|-------------|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|-----|-----|------|--------------------|
| $V_{RRM}$   | repetitive peak reverse voltage     | $T_j = 25\text{ }^{\circ}\text{C}$                                                                                                     |     | -   | 100  | V                  |
| $V_R$       | reverse voltage                     |                                                                                                                                        |     | -   | 100  | V                  |
| $V_{RMS}$   | RMS voltage                         |                                                                                                                                        |     | -   | 70   | V                  |
| $I_F$       | forward current                     | $\delta = 1; T_{sp} \leq 137\text{ }^{\circ}\text{C}$                                                                                  |     | -   | 1.4  | A                  |
| $I_{F(AV)}$ | average forward current             | $\delta = 0.5; f = 20\text{ kHz}; \text{square wave}; T_{sp} \leq 140\text{ }^{\circ}\text{C}$                                         |     | -   | 1    | A                  |
| $I_{FSM}$   | non-repetitive peak forward current | $t_p = 8.3\text{ ms}; \text{single half sine wave (applied at rated load condition)}; T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$ |     | -   | 30   | A                  |
| $P_{tot}$   | total power dissipation             | $T_{amb} \leq 25\text{ }^{\circ}\text{C}$                                                                                              | [1] | -   | 0.63 | W                  |
|             |                                     |                                                                                                                                        | [2] | -   | 0.93 | W                  |
| $T_j$       | junction temperature                |                                                                                                                                        |     | -55 | 150  | $^{\circ}\text{C}$ |
| $T_{stg}$   | storage temperature                 |                                                                                                                                        |     | -55 | 150  | $^{\circ}\text{C}$ |

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 cm<sup>2</sup>.

9. Thermal characteristics

Table 6. Thermal characteristics

| Symbol         | Parameter                                        | Conditions  |     | Min | Typ | Max | Unit |
|----------------|--------------------------------------------------|-------------|-----|-----|-----|-----|------|
| $R_{th(j-a)}$  | thermal resistance from junction to ambient      | in free air | [1] | -   | -   | 200 | K/W  |
|                |                                                  |             | [2] | -   | -   | 135 | K/W  |
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point |             | [3] | -   | -   | 30  | K/W  |

- [1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
- [2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 cm<sup>2</sup>.
- [3] Soldering point of cathode tab.

