



# 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

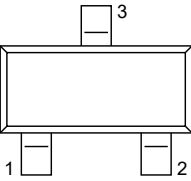
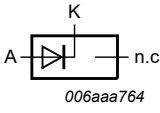
Table 1. Quick reference data

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>	
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

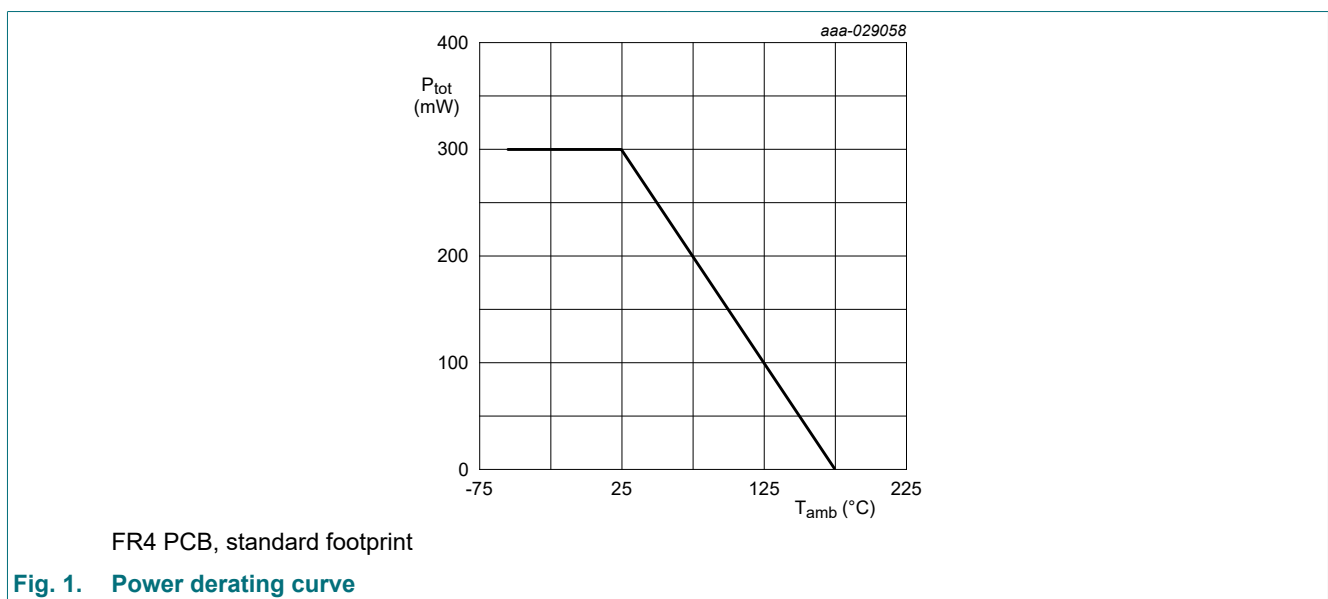
## 8. Limiting values

**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

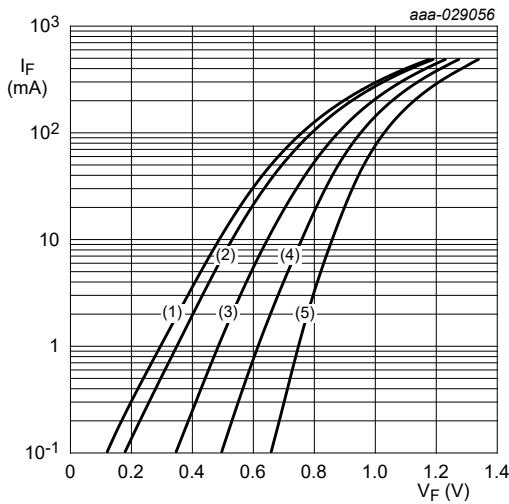
- [1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-side copper, tin-plated and standard footprint.
- [2] Thermal runaway has to be considered, as in some applications the reverse power losses  $P_R$  are a significant part of the total power losses.
- [3] Soldering point of cathode tab.

## 10. Characteristics

Table 7. Characteristics

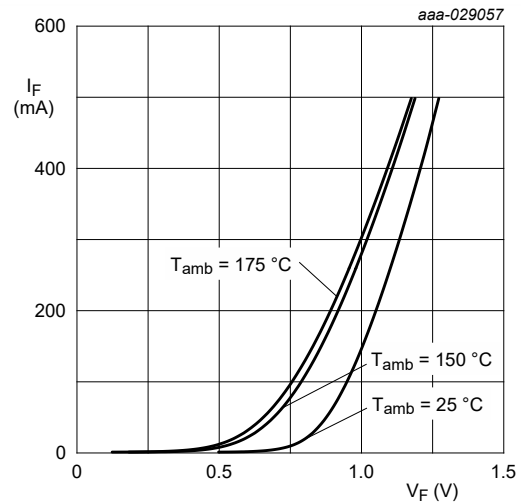
$T_j = 25\text{ °C}$  unless otherwise specified.

