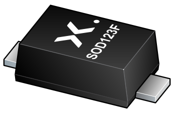



# BAT46WH-Q

## Schottky barrier diode

20 March 2023

Product data sheet

## 1. General description

Planar Schottky barrier diode with an integrated guard ring for stress protection, encapsulated in a small and flat lead SOD123F Surface-Mounted Device (SMD) plastic package.

## 2. Features and benefits

- Low forward voltage
- Reverse voltage $V_R \leq 100$ V
- Small and flat lead SMD plastic package
- Low capacitance
- Qualified according to AEC-Q101 and recommended for use in automotive applications

## 3. Applications

- High-speed switching
- Line termination
- Voltage clamping
- Reverse polarity protection

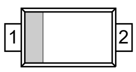
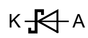
## 4. Quick reference data

**Table 1. Quick reference data**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_R$ | reverse voltage | | | - | - | 100 | V |
| $V_F$ | forward voltage | $I_F$ = 250 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02; $T_{amb}$ = 25 °C | | - | 710 | 850 | mV |
| $I_R$ | reverse current | $V_R$ = 75 V; $t_p \leq$ 300 µs; $\delta \leq$ 0.02; pulsed; $T_{amb}$ = 25 °C | | - | 1 | 4 | µA |

## 5. Pinning information

**Table 2. Pinning information**

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|---|---|---|---|---|
| 1 | K | cathode[1] |   SOD123F |   aaa-003679 |
| 2 | A | anode | | |

[1] The marking bar indicates the cathode.

## 6. Ordering information

**Table 3. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| BAT46WH-Q | SOD123F | plastic, surface-mounted package; 2 leads; 2.6 mm x 1.6 mm x 1.1 mm body | SOD123F |

## 7. Marking

**Table 4. Marking codes**

| Type number | Marking code |
|---|---|
| BAT46WH-Q | DB |

## 8. Limiting values

**Table 5. Limiting values**

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

| Symbol | Parameter | Conditions | | Min | Max | Unit |
|---|---|---|---|---|---|---|
| $V_R$ | reverse voltage | | | - | 100 | V |
| $I_F$ | forward current | | | - | 250 | mA |
| $I_{FSM}$ | non-repetitive peak forward current | $t_p$ < 10 ms; square wave; $T_{j(init)}$ = 25 °C | | - | 2.5 | A |
| $P_{tot}$ | total power dissipation | $T_{amb} \leq$ 25 °C | [1] | - | 440 | mW |
| | | | [2] | - | 780 | mW |
| $T_j$ | junction temperature | | | - | 150 | °C |
| $T_{amb}$ | ambient temperature | | | -55 | 150 | °C |
| $T_{stg}$ | storage temperature | | | -65 | 150 | °C |

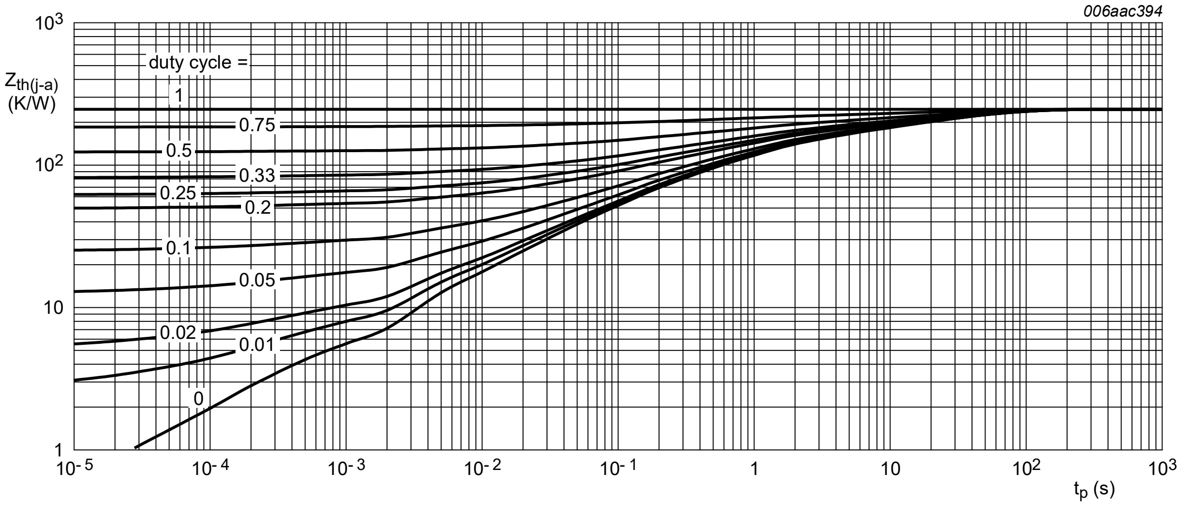
[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.
[2] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for cathode 1 $cm^2$.