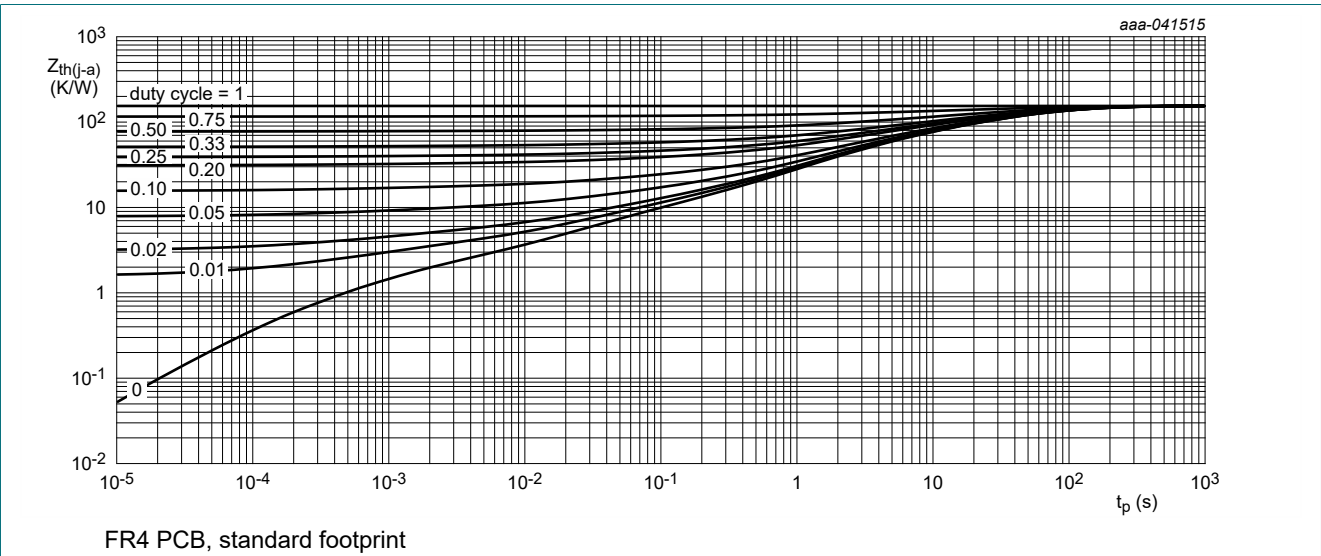


Fig. 1. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