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



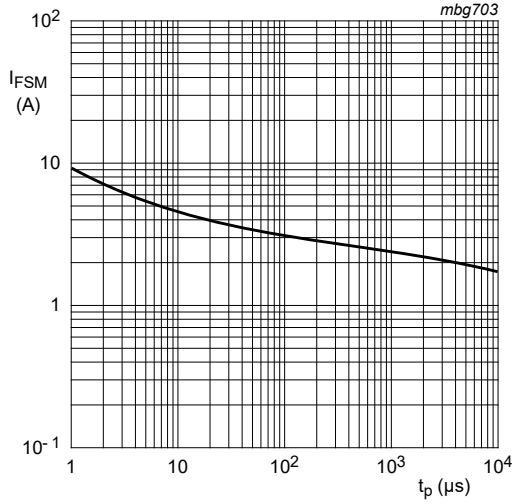
- (1)  $T_j = 175\text{ °C}$
- (2)  $T_j = 150\text{ °C}$
- (3)  $T_j = 85\text{ °C}$
- (4)  $T_j = 25\text{ °C}$
- (5)  $T_j = -40\text{ °C}$

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



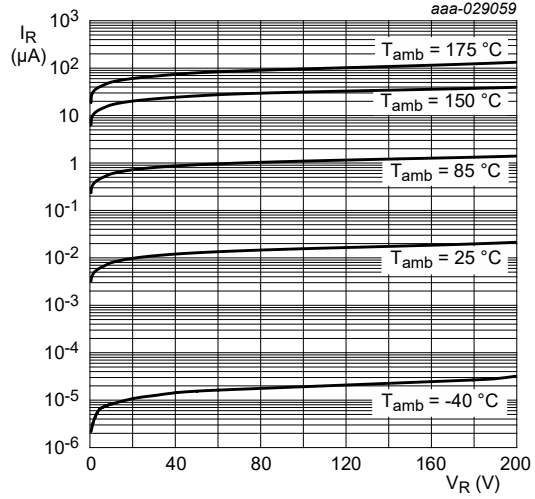
- (1)  $T_j = 175\text{ °C}$
- (2)  $T_j = 150\text{ °C}$
- (3)  $T_j = 25\text{ °C}$

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

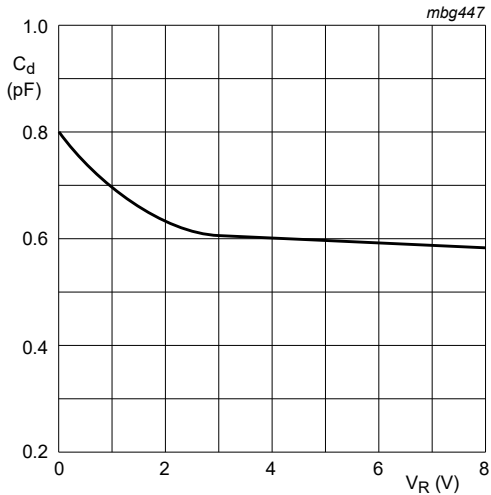


Based on square wave currents.  
 $T_j = 25\text{ }^\circ\text{C}$  prior to surge.