## 9. Thermal characteristics

**Table 6. Thermal characteristics**

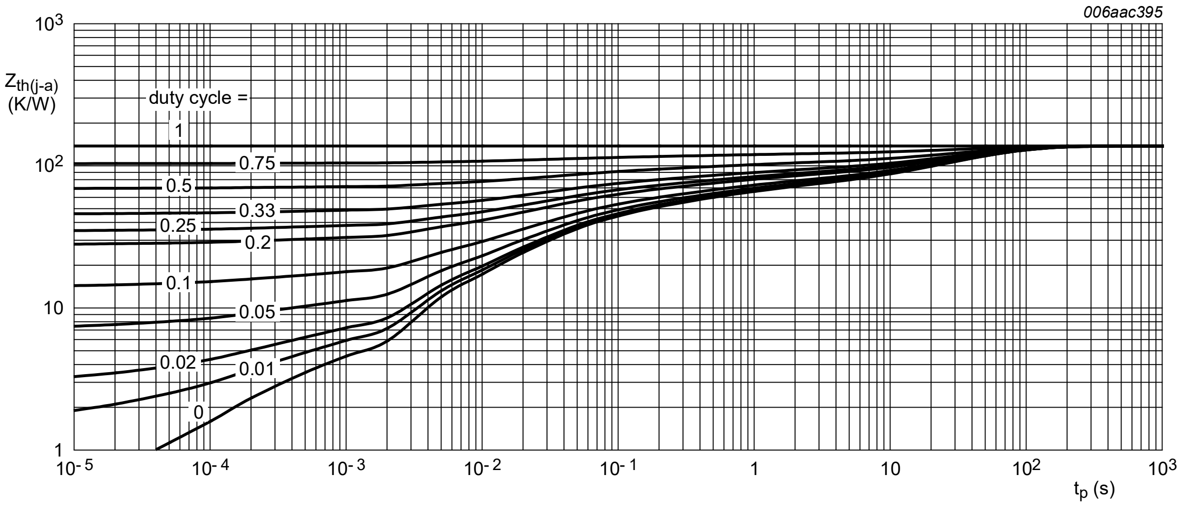
| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | [1] | - | - | 285 | K/W |
| | | | [2] | - | - | 160 | K/W |
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point | | [3] | - | - | 25 | K/W |

[1] Device mounted on an FR4 Printed-Circuit Board (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**



