



# BAS21TH

## High-voltage switching diode

18 January 2019

Product data sheet

### 1. General description

High-voltage switching diode, encapsulated in a small SOT23 (TO-236AB) Surface-Mounted Device (SMD) plastic package.

### 2. Features and benefits

- Switching speed max. 50 ns
- Reverse voltage  $V_R \leq 200$  V
- Repetitive peak reverse voltage  $V_{RRM} \leq 250$  V
- Small SMD plastic package
- High-temperature applications up to 175 °C
- AEC-Q101 qualified

### 3. Applications

- High-speed switching
- General-purpose switching

### 4. Quick reference data

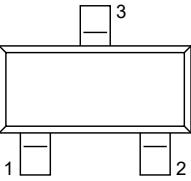
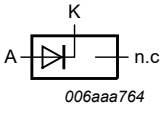
Table 1. Quick reference data

| Symbol    | Parameter                       | Conditions  | Min | Typ | Max  | Unit |
|-----------|---------------------------------|---|-----|-----|------|------|
| $V_{RRM}$ | repetitive peak reverse voltage |   | -   | -   | 250  | V    |
| $I_F$     | forward current                 | [1]   | -   | -   | 200  | mA   |
| $V_R$     | reverse voltage                 |   | -   | -   | 200  | V    |
| $V_F$     | forward voltage                 | $I_F = 200$ mA; $t_p \leq 300$ $\mu$ s; $\delta \leq 0.02$ ; pulsed       | -   | -   | 1.25 | V    |
| $I_R$     | reverse current                 | $V_R = 200$ V   | -   | -   | 100  | nA   |
| $t_{rr}$  | reverse recovery time           | $I_F = 30$ mA; $I_R = 30$ mA; $R_L = 100$ $\Omega$ ; $I_{R(meas)} = 3$ mA | -   | -   | 50   | ns   |

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-side copper, tin-plated and standard footprint.

## 5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description   | Simplified outline  | Graphic symbol   |
|-----|--------|---------------|---|--|
| 1   | A      | anode         |  <p style="text-align: center;"><b>SOT23</b></p> |  <p style="text-align: center;">006aaa764</p> |
| 2   | n.c.   | not connected |   |  |
| 3   | K      | cathode       |   |  |

## 6. Ordering information

Table 3. Ordering information

| Type number | Package |  |         |
|-------------|---------|--|---------|
|             | Name    | Description  | Version |
| BAS21TH     | SOT23   | plastic, surface-mounted package; 3 terminals; 1.9 mm pitch; 2.9 mm x 1.3 mm x 1 mm body | SOT23   |

## 7. Marking

Table 4. Marking codes

| Type number | Marking code <sup>[1]</sup> |
|-------------|-----------------------------|
| BAS21TH     | VX%                         |