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

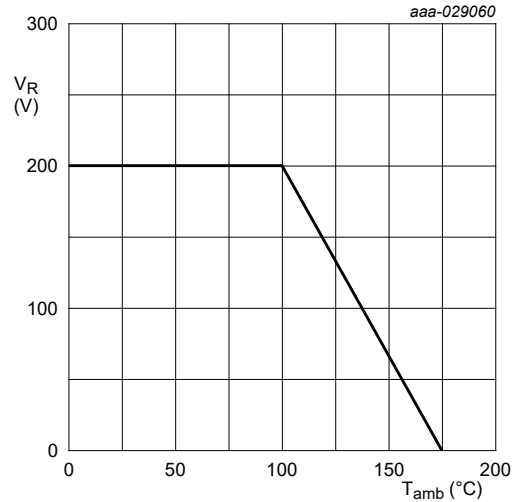


**Fig. 5. Reverse current as a function of reverse voltage; typical values**



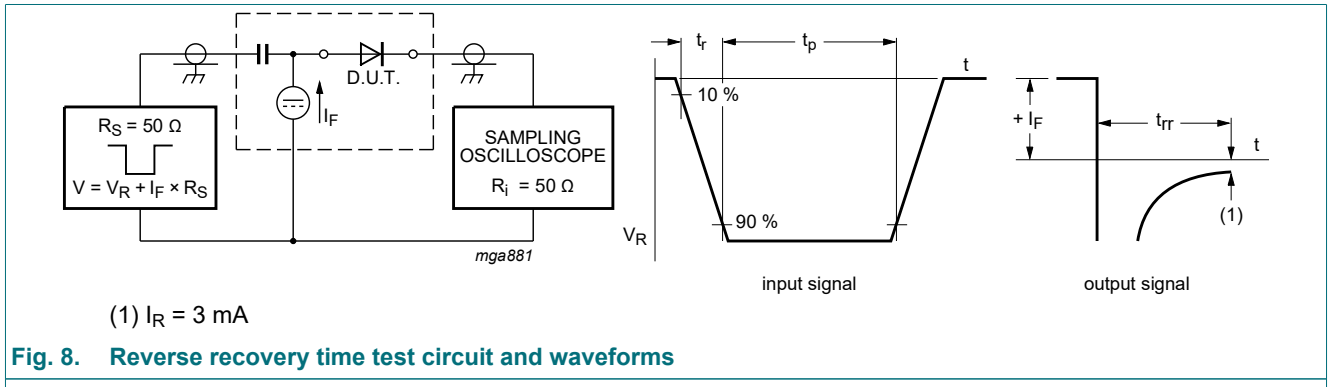
$f = 1\text{ MHz}$   
 $T_j = 25\text{ }^\circ\text{C}$ .

