
# FR2J

## 600 V, 2 A fast recovery rectifier in SMB

20 January 2025 Product data sheet

## 1. General description

Fast recovery rectifier, encapsulated in an SMB package.

## 2. Features and benefits

- Reverse voltage: $V_R \leq 600$ V
- Forward current: $I_F \leq 2$ A
- Fast recovery time: $t_{rr} \leq 250$ ns
- Pt doped life time control
- Ideal for automated placement
- Glass passivated chip junction
- High forward surge capability

## 3. Applications

- Rectification
- Reverse polarity protection
- Freewheeling applications

## 4. Quick reference data

**Table 1. Quick reference data**

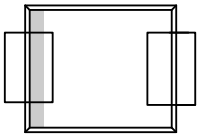
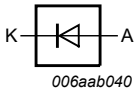
| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $I_{F(AV)}$ | average forward current | δ = 0.5; f = 20 kHz; square wave; $T_{sp} \leq$ 139 °C | | - | - | 2 | A |
| $V_{RRM}$ | repetitive peak reverse voltage | $T_j$ = 25 °C | | - | - | 600 | V |
| $V_R$ | reverse voltage | | | - | - | 600 | V |
| $V_F$ | forward voltage | $I_F$ = 2 A; pulsed; $T_j$ = 25 °C | [1] | - | - | 1.3 | V |
| | | $I_F$ = 2 A; pulsed; $T_j$ = 125 °C | [1] | - | 0.82 | - | V |
| $I_R$ | reverse current | $V_R$ = 600 V; pulsed; $T_j$ = 25 °C | [1] | - | - | 5 | µA |
| | | $V_R$ = 600 V; pulsed; $T_j$ = 125 °C | [1] | - | - | 150 | µA |

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

nexperia

## 5. Pinning information

**Table 2. Pinning information**

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|---|---|---|---|---|
| 1 | K | cathode |  Transparent top view **SMB (SOD1002-1)** |   |
| 2 | A | anode | | |

## 6. Ordering information

**Table 3. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| FR2J | SMB | plastic, surface mounted package; 2 terminals; 4.32 mm × 3.62 mm × 2.30 mm body | SOD1002-1 |

## 7. Marking

**Table 4. Marking codes**

| Type number | Marking code |
|---|---|
| FR2J | AN3 |

## 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 °C | | - | 600 | V |
| $V_R$ | reverse voltage | | | - | 600 | V |
| $V_{RMS}$ | RMS voltage | | | - | 420 | V |
| $I_F$ | forward current | δ = 1; $T_{sp}$ ≤ 135 °C | | - | 2.8 | A |
| $I_{F(AV)}$ | average forward current | δ = 0.5; f = 20 kHz; square wave; $T_{sp}$ ≤ 139 °C | | - | 2 | A |
| $I_{FSM}$ | non-repetitive peak forward current | $t_p$ = 8.3 ms; single half sine wave (applied at rated load condition); $T_{j(init)}$ = 25 °C | | - | 50 | A |
| $P_{tot}$ | total power dissipation | $T_{amb}$ ≤ 25 °C | [1] | - | 0.76 | W |
| | | | [2] | - | 1.09 | W |
| $T_j$ | junction temperature | | | -55 | 150 | °C |
| $T_{stg}$ | storage temperature | | | -55 | 150 | °C |