[1] % = placeholder for manufacturing site code

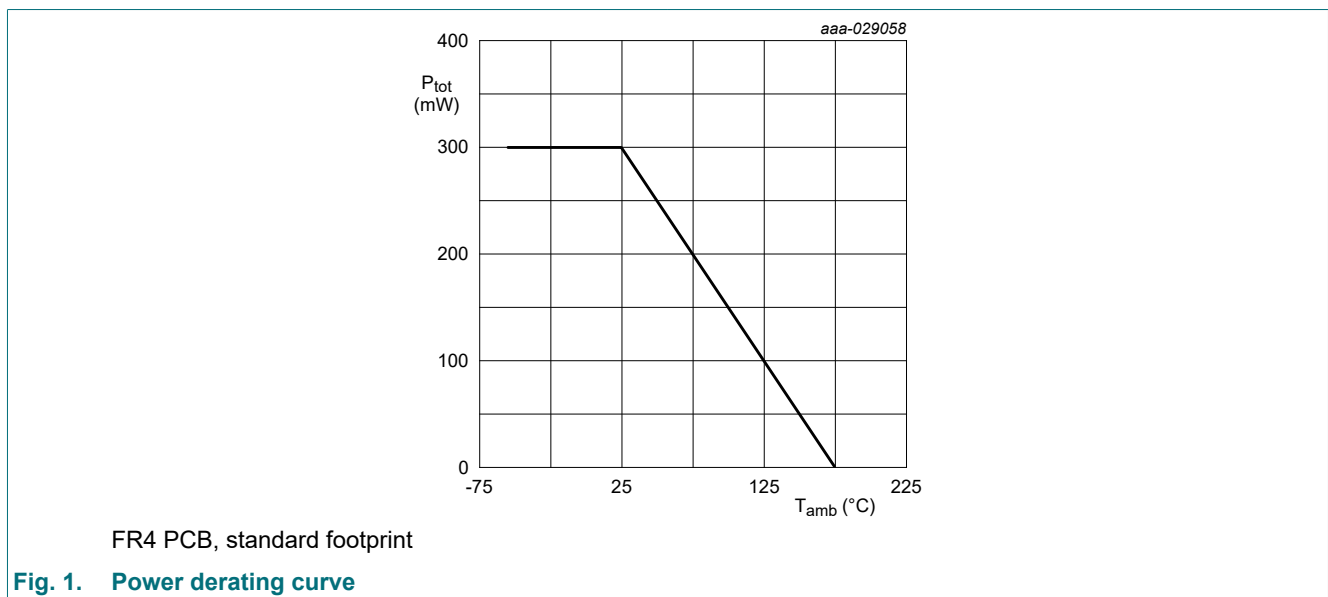
## 8. Limiting values

**Table 5. Limiting values**

In accordance with the Absolute Maximum Rating System (IEC 60134).  $T_j = 25\text{ °C}$  unless otherwise specified.

| Symbol           | Parameter                           | Conditions   | Min | Max | Unit |
|------------------|-------------------------------------|--|-----|-----|------|
| $V_{RRM}$        | repetitive peak reverse voltage     |  | -   | 250 | V    |
| $V_R$            | reverse voltage                     |  | -   | 200 | V    |
| $I_F$            | forward current                     |  | [1] | 200 | mA   |
| $I_{FSM}$        | non-repetitive peak forward current | $t_p = 1\ \mu\text{s}; T_{j(\text{init})} = 25\text{ °C};$   | -   | 9   | A    |
|                  |                                     | $t_p = 100\ \mu\text{s}; T_{j(\text{init})} = 25\text{ °C};$ | -   | 3   | A    |
|                  |                                     | $t_p = 10\ \text{ms}; T_{j(\text{init})} = 25\text{ °C};$    | -   | 1.7 | A    |
| $I_{FRM}$        | repetitive peak forward current     | $t_p \leq 1\ \text{ms}; \delta = 0.25$                       | -   | 625 | mA   |
| $P_{\text{tot}}$ | total power dissipation             | $T_{\text{amb}} \leq 25\text{ °C}$                           | [1] | 300 | mW   |
| $T_j$            | junction temperature                |  | -   | 175 | °C   |
| $T_{\text{amb}}$ | ambient temperature                 |  | -55 | 175 | °C   |
| $T_{\text{stg}}$ | storage temperature                 |  | -65 | 175 | °C   |

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-side copper, tin-plated and standard footprint.



## 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] [2] | -   | 500 | K/W  |
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point |             | [3]     | -   | 330 | K/W  |

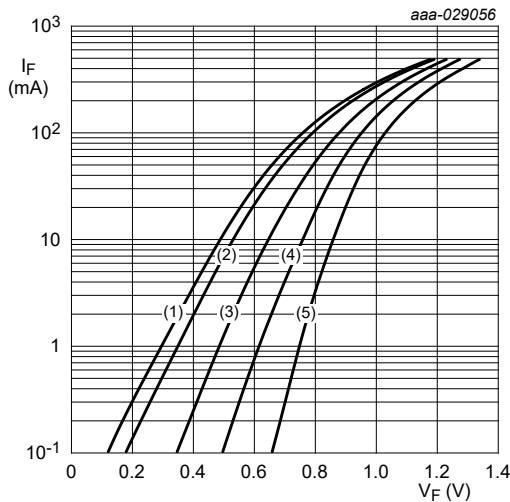
- [1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-side copper, tin-plated and standard footprint.
- [2] Thermal runaway has to be considered, as in some applications the reverse power losses  $P_R$  are a significant part of the total power losses.
- [3] Soldering point of cathode tab.