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



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

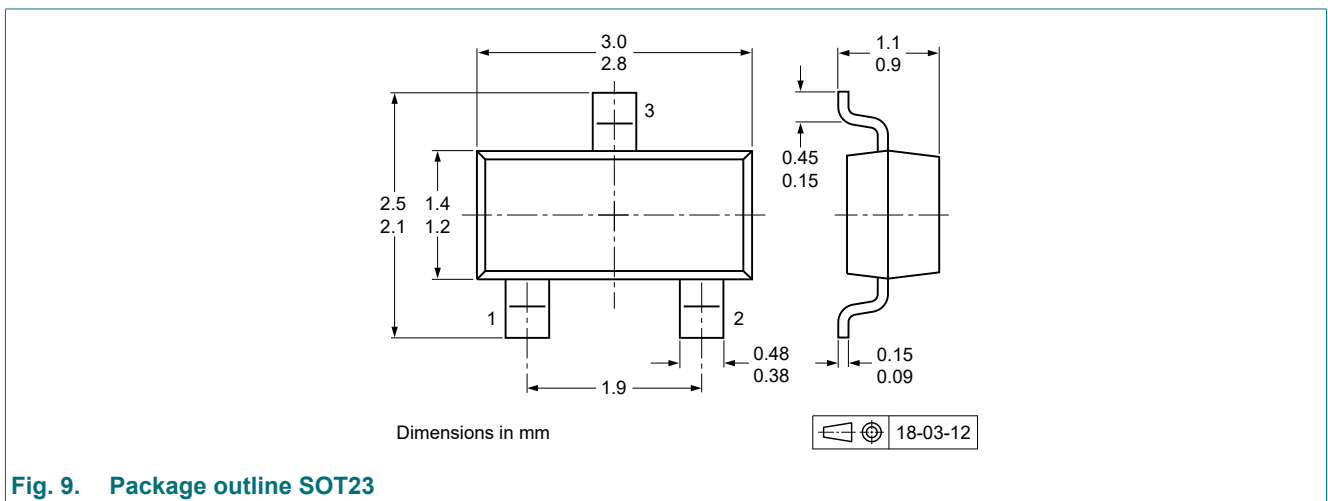
### 11. Test information



#### 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

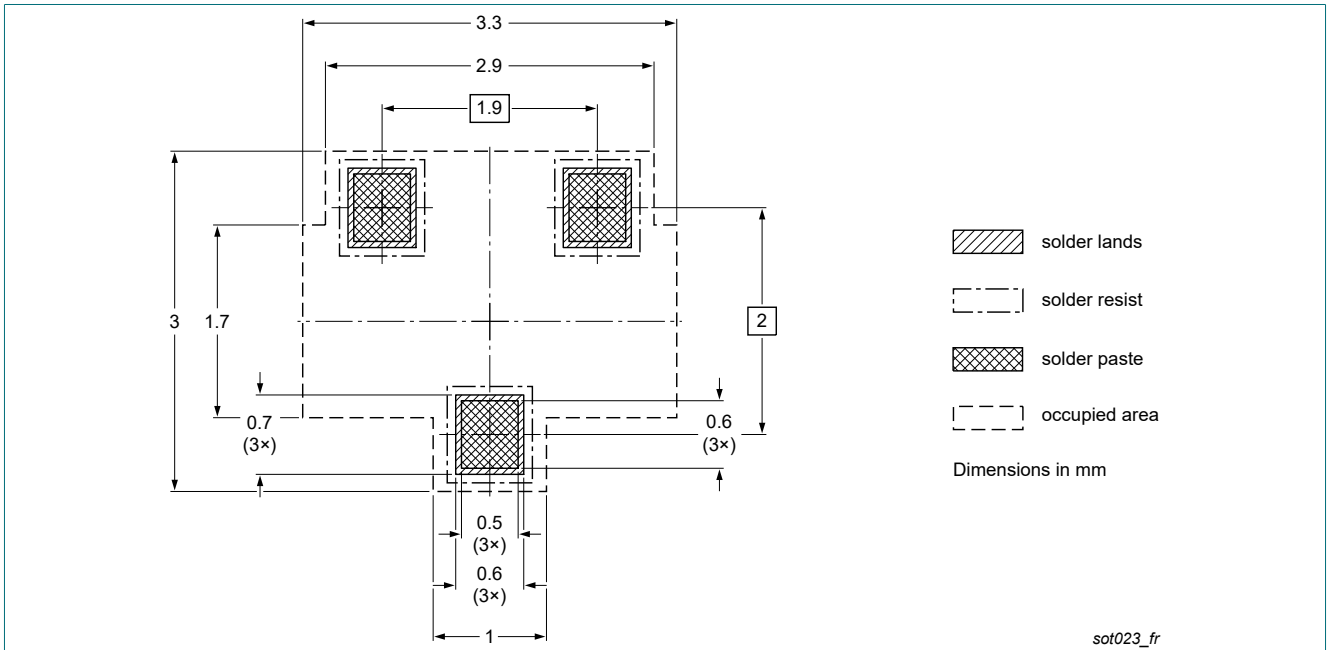


Fig. 10. Reflow soldering footprint for SOT23

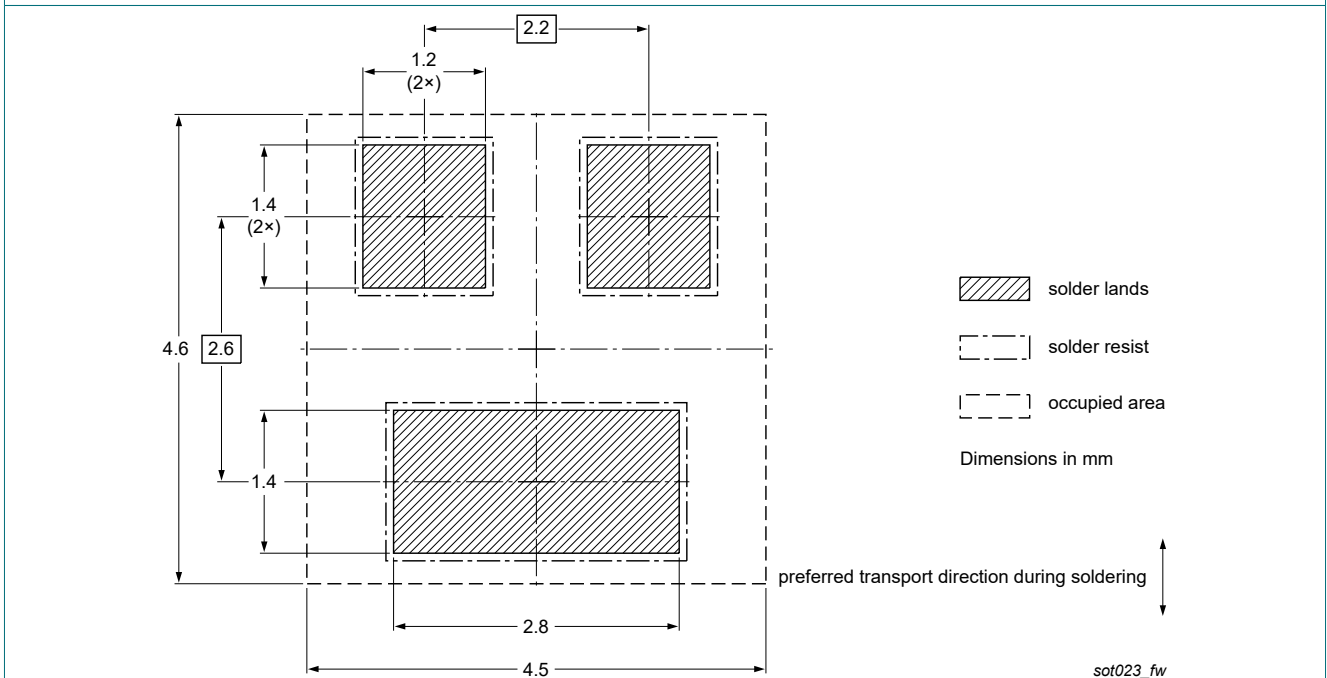


Fig. 11. Wave soldering footprint for SOT23

## 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".
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