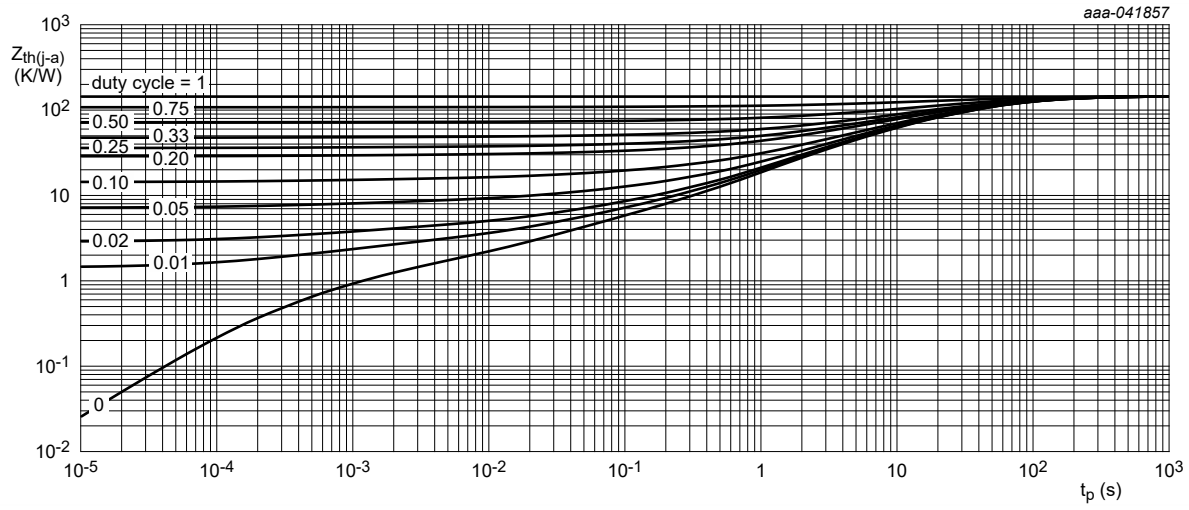
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 $cm^2$.

# 9. Thermal characteristics

**Table 6. Thermal characteristics**

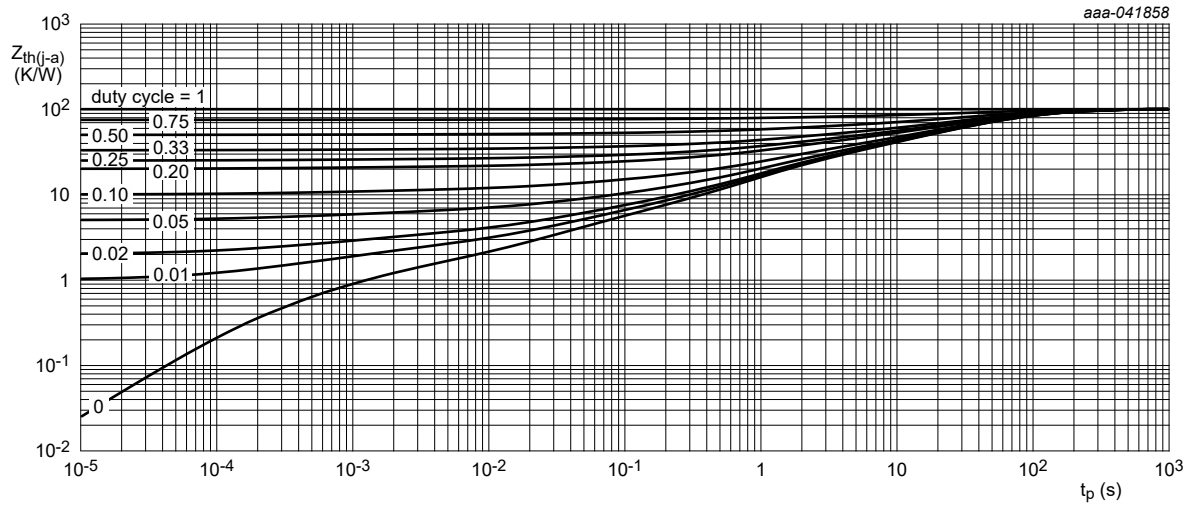
| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | [1] | - | - | 165 | K/W |
| | | | [2] | - | - | 115 | K/W |
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point | | [3] | - | - | 20 | 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 $cm^2$.
[3] Soldering point of cathode tab.




