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

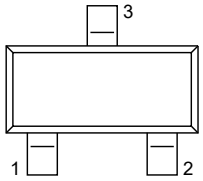
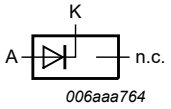
Table 1. Quick reference data

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 µs; $\delta \leq$ 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 Ω; $I_{R(meas)}$ = 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	 SOT23	
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[1]
BAS21TH	VX%

[1] % = placeholder for manufacturing site code

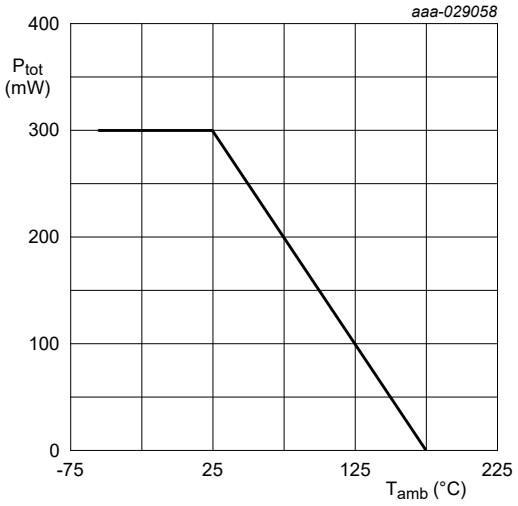
8. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). T_j = 25 °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 µs; $T_{j(init)}$ = 25 °C;		-	9	A
		t_p = 100 µs; $T_{j(init)}$ = 25 °C;		-	3	A
		t_p = 10 ms; $T_{j(init)}$ = 25 °C;		-	1.7	A
I_{FRM}	repetitive peak forward current	$t_p \leq$ 1 ms; δ = 0.25		-	625	mA
P_{tot}	total power dissipation	$T_{amb} \leq$ 25 °C	[1]	-	300	mW
T_j	junction temperature			-	175	°C
T_{amb}	ambient temperature			-55	175	°C
T_{stg}	storage temperature			-65	175	°C

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



FR4 PCB, standard footprint

Fig. 1. Power derating curve

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

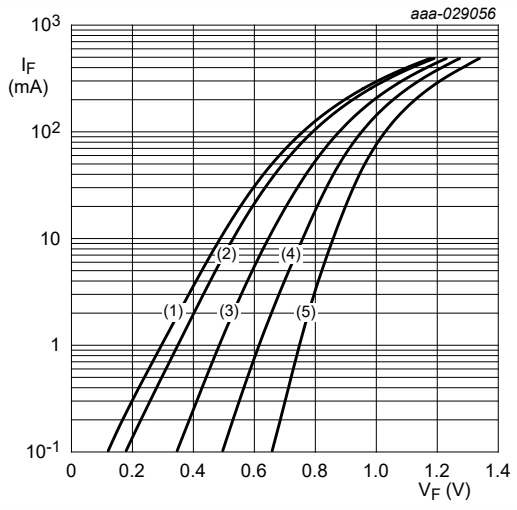
[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-side copper, tin-plated and standard footprint.
[2] Thermal runaway has to be considered, as in some applications the reverse power losses P_R are a significant part of the total power losses.
[3] Soldering point of cathode tab.

10. Characteristics

Table 7. Characteristics

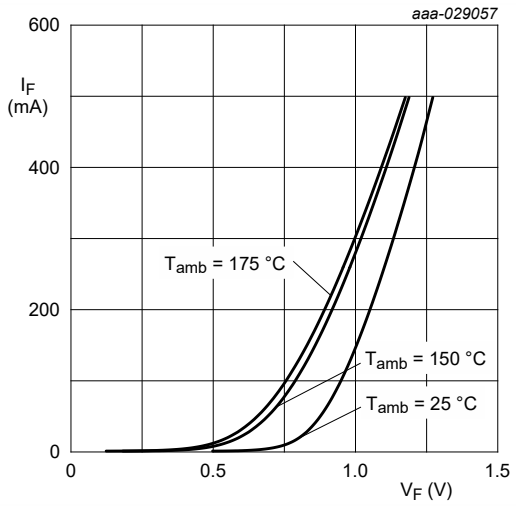
T_j = 25 °C unless otherwise specified.

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



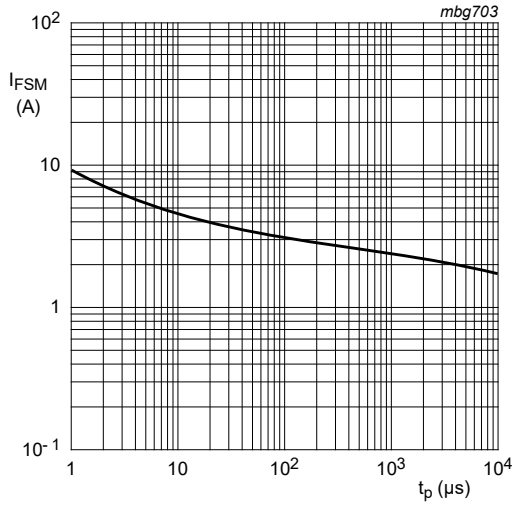
(1) T_j = 175 °C
(2) T_j = 150 °C
(3) T_j = 85 °C
(4) T_j = 25 °C
(5) T_j = −40 °C

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



(1) T_j = 175 °C
(2) T_j = 150 °C
(3) T_j = 25 °C

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



Based on square wave currents.
T_j = 25 °C prior to surge.

