



# BAS21W series

## High-voltage switching diodes

Rev. 01 — 9 October 2009

Product data sheet

## 1. Product profile

### 1.1 General description

High-voltage switching diodes, encapsulated in a very small Surface-Mounted Device (SMD) plastic package.

Table 1. Product overview

Type number	Configuration	Package		Package configuration
		Nexperia	JEDEC	
BAS21W	single	SOT323	SC-70	very small
BAS21AW	dual common anode			
BAS21SW	dual series			

### 1.2 Features

- High switching speed:  $t_{rr} \leq 50$  ns
- Low leakage current
- High reverse voltage:  $V_R \leq 250$  V
- Low capacitance:  $C_d \leq 2$  pF
- Very small SMD plastic package
- AEC-Q101 qualified

### 1.3 Applications

- High-speed switching
- General-purpose switching
- Voltage clamping
- Reverse polarity protection

### 1.4 Quick reference data

Table 2. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per diode</b>						
$I_F$	forward current		[1] -	-	225	mA
$I_R$	reverse current	$V_R = 200$ V	-	-	100	nA
$V_R$	reverse voltage		-	-	250	V
$t_{rr}$	reverse recovery time		[2] -	-	50	ns

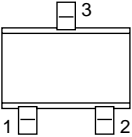
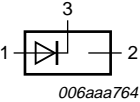
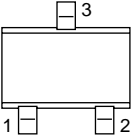
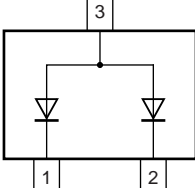
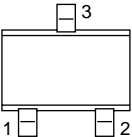
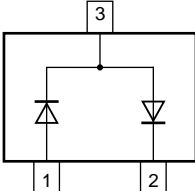
[1] Single diode loaded.

[2] When switched from  $I_F = 10$  mA to  $I_R = 10$  mA;  $R_L = 100$   $\Omega$ ; measured at  $I_R = 1$  mA.

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## 2. Pinning information

Table 3. Pinning

Pin	Description	Simplified outline	Graphic symbol
<b>BAS21W</b>			
1	anode		
2	not connected		
3	cathode		
<b>BAS21AW</b>			
1	cathode (diode 1)		
2	cathode (diode 2)		
3	common anode		
<b>BAS21SW</b>			
1	anode (diode 1)		
2	cathode (diode 2)		
3	cathode (diode 1), anode (diode 2)		

## 3. Ordering information

Table 4. Ordering information

Type number	Package		Version
	Name	Description	
BAS21W	SC-70	plastic surface-mounted package; 3 leads	SOT323
BAS21AW			
BAS21SW			

## 4. Marking

**Table 5. Marking codes**

Type number	Marking code <sup>[1]</sup>
BAS21W	X4*
BAS21AW	X6*
BAS21SW	X5*

- [1] \* = -: made in Hong Kong  
 \* = p: made in Hong Kong  
 \* = t: made in Malaysia  
 \* = W: made in China

## 5. Limiting values

**Table 6. Limiting values**

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

Symbol	Parameter	Conditions	Min	Max	Unit	
<b>Per diode</b>						
$V_R$	reverse voltage		-	250	V	
$I_F$	forward current		[1] -	225	mA	
			[2] -	125	mA	
$I_{FRM}$	repetitive peak forward current		-	625	mA	
$I_{FSM}$	non-repetitive peak forward current	square wave	[3]			
		$t_p = 1 \mu\text{s}$		-	9	A
		$t_p = 100 \mu\text{s}$		-	3	A
		$t_p = 10 \text{ms}$		-	1.7	A
<b>Per device</b>						
$P_{\text{tot}}$	total power dissipation	$T_{\text{amb}} \leq 25 \text{ }^\circ\text{C}$	[4] -	200	mW	
$T_j$	junction temperature		-	150	$^\circ\text{C}$	
$T_{\text{amb}}$	ambient temperature		-55	+150	$^\circ\text{C}$	
$T_{\text{stg}}$	storage temperature		-65	+150	$^\circ\text{C}$	

[1] Single diode loaded.

[2] Double diode loaded.

[3]  $T_j = 25 \text{ }^\circ\text{C}$  prior to surge.