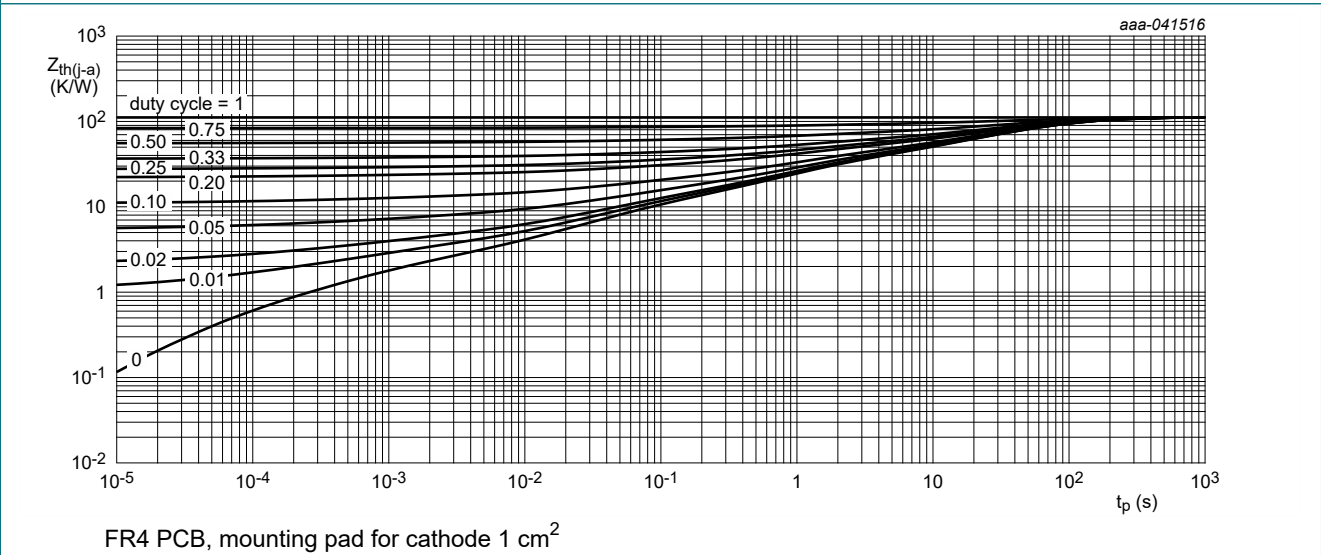


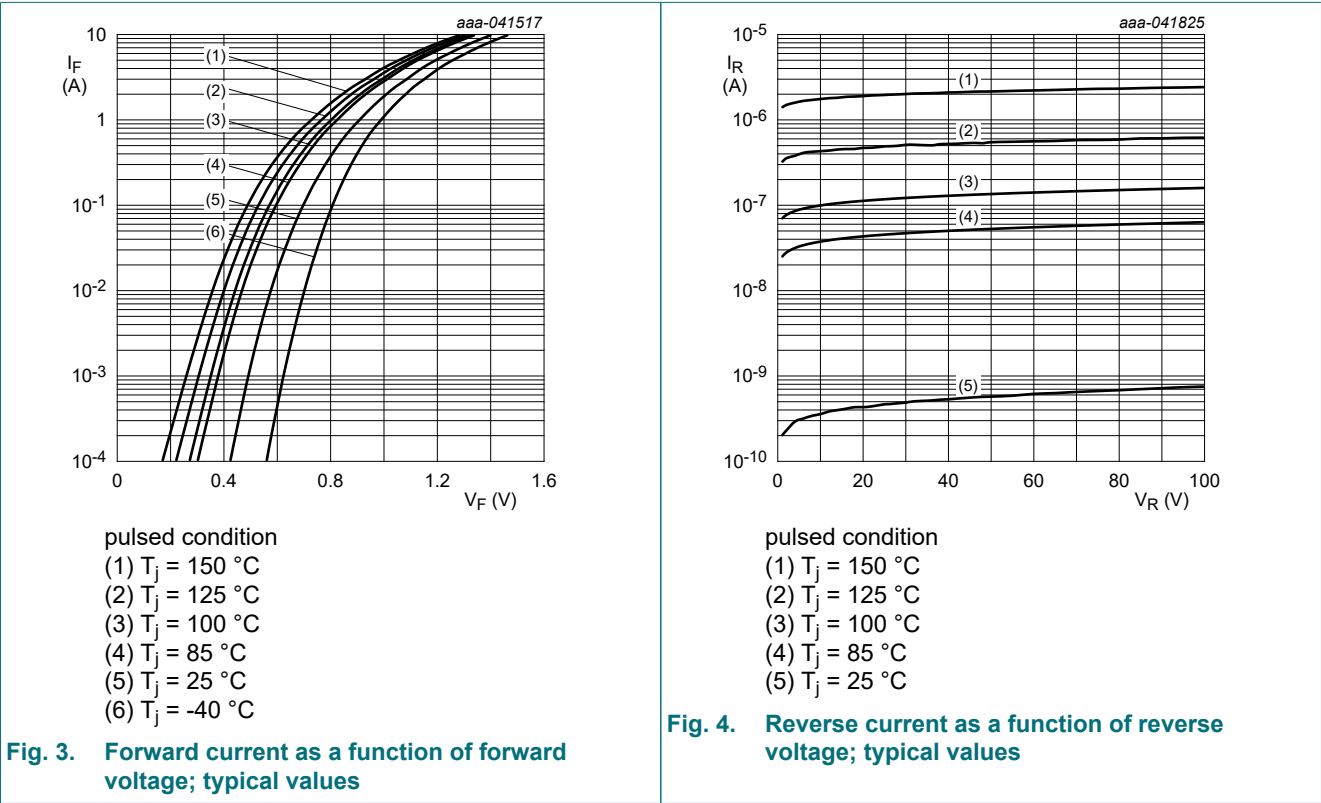
Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