## 10. Characteristics

Table 7. Characteristics

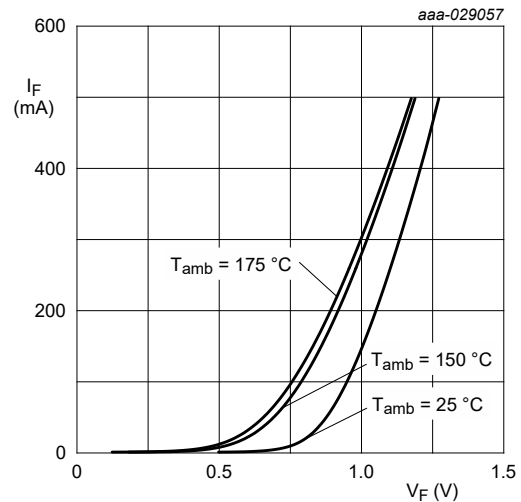
$T_j = 25\text{ °C}$  unless otherwise specified.

| Symbol   | Parameter             | Conditions  | Min | Typ | Max  | Unit          |
|----------|-----------------------|---|-----|-----|------|---------------|
| $V_F$    | forward voltage       | $I_F = 100\text{ mA}$ ; $t_p \leq 300\text{ }\mu\text{s}$ ; $\delta \leq 0.02$ ; pulsed               | -   | -   | 1    | V             |
|          |                       | $I_F = 200\text{ mA}$ ; $t_p \leq 300\text{ }\mu\text{s}$ ; $\delta \leq 0.02$ ; pulsed               | -   | -   | 1.25 | V             |
| $I_R$    | reverse current       | $V_R = 200\text{ V}$  | -   | -   | 100  | nA            |
|          |                       | $V_R = 200\text{ V}$ ; $T_j = 150\text{ °C}$  | -   | -   | 100  | $\mu\text{A}$ |
| $C_d$    | diode capacitance     | $V_R = 0\text{ V}$ ; $f = 1\text{ MHz}$   | -   | -   | 5    | pF            |
| $t_{rr}$ | reverse recovery time | $I_F = 30\text{ mA}$ ; $I_R = 30\text{ mA}$ ; $R_L = 100\text{ }\Omega$ ; $I_{R(meas)} = 3\text{ mA}$ | -   | -   | 50   | ns            |



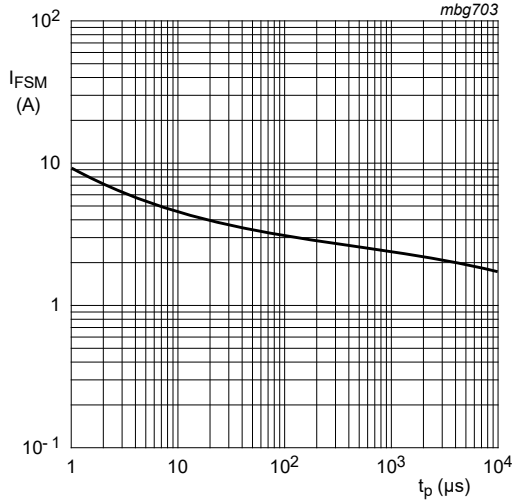
- (1)  $T_j = 175\text{ °C}$
- (2)  $T_j = 150\text{ °C}$
- (3)  $T_j = 85\text{ °C}$
- (4)  $T_j = 25\text{ °C}$
- (5)  $T_j = -40\text{ °C}$

Fig. 2. Forward current as a function of forward voltage; typical values



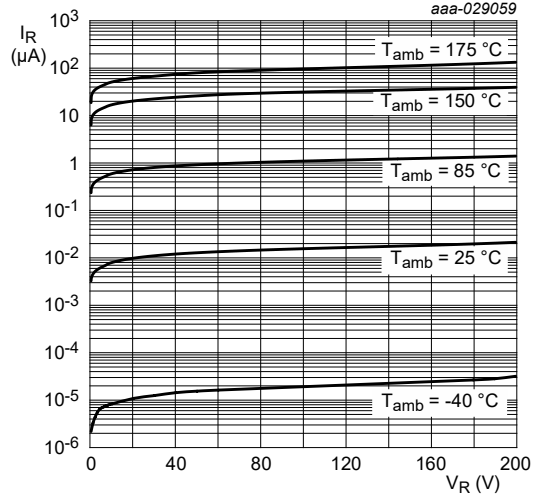
- (1)  $T_j = 175\text{ °C}$
- (2)  $T_j = 150\text{ °C}$
- (3)  $T_j = 25\text{ °C}$