FR4 PCB, standard footprint

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




FR4 PCB, mounting pad for cathode 1 $cm^2$

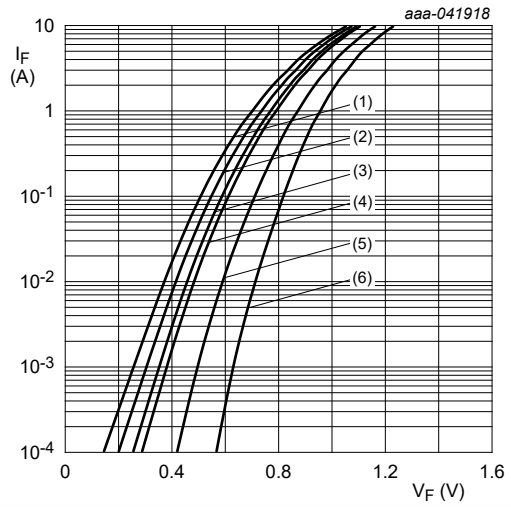
**Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values**

# 10. Characteristics

**Table 7. Characteristics**

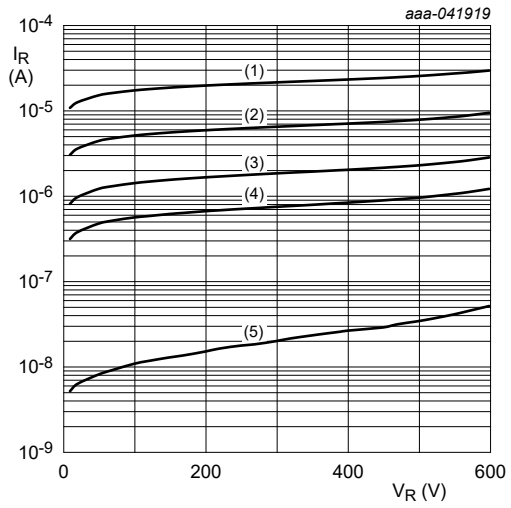
| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_{(BR)R}$ | reverse breakdown voltage | $I_R$ = 100 µA; pulsed; $T_j$ = 25 °C | [1] | 600 | - | - | V |
| $V_F$ | forward voltage | $I_F$ = 2 A; pulsed; $T_j$ = 25 °C | [1] | - | - | 1.3 | V |
| | | $I_F$ = 2 A; pulsed; $T_j$ = 125 °C | [1] | - | 0.82 | - | V |
| $I_R$ | reverse current | $V_R$ = 600 V; pulsed; $T_j$ = 25 °C | [1] | - | - | 5 | µA |
| | | $V_R$ = 600 V; pulsed; $T_j$ = 125 °C | [1] | - | - | 150 | µA |
| $C_d$ | diode capacitance | $V_R$ = 4 V; f = 1 MHz; $T_j$ = 25 °C | | - | 14 | - | pF |
| $t_{rr}$ | reverse recovery time ; step recovery | $I_F$ = 0.5 A; $I_R$ = 1 A; $I_{R(meas)}$ = 0.25 A; $T_j$ = 25 °C | | - | 155 | 250 | ns |

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



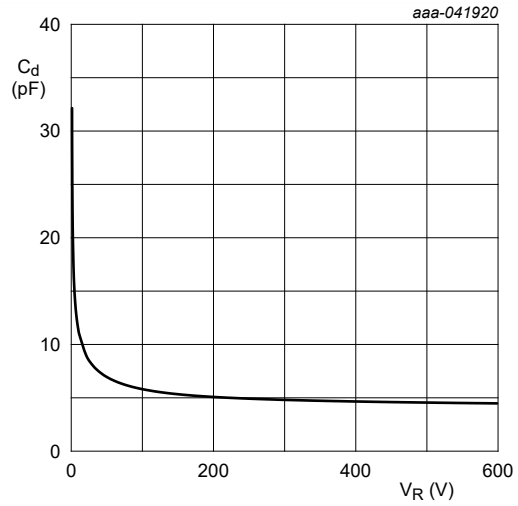

pulsed condition
(1) $T_j$ = 150 °C
(2) $T_j$ = 125 °C
(3) $T_j$ = 100 °C
(4) $T_j$ = 85 °C
(5) $T_j$ = 25 °C
(6) $T_j$ = -40 °C