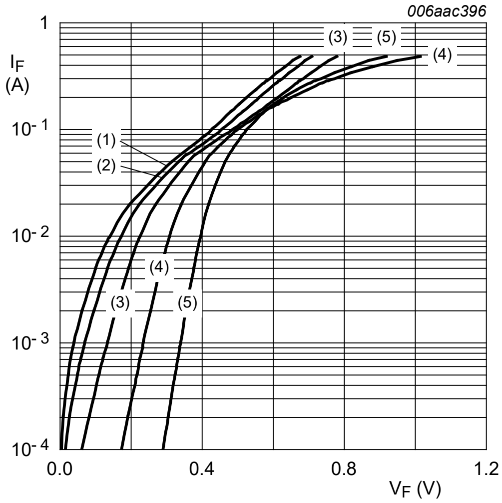

FR4 PCB, mounting pad for cathode 1 $cm^2$

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

## 10. Characteristics

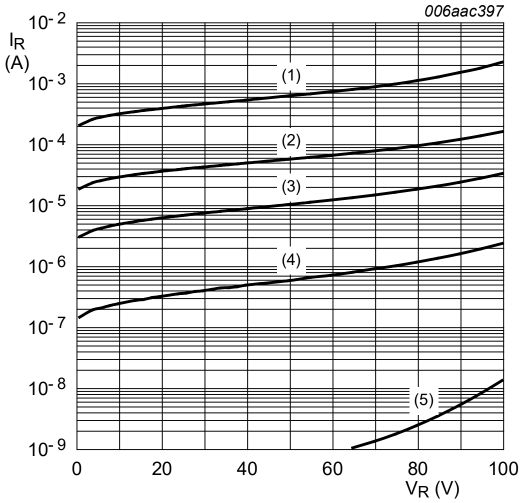
**Table 7. Characteristics**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_F$ | forward voltage | $I_F$ = 0.1 mA; pulsed; $t_p$ ≤ 300 μs; δ ≤ 0.02; $T_{amb}$ = 25 °C | | - | 175 | 200 | mV |
| | | $I_F$ = 10 mA; pulsed; $t_p$ ≤ 300 μs; δ ≤ 0.02; $T_{amb}$ = 25 °C | | - | 315 | 350 | mV |
| | | $I_F$ = 10 mA; pulsed; $t_p$ ≤ 300 μs; δ ≤ 0.02; $T_j$ = -40 °C | | - | - | 470 | mV |
| | | $I_F$ = 50 mA; pulsed; $t_p$ ≤ 300 μs; δ ≤ 0.02; $T_{amb}$ = 25 °C | | - | 415 | 475 | mV |
| | | $I_F$ = 50 mA; pulsed; $t_p$ ≤ 300 μs; δ ≤ 0.02; $T_j$ = -40 °C | | - | - | 560 | mV |
| | | $I_F$ = 250 mA; pulsed; $t_p$ ≤ 300 μs; δ ≤ 0.02; $T_{amb}$ = 25 °C | | - | 710 | 850 | mV |
| $I_R$ | reverse current | $V_R$ = 1.5 V; $t_p$ ≤ 300 μs; δ ≤ 0.02; pulsed; $T_{amb}$ = 25 °C | | - | 0.2 | 0.5 | μA |
| | | $V_R$ = 1.5 V; $t_p$ ≤ 300 μs; δ ≤ 0.02; pulsed; $T_j$ = 60 °C | | - | - | 12 | μA |
| | | $V_R$ = 10 V; $t_p$ ≤ 300 μs; δ ≤ 0.02; pulsed; $T_{amb}$ = 25 °C | | - | 0.3 | 0.8 | μA |
| | | $V_R$ = 10 V; $t_p$ ≤ 300 μs; δ ≤ 0.02; pulsed; $T_j$ = 60 °C | | - | - | 20 | μA |
| | | $V_R$ = 50 V; $t_p$ ≤ 300 μs; δ ≤ 0.02; pulsed; $T_{amb}$ = 25 °C | | - | 0.7 | 2 | μA |
| | | $V_R$ = 50 V; $t_p$ ≤ 300 μs; δ ≤ 0.02; pulsed; $T_j$ = 60 °C | | - | - | 44 | μA |
| | | $V_R$ = 75 V; $t_p$ ≤ 300 μs; δ ≤ 0.02; pulsed; $T_{amb}$ = 25 °C | | - | 1 | 4 | μA |
| | | $V_R$ = 75 V; $t_p$ ≤ 300 μs; δ ≤ 0.02; pulsed; $T_j$ = 60 °C | | - | - | 80 | μA |
| | | $V_R$ = 100 V; $t_p$ ≤ 300 μs; δ ≤ 0.02; pulsed; $T_{amb}$ = 25 °C | | - | 2 | 9 | μA |
| | | $V_R$ = 100 V; $t_p$ ≤ 300 μs; δ ≤ 0.02; pulsed; $T_j$ = 60 °C | | - | - | 120 | μA |
| | | $V_R$ = 100 V; $t_p$ ≤ 300 μs; δ ≤ 0.02; pulsed; $T_j$ = 85 °C | | - | - | 600 | μA |
| $C_d$ | diode capacitance | $V_R$ = 0 V; f = 1 MHz; $T_{amb}$ = 25 °C | | - | - | 39 | pF |
| | | $V_R$ = 1 V; f = 1 MHz; $T_{amb}$ = 25 °C | | - | - | 21 | pF |
| $t_{rr}$ | reverse recovery time | $I_F$ = 10 mA; $I_R$ = 10 mA; $I_{R(meas)}$ = 1 mA; $R_L$ = 100 Ω; $T_{amb}$ = 25 °C | | - | 5.9 | - | ns |