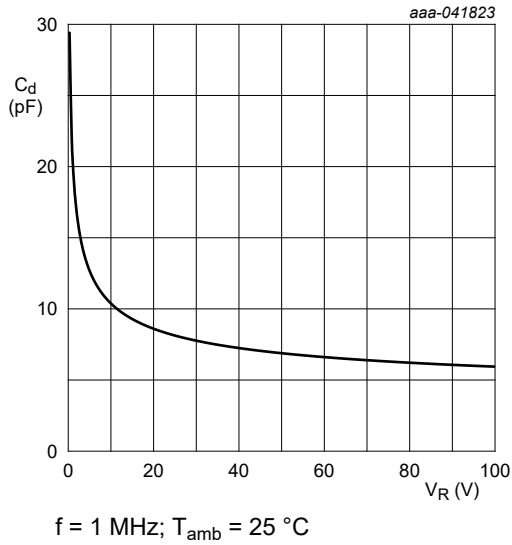
10. Characteristics

Table 7. Characteristics

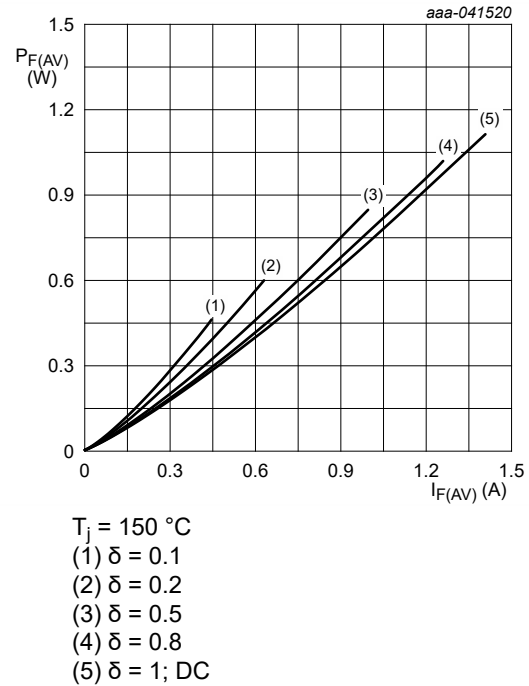
| Symbol      | Parameter                             | Conditions                                                                                                     |     | Min | Typ  | Max  | Unit          |
|-------------|---------------------------------------|----------------------------------------------------------------------------------------------------------------|-----|-----|------|------|---------------|
| $V_{(BR)R}$ | reverse breakdown voltage             | $I_R = 10\text{ }\mu\text{A}$ ; pulsed; $T_j = 25\text{ }^{\circ}\text{C}$                                     | [1] | 100 | -    | -    | V             |
| $V_F$       | forward voltage                       | $I_F = 1\text{ A}$ ; pulsed; $T_j = 25\text{ }^{\circ}\text{C}$                                                | [1] | -   | -    | 0.95 | V             |
|             |                                       | $I_F = 1\text{ A}$ ; pulsed; $T_j = 125\text{ }^{\circ}\text{C}$                                               | [1] | -   | 0.77 | -    | V             |
| $I_R$       | reverse current                       | $V_R = 100\text{ V}$ ; pulsed; $T_j = 25\text{ }^{\circ}\text{C}$                                              | [1] | -   | -    | 5    | $\mu\text{A}$ |
|             |                                       | $V_R = 100\text{ V}$ ; pulsed; $T_j = 125\text{ }^{\circ}\text{C}$                                             | [1] | -   | -    | 150  | $\mu\text{A}$ |
| $C_d$       | diode capacitance                     | $V_R = 4\text{ V}$ ; $f = 1\text{ MHz}$ ; $T_j = 25\text{ }^{\circ}\text{C}$                                   |     | -   | 15   | -    | pF            |
| $t_{rr}$    | reverse recovery time ; step recovery | $I_F = 0.5\text{ A}$ ; $I_R = 1\text{ A}$ ; $I_{R(meas)} = 0.25\text{ A}$ ; $T_j = 25\text{ }^{\circ}\text{C}$ |     | -   | 22   | 35   | ns            |

[1] Very short pulse, in order to maintain a stable junction temperature.