**Fig. 3. Forward current as a function of forward voltage; typical values**



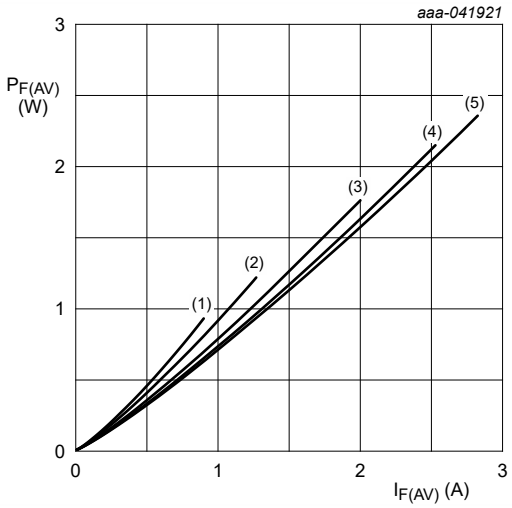

pulsed condition
(1) $T_j$ = 150 °C
(2) $T_j$ = 125 °C
(3) $T_j$ = 100 °C
(4) $T_j$ = 85 °C
(5) $T_j$ = 25 °C

**Fig. 4. Reverse current as a function of reverse voltage; typical values**



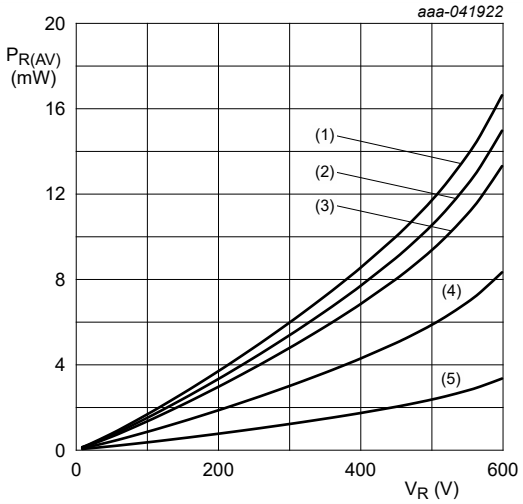

f = 1 MHz; $T_{amb}$ = 25 °C

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



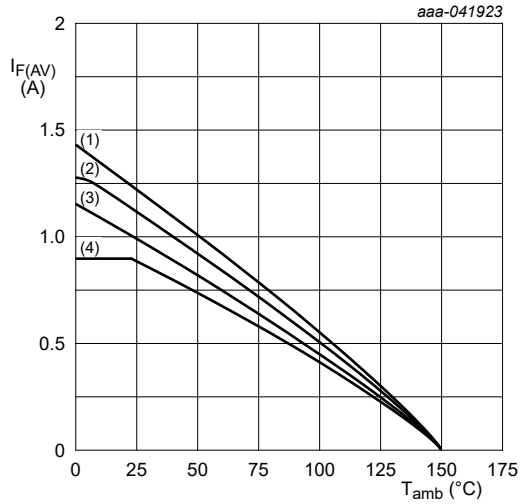

$T_j$ = 150 °C
(1) δ = 0.1
(2) δ = 0.2
(3) δ = 0.5
(4) δ = 0.8
(5) δ = 1; DC