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

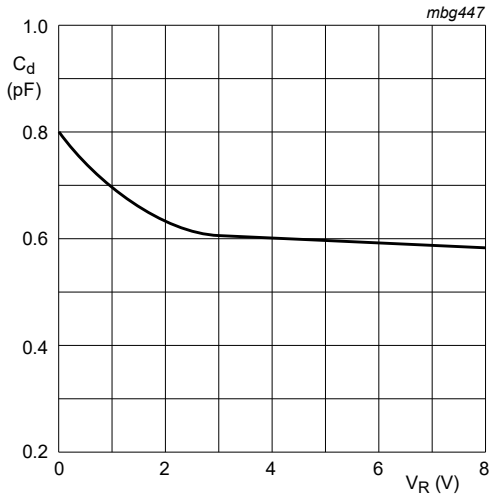


Based on square wave currents.  
 $T_j = 25^\circ C$  prior to surge.

**Fig. 4. Non-repetitive peak forward current as a function of pulse duration; maximum values**

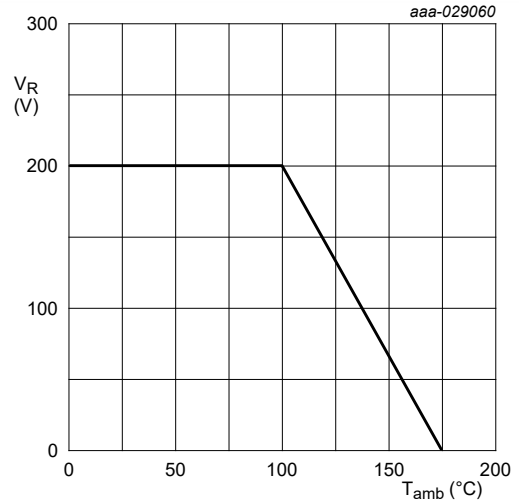


**Fig. 5. Reverse current as a function of reverse voltage; typical values**



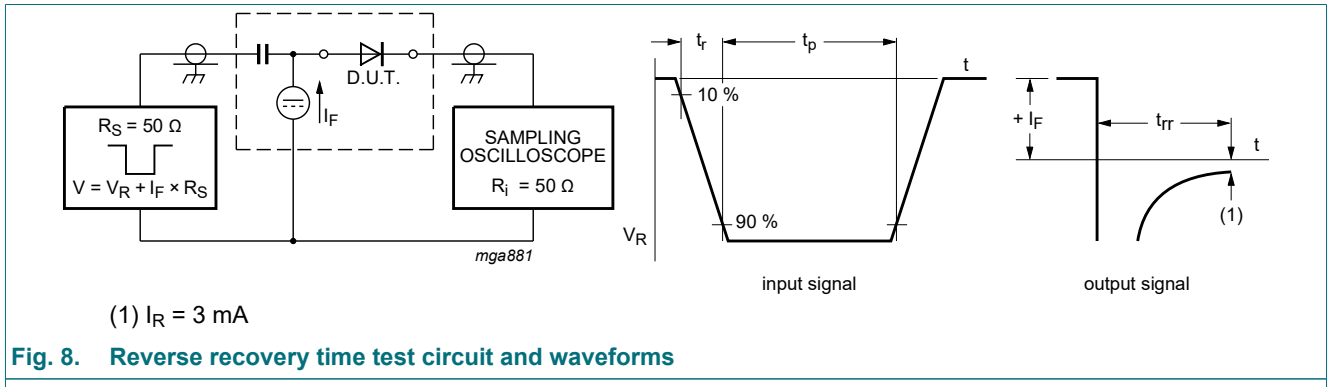
$f = 1\text{ MHz}$   
 $T_j = 25^\circ C$ .