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

## 6. Thermal characteristics

**Table 7. Thermal characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per device</b>						
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	625	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		-	-	300	K/W

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

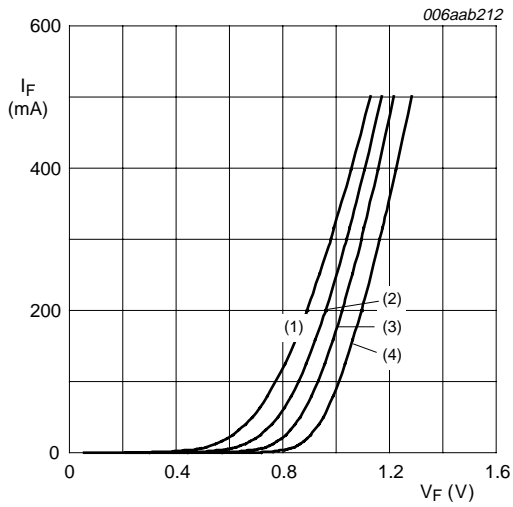
## 7. Characteristics

**Table 8. Characteristics**

$T_{amb} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

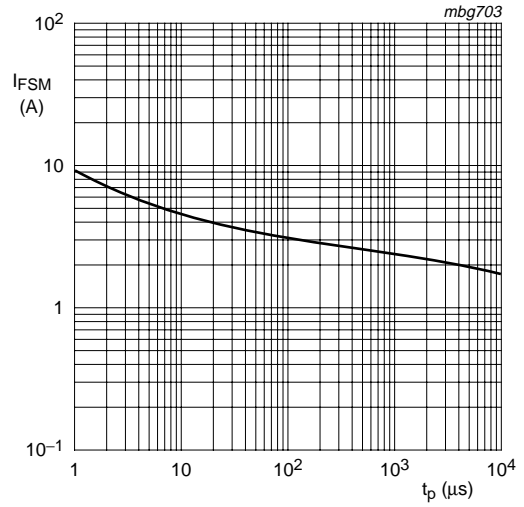
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per diode</b>						
$V_F$	forward voltage	$I_F = 100\text{ mA}$	-	-	1.0	V
		$I_F = 200\text{ mA}$	-	-	1.25	V
$I_R$	reverse current	$V_R = 200\text{ V}$	-	-	100	nA
		$V_R = 200\text{ V}; T_j = 150\text{ }^{\circ}\text{C}$	-	-	100	$\mu\text{A}$
$C_d$	diode capacitance	$f = 1\text{ MHz}; V_R = 0\text{ V}$	-	-	2	pF
$t_{rr}$	reverse recovery time		[1]	-	50	ns

[1] When switched from  $I_F = 10\text{ mA}$  to  $I_R = 10\text{ mA}$ ;  $R_L = 100\text{ }\Omega$ ; measured at  $I_R = 1\text{ mA}$ .



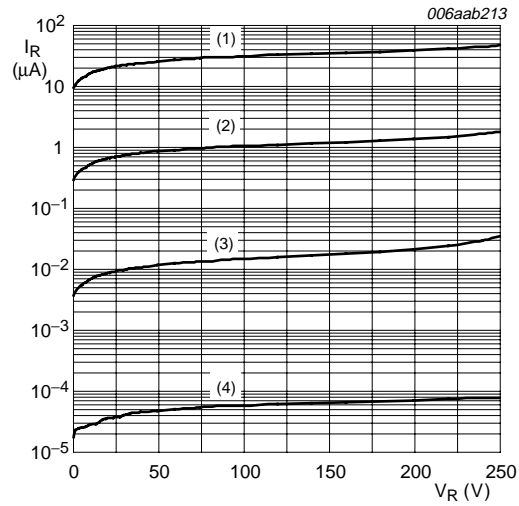
- (1)  $T_{amb} = 150\text{ °C}$
- (2)  $T_{amb} = 85\text{ °C}$
- (3)  $T_{amb} = 25\text{ °C}$
- (4)  $T_{amb} = -40\text{ °C}$

**Fig 1. Forward current as a function of forward voltage; typical values**



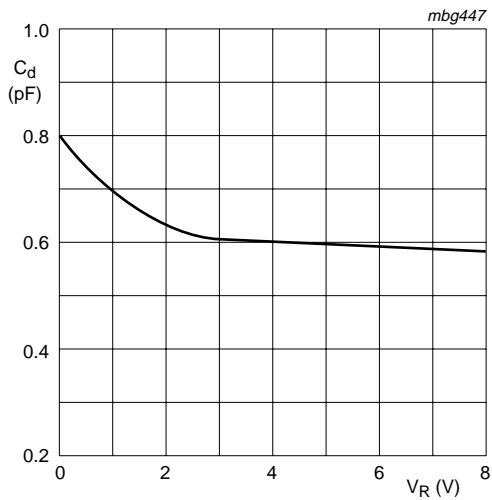
Based on square wave currents.  
 $T_j = 25\text{ °C}$ ; prior to surge