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



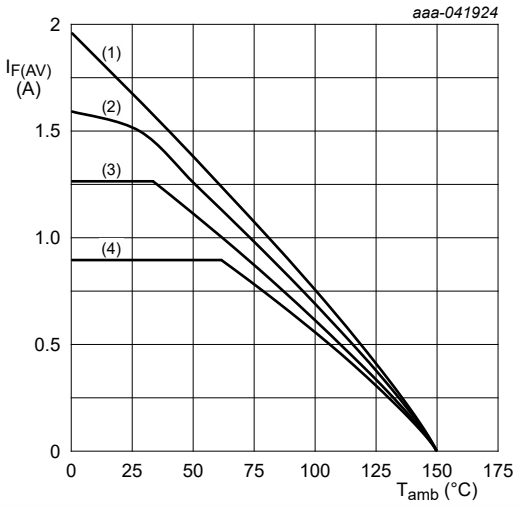

$T_j$ = 150 °C
(1) δ = 1; DC
(2) δ = 0.9
(3) δ = 0.8
(4) δ = 0.5
(5) δ = 0.2

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



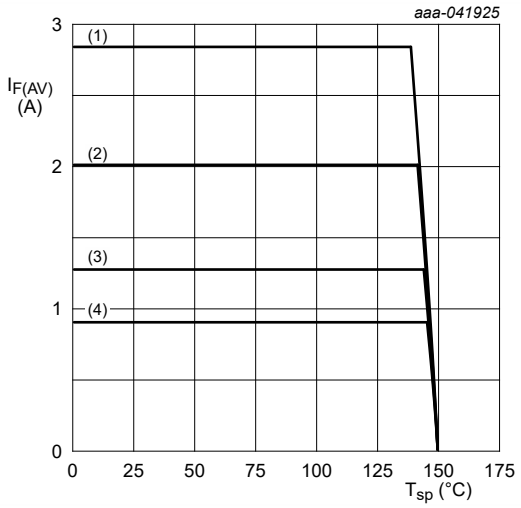

FR4 PCB, standard footprint
$T_j$ = 150 °C
(1) δ = 1; DC
(2) δ = 0.5; f = 20 kHz
(3) δ = 0.2; f = 20 kHz
(4) δ = 0.1; f = 20 kHz

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




FR4 PCB, mounting pad for cathode 1 cm $^2$
$T_j$ = 150 °C
(1) δ = 1; DC
(2) δ = 0.5; f = 20 kHz
(3) δ = 0.2; f = 20 kHz
(4) δ = 0.1; f = 20 kHz