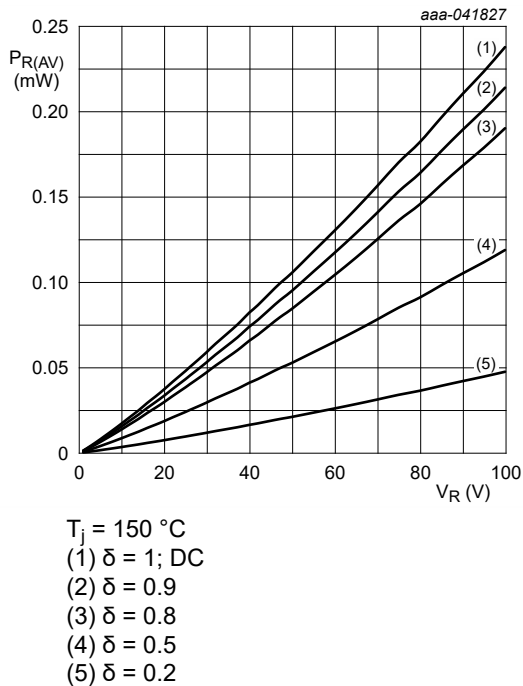




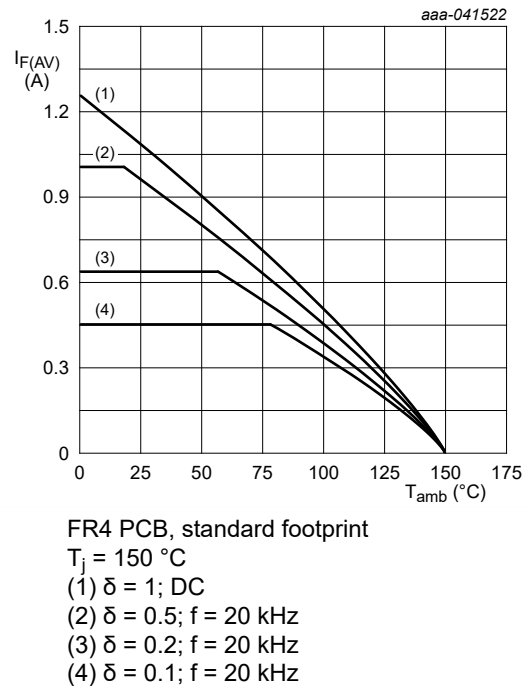
**Fig. 5.** Diode capacitance as a function of reverse voltage; typical values



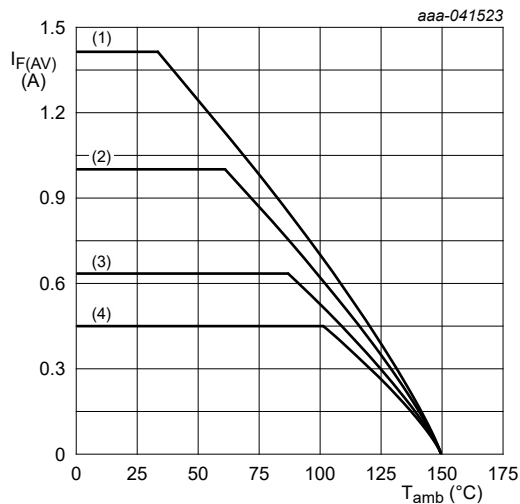
**Fig. 6.** Average forward power dissipation as a function of average forward current; typical values



**Fig. 7.** Average reverse power dissipation as a function of reverse voltage; typical values

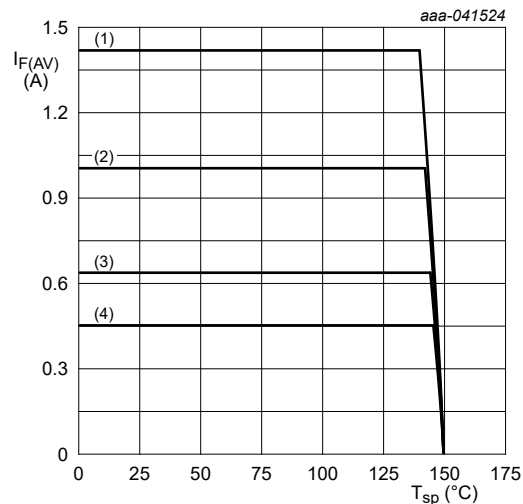


**Fig. 8.** Average forward current as a function of ambient temperature; typical values



FR4 PCB, mounting pad for cathode 1 cm<sup>2</sup>  
 $T_j = 150$  °C  
(1)  $\delta = 1$ ; DC  
(2)  $\delta = 0.5$ ;  $f = 20$  kHz  
(3)  $\delta = 0.2$ ;  $f = 20$  kHz  
(4)  $\delta = 0.1$ ;  $f = 20$  kHz