**Fig 2. Non-repetitive peak forward current as a function of pulse duration; maximum values**



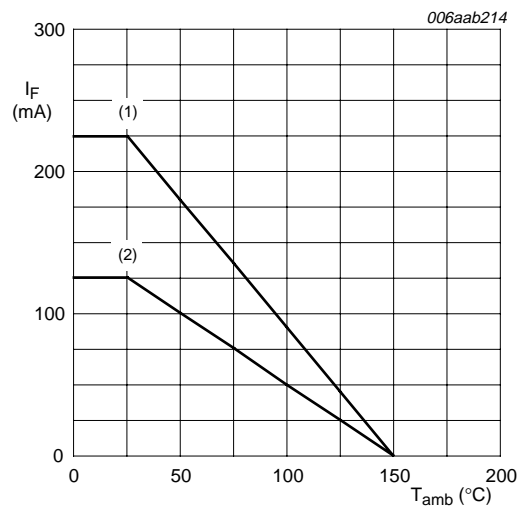
- (1)  $T_{amb} = 150\text{ °C}$
- (2)  $T_{amb} = 85\text{ °C}$
- (3)  $T_{amb} = 25\text{ °C}$
- (4)  $T_{amb} = -40\text{ °C}$

**Fig 3. Reverse current as a function of reverse voltage; typical values**



f = 1 MHz; T<sub>amb</sub> = 25 °C

**Fig 4.** Diode capacitance as a function of reverse voltage; typical values

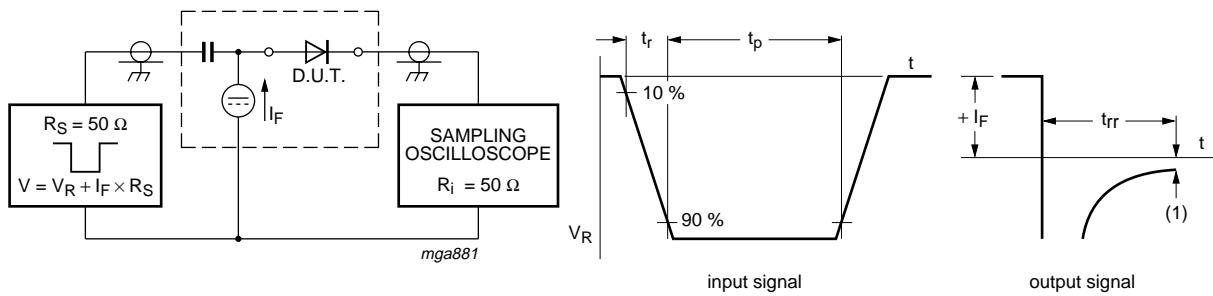


FR4 PCB, standard footprint

- (1) Single diode loaded.
- (2) Double diode loaded.