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




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

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

## 11. Test information

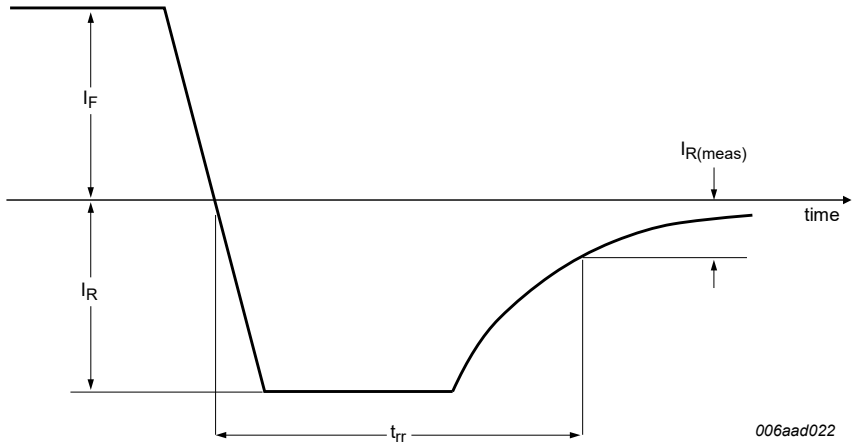



**Fig. 11. Reverse recovery definition**

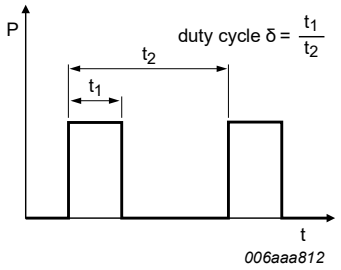



**Fig. 12. Duty cycle definition**

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

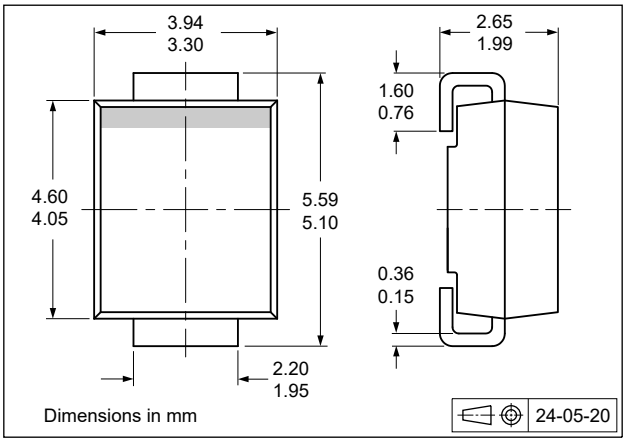
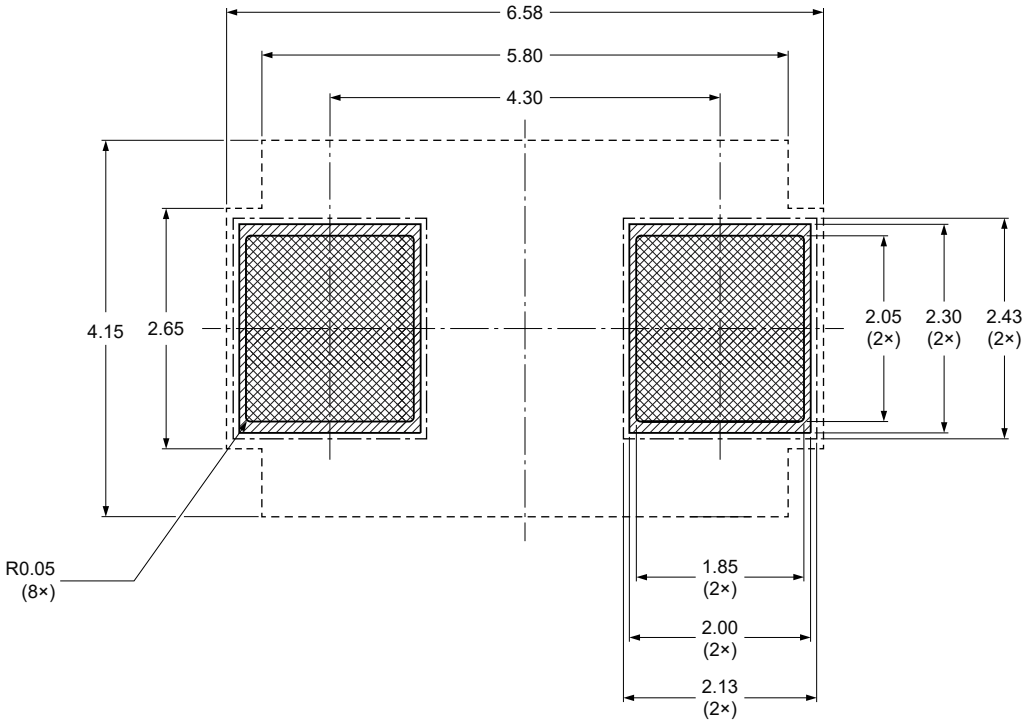



**Fig. 13. Package outline SMB (SOD1002-1)**

## 13. Soldering

**Footprint information for reflow soldering of SMB package** **SOD1002-1**




recommended stencil thickness: 0.125 mm

occupied area

solder resist

solder land

solder paste

Dimensions in mm

Issue date 24-05-21

*sod1002-1_fr*

**Fig. 14. Reflow soldering footprint for SMB (SOD1002-1)**

# 14. Revision history

**Table 8. Revision history**

| Data sheet ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| FR2J 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. |
| 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".
[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the internet at https://www.nexperia.com.

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