Fig. 9. Average forward current as a function of ambient temperature; typical values



$T_j = 150$  °C  
(1)  $\delta = 1$ ; DC  
(2)  $\delta = 0.5$ ;  $f = 20$  kHz  
(3)  $\delta = 0.2$ ;  $f = 20$  kHz  
(4)  $\delta = 0.1$ ;  $f = 20$  kHz

Fig. 10. Average forward current as a function of solder point temperature; typical values

11. Test information

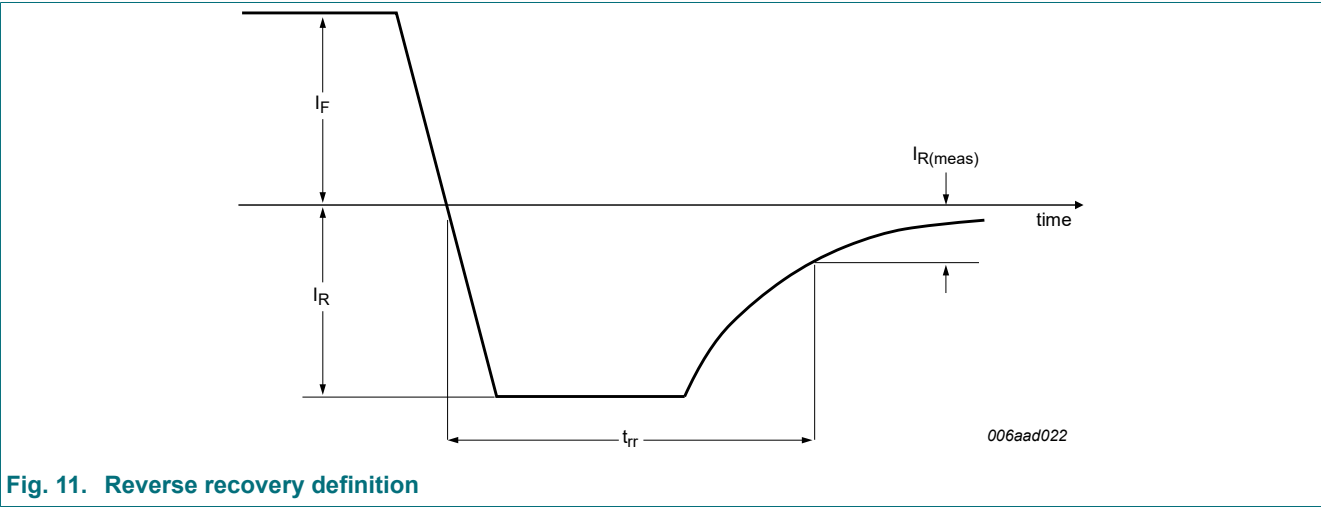


Fig. 11. Reverse recovery definition