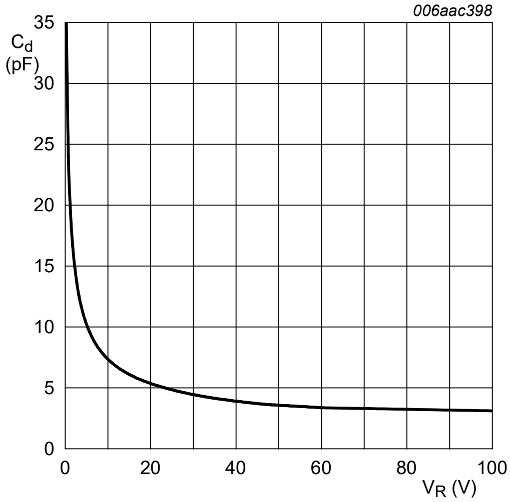

(1) $T_{amb}$ = 150 °C
(2) $T_{amb}$ = 125 °C
(3) $T_{amb}$ = 85 °C
(4) $T_{amb}$ = 25 °C
(5) $T_{amb}$ = -40 °C

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



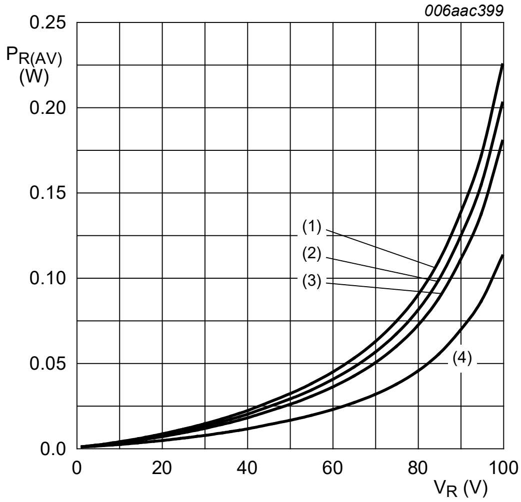

(1) $T_{amb}$ = 125 °C
(2) $T_{amb}$ = 85 °C
(3) $T_{amb}$ = 60 °C
(4) $T_{amb}$ = 25 °C
(5) $T_{amb}$ = -40 °C