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

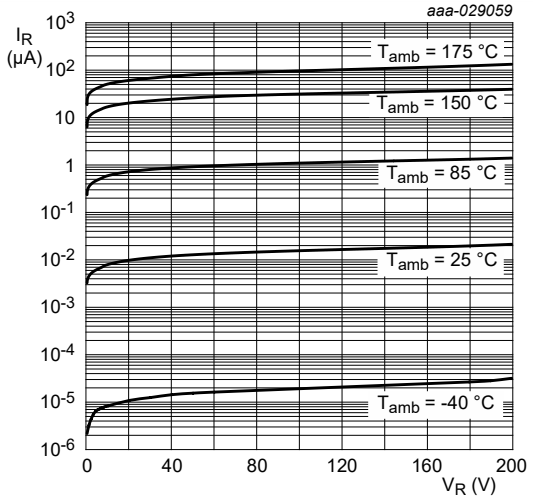
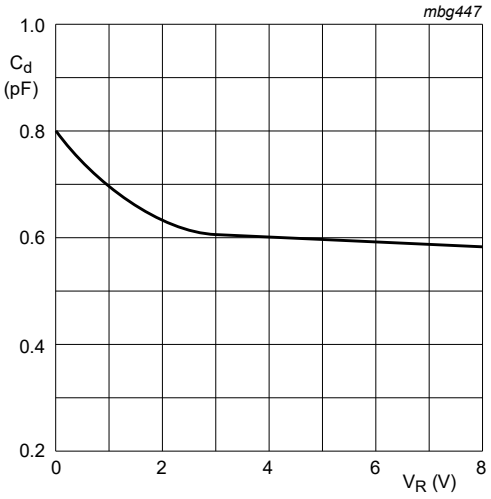


Fig. 5. Reverse current as a function of reverse voltage; typical values



f = 1 MHz
T_j = 25 °C.

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

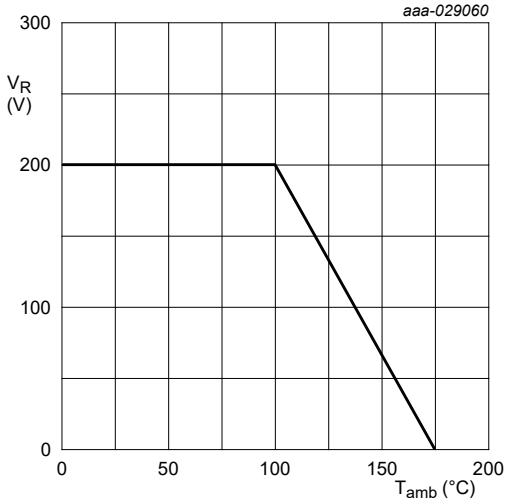
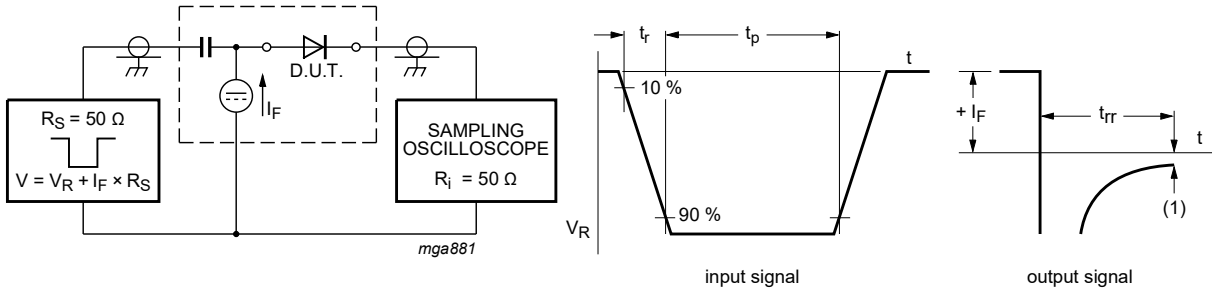