**Fig. 6. Diode capacitance as a function of reverse voltage; typical values.**



**Fig. 7. Maximum continuous reverse voltage as a function of ambient temperature**

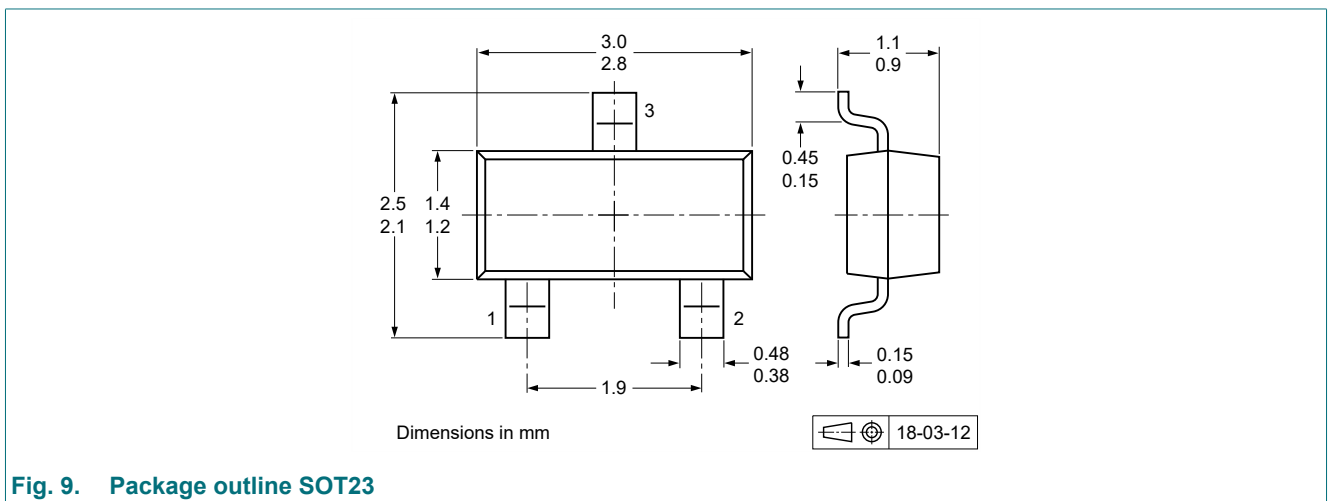
### 11. Test information



#### 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



### 13. Soldering

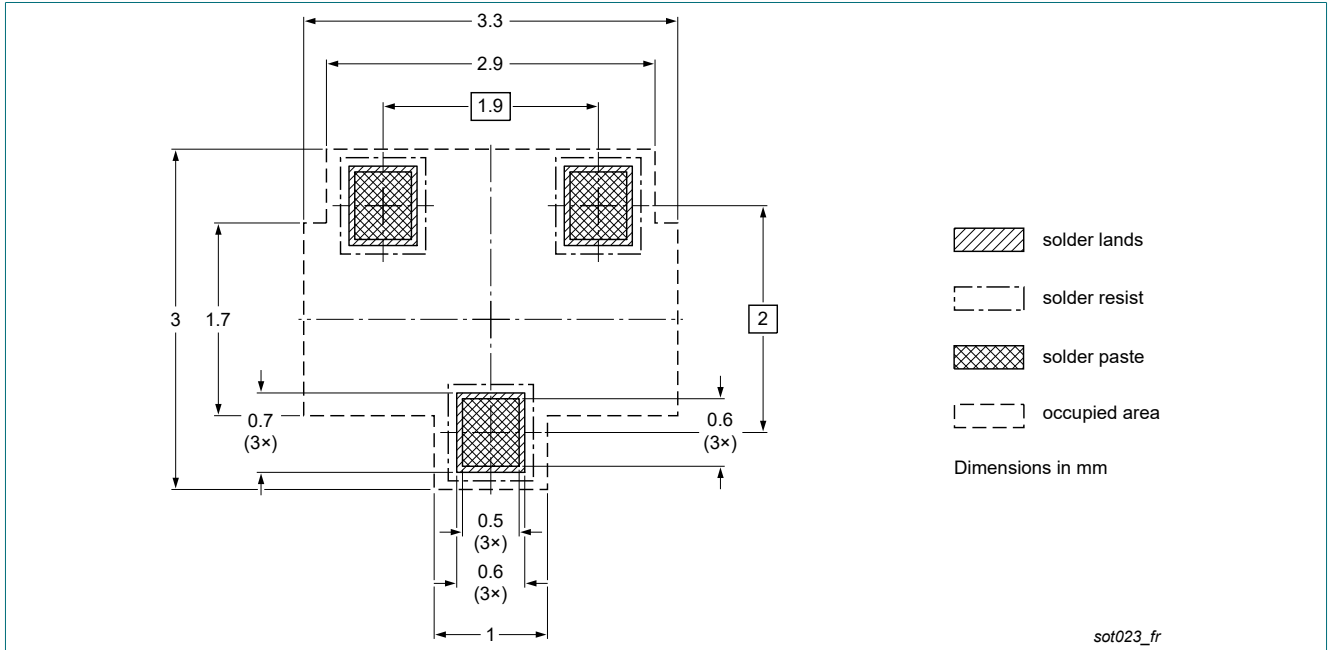


Fig. 10. Reflow soldering footprint for SOT23

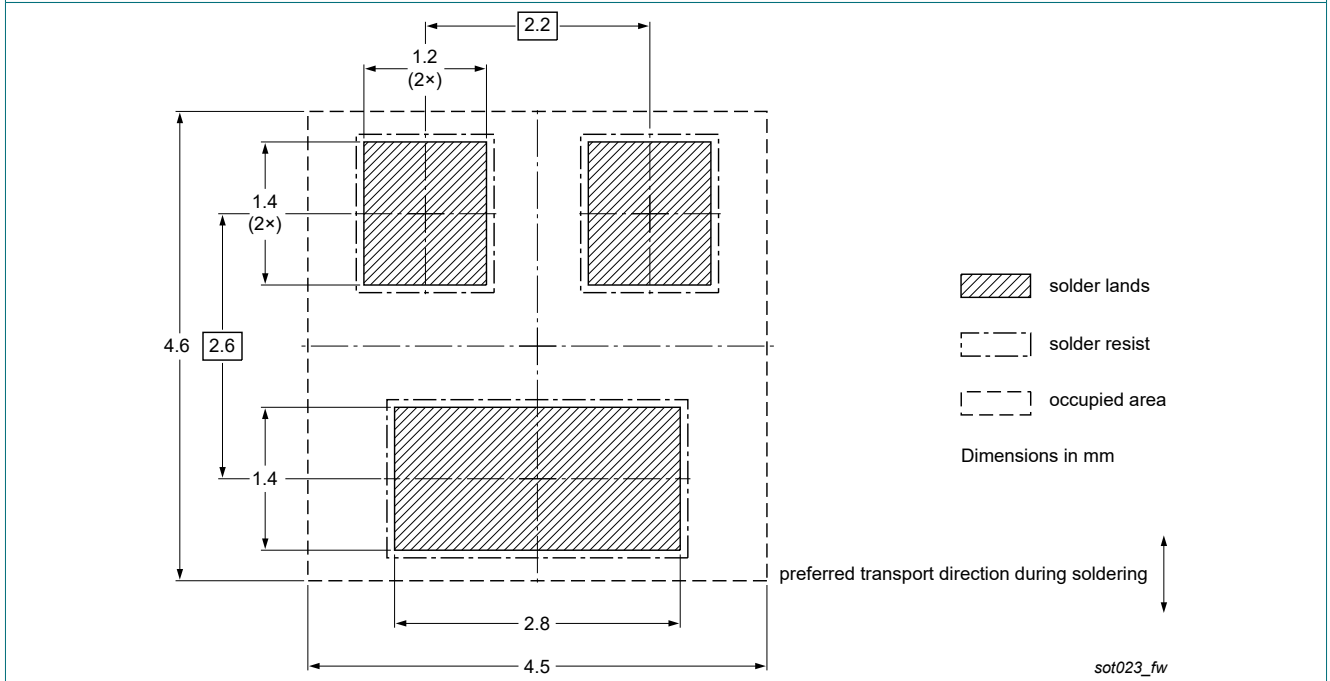


Fig. 11. Wave soldering footprint for SOT23

## 14. Revision history

Table 8. Revision history

| Data sheet ID  | Release date  | Data sheet status  | Change notice | Supersedes  |
|----------------|---|--------------------|---------------|-------------|
| BAS21TH v.2    | 20190119  | Product data sheet | -             | BAS21TH v.1 |
| Modifications: | • Characteristics: Figure 5 y-scale unit corrected to $\mu\text{A}$ |                    |               |             |
| BAS21TH v.1    | 20181207  | 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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Date of release: 18 January 2019

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