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



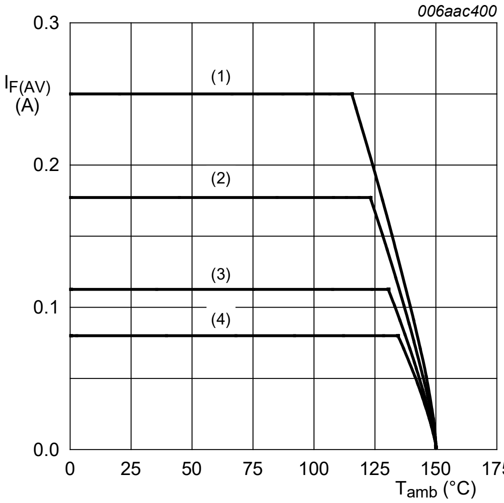

f = 1 MHz; $T_{amb}$ = 25 °C

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



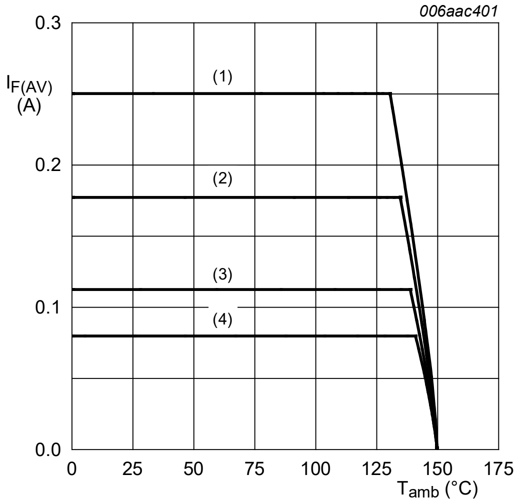

$T_j$ = 125 °C
(1) δ = 1
(2) δ = 0.9
(3) δ = 0.8
(4) δ = 0.5

**Fig. 6. Average reverse power dissipation as a function of reverse voltage; typical values**



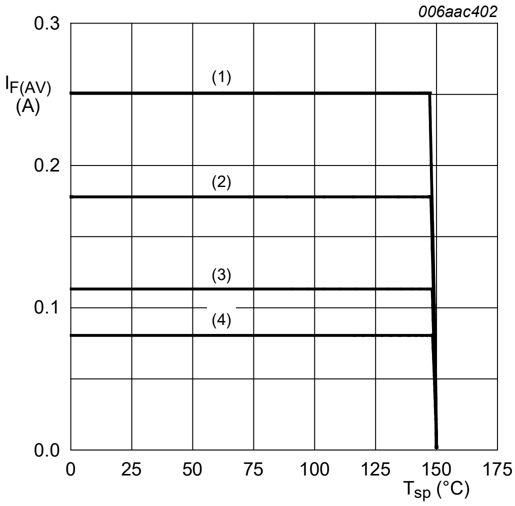

FR4 PCB, standard footprint
$T_j$ = 150 °C
(1) δ = 1; DC
(2) δ = 0.5; f = 20 kHz
(3) δ = 0.2; f = 20 kHz
(4) δ = 0.1; f = 20 kHz

**Fig. 7. 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

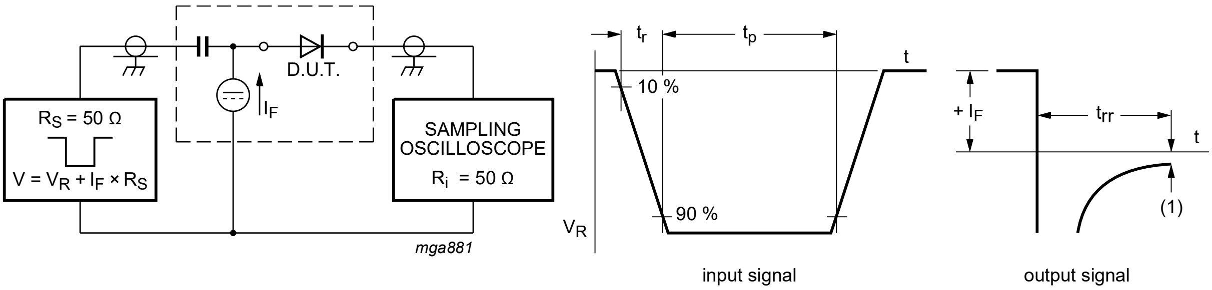
**Fig. 8. Average forward current as a function of ambient temperature; typical values**




$T_j$ = 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. 9. Average forward current as a function of solder point temperature; typical values**

# 11. Test information




(1) $I_R$ = 1 mA

**Fig. 10. Reverse recovery time: test circuit and waveforms**

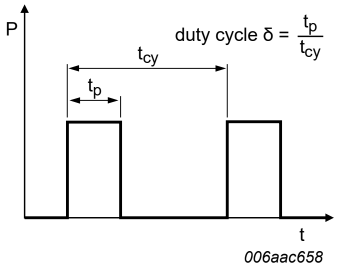



**Fig. 11. Duty cycle definition**

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, and $I_{RMS} = I_M \times \sqrt{\delta}$ with $I_{RMS}$ defined as RMS current.