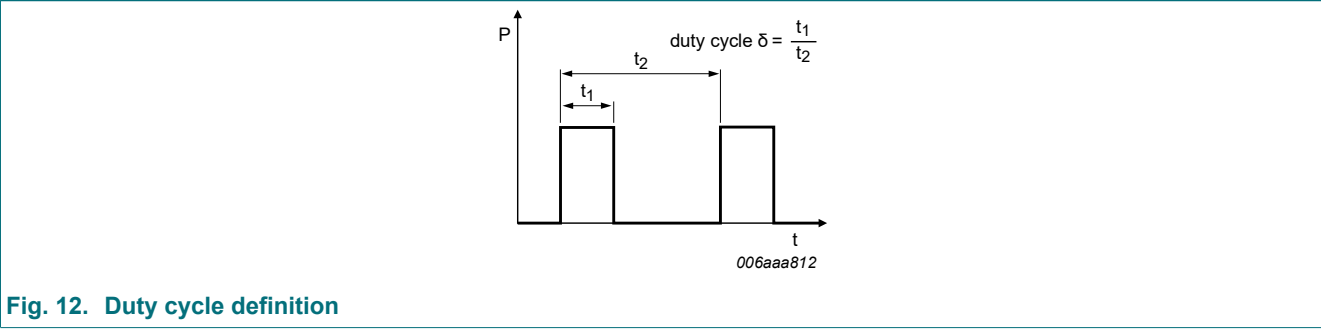


Fig. 12. Duty cycle definition

The current ratings for the typical waveforms are calculated according to the equations:

$I_{F(AV)} = I_M \times \delta$  with  $I_M$  defined as peak current,  
 $I_{RMS} = I_{F(AV)}$  at DC  
 $I_{RMS} = I_M \times \sqrt{\delta}$  with  $I_{RMS}$  defined as RMS current.

12. Package outline

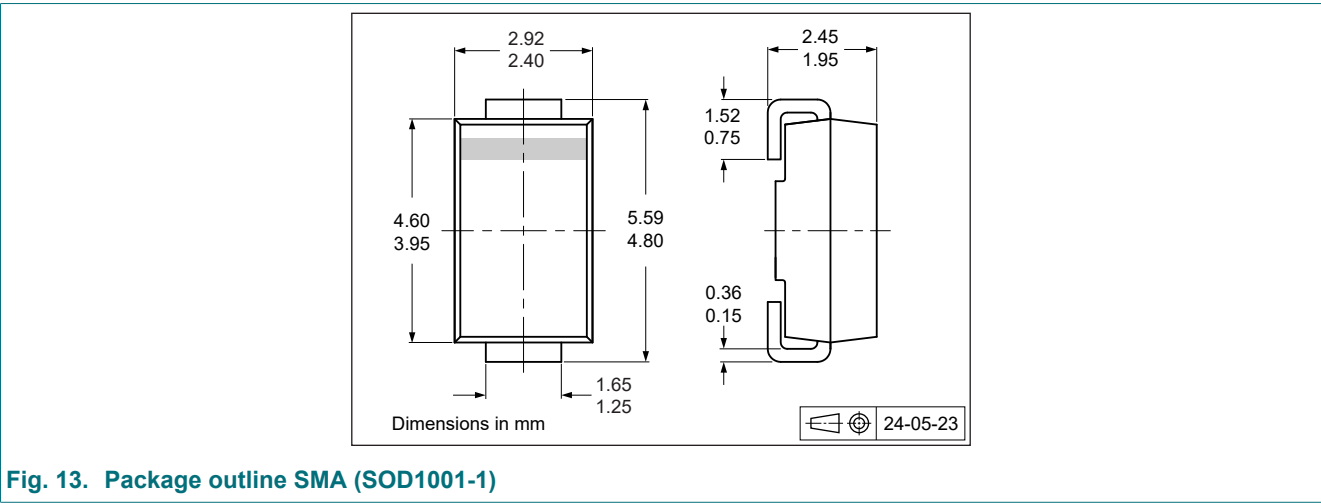


Fig. 13. Package outline SMA (SOD1001-1)