**Fig 5.** Forward current as a function of ambient temperature; derating curve

## 8. Test information



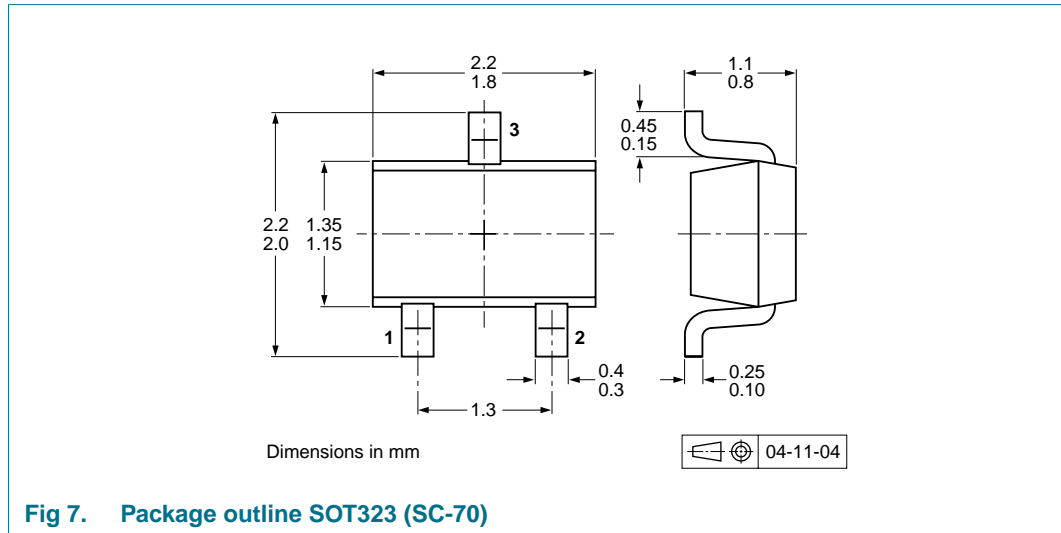
(1) I<sub>R</sub> = 1 mA

**Fig 6.** Reverse recovery time test circuit and waveforms

### 8.1 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.

## 9. Package outline



## 10. Packing information

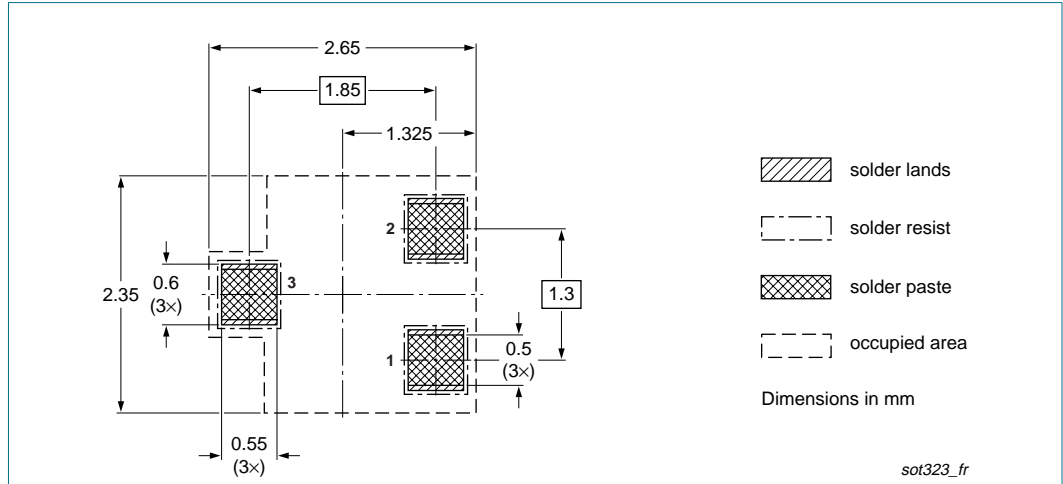
**Table 9. Packing methods**

The indicated -xxx are the last three digits of the 12NC ordering code.<sup>[1]</sup>

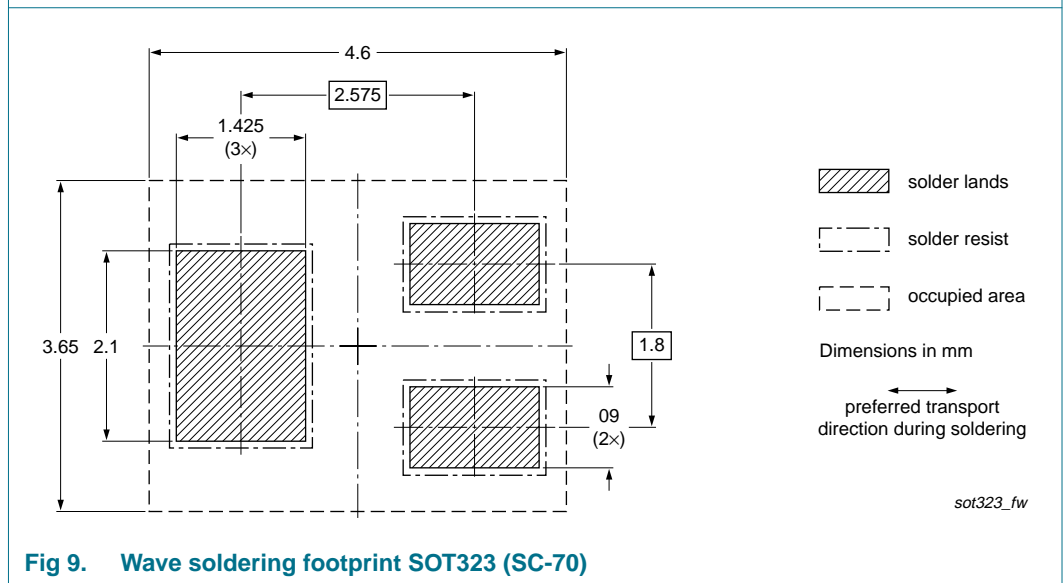
Type number	Package	Description	Packing quantity	
			3000	10000
BAS21W	SOT323	4 mm pitch, 8 mm tape and reel	-115	-135
BAS21AW				
BAS21SW				

[1] For further information and the availability of packing methods, see [Section 14](#).

**11. Soldering**



**Fig 8. Reflow soldering footprint SOT323 (SC-70)**



**Fig 9. Wave soldering footprint SOT323 (SC-70)**



## 12. Revision history

**Table 10. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
BAS21W_SER_1	20091009	Product data sheet	-	-

## 13. Legal information

### 13.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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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