## 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

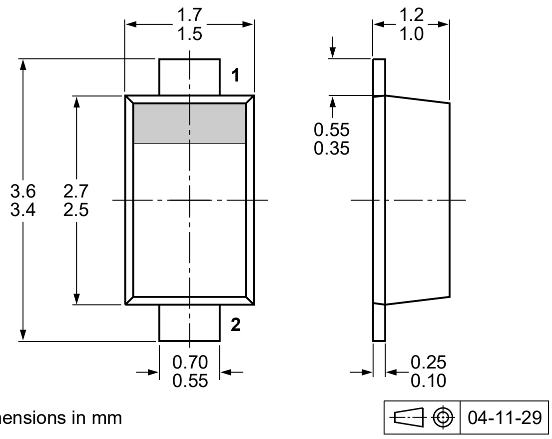



**Fig. 12. Package outline SOD123F**

# 13. Soldering

**Footprint information for reflow soldering of plastic surface-mounted, 2 leads package** **SOD123F**

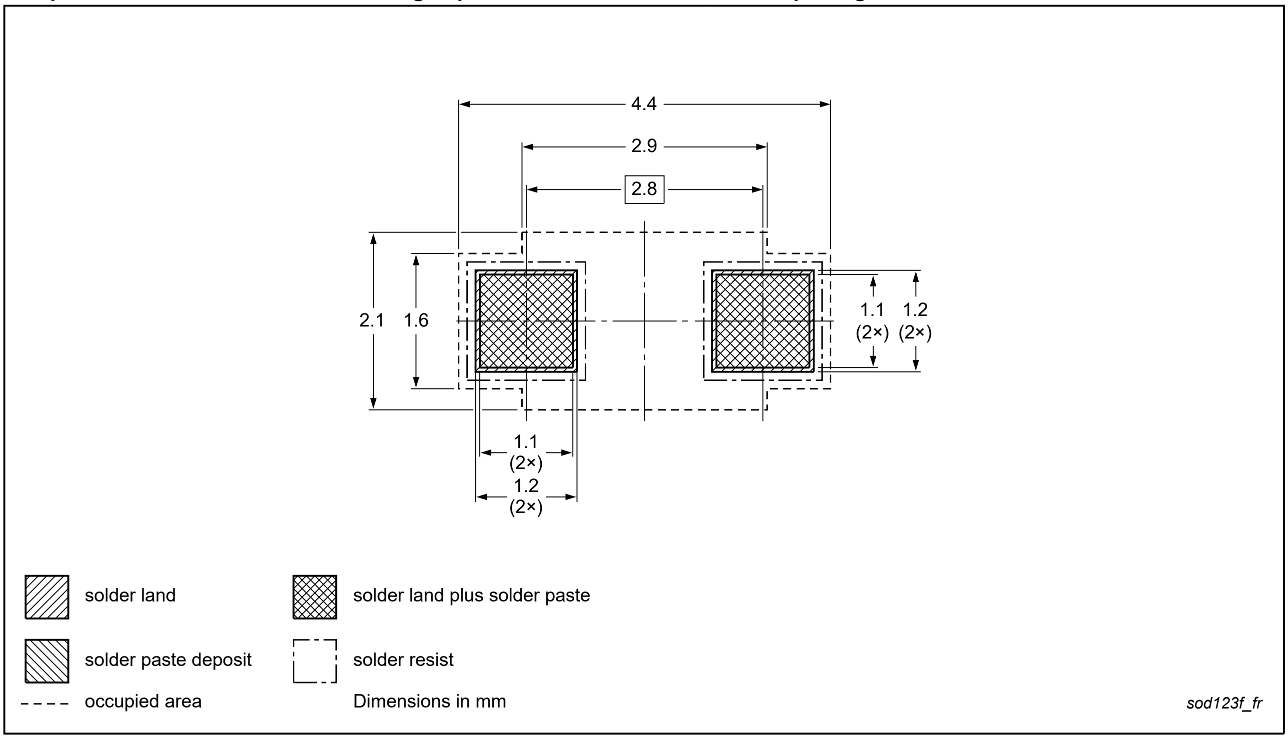



**Fig. 13. Reflow soldering footprint for SOD123F**

## 14. Revision history

**Table 8. Revision history**

| Data sheet ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| BAT46WH-Q v.1 | 20230320 | 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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