13. Soldering

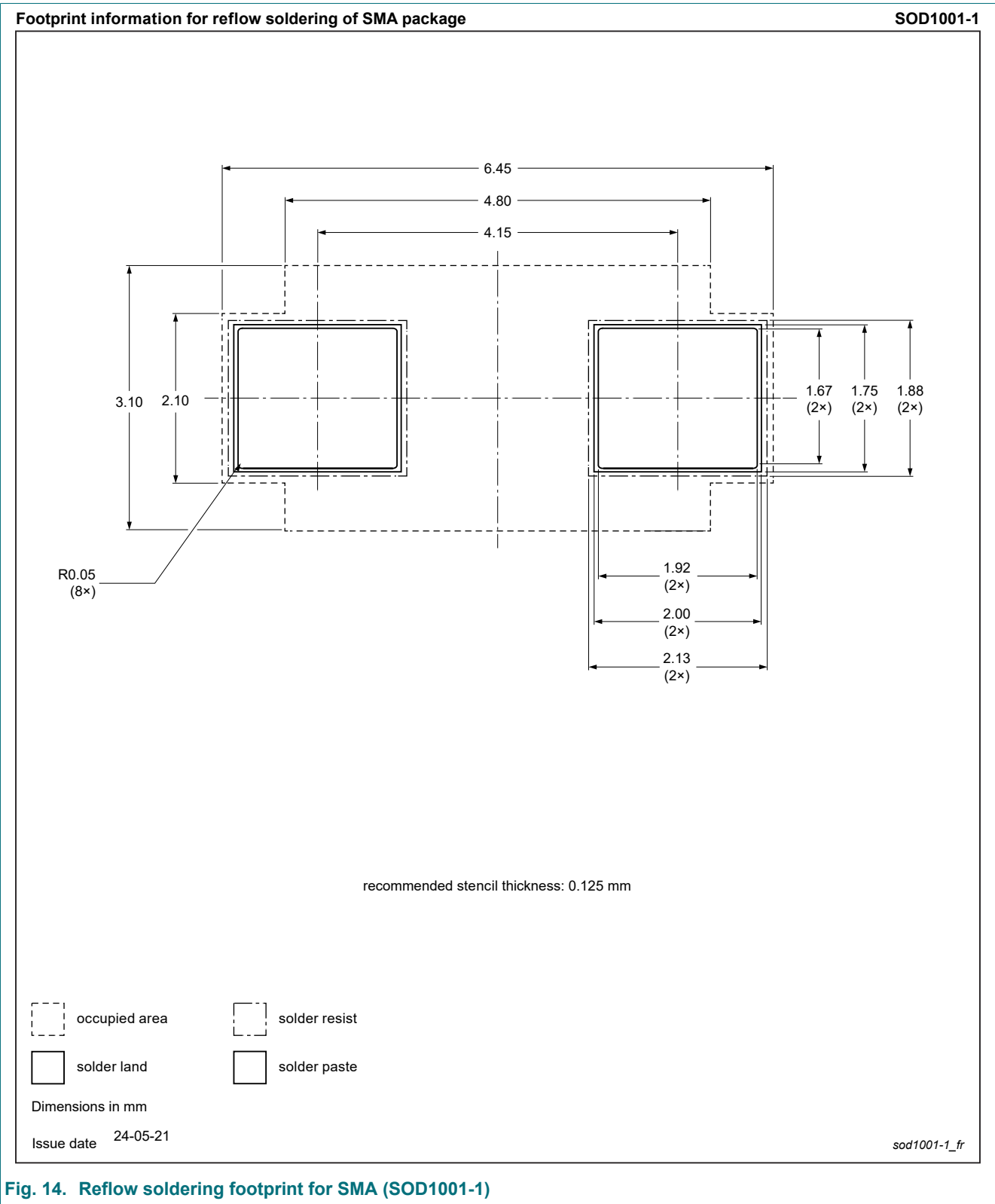


Fig. 14. Reflow soldering footprint for SMA (SOD1001-1)

14. Revision history

Table 8. Revision history

| Data sheet ID | Release date | Data sheet status  | Change notice | Supersedes |
|---------------|--------------|--------------------|---------------|------------|
| ES1B v.1      | 20250120     | 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.                       |
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- [2] The term 'short data sheet' is explained in section "Definitions".
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Date of release: 20 January 2025