Fig. 7. Maximum continuous reverse voltage as a function of ambient temperature

11. Test information



(1) I_R = 3 mA

Fig. 8. Reverse recovery time test circuit and waveforms

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

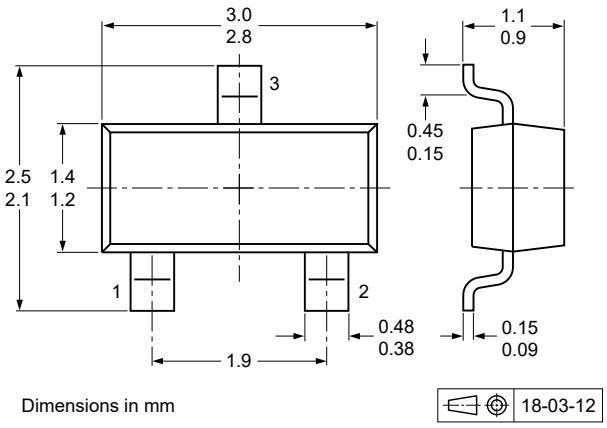


Fig. 9. Package outline SOT23

13. Soldering

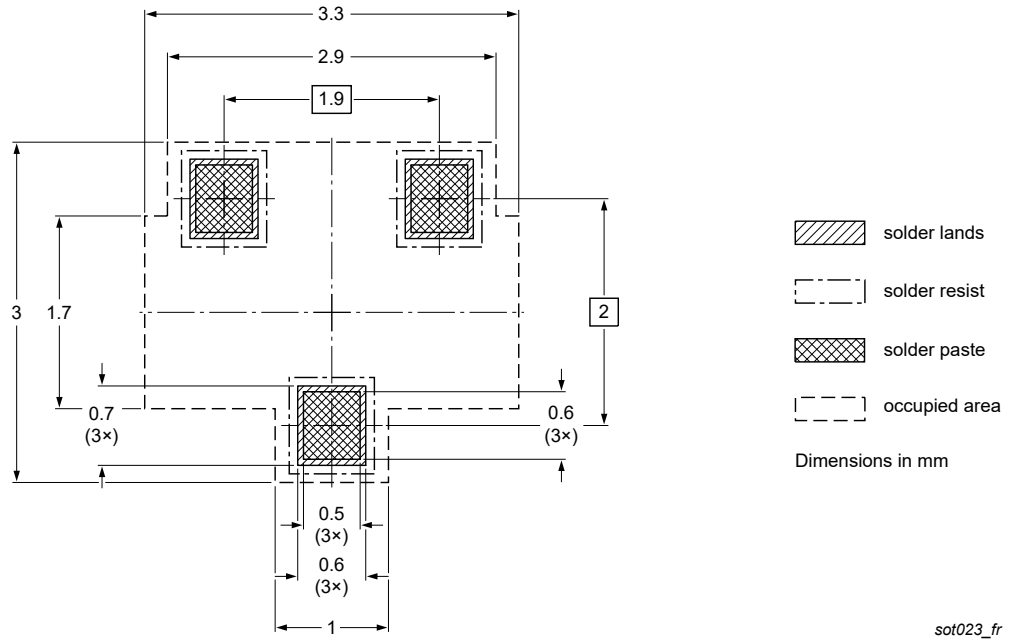


Fig. 10. Reflow soldering footprint for SOT23

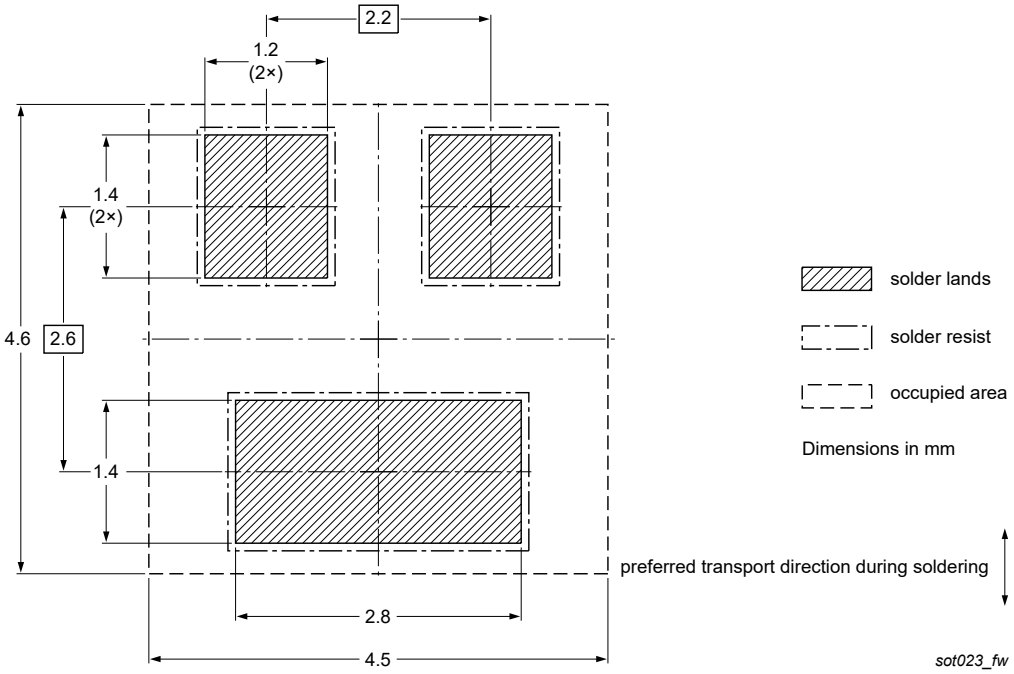


Fig. 11. Wave soldering footprint for SOT23

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 µA			
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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