# **BAV99** series

# High-speed switching diodes Rev. 8 — 18 November 2010

Product data sheet

#### 1. **Product profile**

### 1.1 General description

High-speed switching diodes, encapsulated in small Surface-Mounted Device (SMD) plastic packages.

Table 1. **Product overview** 

Type number	Package	Package		Configuration	Package	
	Nexperia	JEITA	JEDEC		configuration	
BAV99	SOT23	-	TO-236AB	dual series	small	
BAV99S	SOT363	SC-88	-	quadruple; 2 series	very small	
BAV99W	SOT323	SC-70	-	dual series	very small	

#### 1.2 Features and benefits

- High switching speed: t<sub>rr</sub> ≤ 4 ns
- Low leakage current
- Small SMD plastic packages
- Low capacitance: C<sub>d</sub> ≤ 1.5 pF
- Reverse voltage: V<sub>R</sub> ≤ 100 V
- AEC-Q101 qualified

### 1.3 Applications

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

#### 1.4 Quick reference data

Table 2. Quick reference data

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
Per diode						
I <sub>R</sub>	reverse current	$V_{R} = 80 \text{ V}$	-	-	0.5	μΑ
$V_R$	reverse voltage		-	-	100	V
t <sub>rr</sub>	reverse recovery time		[1] -	-	4	ns

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



### 2. Pinning information

Table 3. Pinning

Table 5.	ı ıııınıy		
Pin	Description	Simplified outline	Graphic symbol
BAV99; E	BAV99W		
1	anode (diode 1)		
2	cathode (diode 2)	3	3
3	cathode (diode 1), anode (diode 2)	1 2 006aaa144	
			006aaa763

BAV99S			
1	anode (diode 1)		
2	cathode (diode 2)	6 5 4	6 5 4
3	cathode (diode 3), anode (diode 4)	0	
4	anode (diode 3)	1 2 3	
5	cathode (diode 4)		1 2 3
6	cathode (diode 1), anode (diode 2)		006aab101

### 3. Ordering information

Table 4. Ordering information

Type number	Package	Package			
	Name	Description	Version		
BAV99	-	plastic surface-mounted package; 3 leads	SOT23		
BAV99S	SC-88	plastic surface-mounted package; 6 leads	SOT363		
BAV99W	SC-70	plastic surface-mounted package; 3 leads	SOT323		

### 4. Marking

Table 5. Marking codes

Type number	Marking code <sup>[1]</sup>
BAV99	A7*
BAV99S	K1*
BAV99W	A7*

[1] \* = placeholder for manufacturing site code

### 5. Limiting values

Table 6. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
Per diode					
$V_{RRM}$	repetitive peak reverse voltage		-	100	V
$V_R$	reverse voltage		-	100	V
I <sub>F</sub>	forward current				
	BAV99		<u>[1]</u> -	215	mA
			[2] -	125	mA
	BAV99S		<u>[1]</u> -	200	mA
	BAV99W		<u>[1]</u> -	150	mA
			[2] -	130	mA
I <sub>FRM</sub>	repetitive peak forward current		-	500	mA
I <sub>FSM</sub>	non-repetitive peak	square wave	<u>[3]</u>		
	forward current	t <sub>p</sub> = 1 μs	-	4	А
		$t_p = 1 \text{ ms}$	-	1	А
		$t_p = 1 s$	-	0.5	Α
P <sub>tot</sub>	total power dissipation		<u>[1][4]</u>		
	BAV99	$T_{amb} \le 25 ^{\circ}C$	-	250	mW
	BAV99S	$T_{sp} \le 85  ^{\circ}C$	<u>[5]</u> _	250	mW
	BAV99W	$T_{amb} \leq 25~^{\circ}C$	-	200	mW
Per device					
$T_j$	junction temperature		-	150	°C
T <sub>amb</sub>	ambient temperature		-65	+150	°C
$T_{stg}$	storage temperature		-65	+150	°C

<sup>[1]</sup> Single diode loaded.

<sup>[2]</sup> Double diode loaded.

<sup>[3]</sup>  $T_i = 25$  °C prior to surge.

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

<sup>[5]</sup> Soldering points at pins 2, 3, 5 and 6.

### 6. Thermal characteristics

Table 7. Thermal characteristics

14610 11	Thomas Grand Gold College					
Symbol	Parameter	Conditions	Min	Тур	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1][2]			
	BAV99		-	-	500	K/W
	BAV99W		-	-	625	K/W
R <sub>th(j-sp)</sub>	thermal resistance from junction to solder point					
	BAV99		-	-	360	K/W
	BAV99S		[3]	-	260	K/W
	BAV99W		-	-	300	K/W

<sup>[1]</sup> Single diode loaded.

### 7. Characteristics

Table 8. Characteristics

 $T_{amb}$  = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
Per diode	•					
$V_{F}$	forward voltage	I <sub>F</sub> = 1 mA	-	-	715	mV
		I <sub>F</sub> = 10 mA	-	-	855	mV
		I <sub>F</sub> = 50 mA	-	-	1	V
		I <sub>F</sub> = 150 mA	-	-	1.25	V
I <sub>R</sub>	reverse current	V <sub>R</sub> = 25 V	-	-	30	nA
		V <sub>R</sub> = 80 V	-	-	0.5	μΑ
		V <sub>R</sub> = 25 V; T <sub>j</sub> = 150 °C	-	-	30	μΑ
		V <sub>R</sub> = 80 V; T <sub>j</sub> = 150 °C	-	-	50	μΑ
$C_d$	diode capacitance	$f = 1 MHz; V_R = 0 V$	-	-	1.5	pF
t <sub>rr</sub>	reverse recovery time		<u>[1]</u> -	-	4	ns
$V_{FR}$	forward recovery voltage		[2] _	-	1.75	V

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

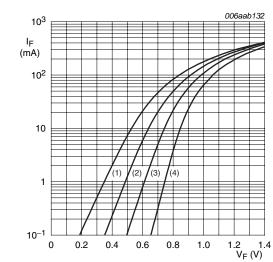
<sup>[2]</sup> Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

<sup>[3]</sup> Soldering points at pins 2, 3, 5 and 6.

<sup>[2]</sup> When switched from  $I_F = 10$  mA;  $t_r = 20$  ns.

006aab133

V<sub>R</sub> (V)



- (1)  $T_{amb} = 150 \, ^{\circ}C$
- (2)  $T_{amb} = 85 \, ^{\circ}C$
- (3)  $T_{amb} = 25 \, ^{\circ}C$
- (4)  $T_{amb} = -40 \, ^{\circ}C$

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



(1)  $T_{amb} = 150 \, ^{\circ}C$ 

20

10<sup>2</sup> Ι<sub>R</sub> (μΑ) 10

 $10^{-1}$ 

 $10^{-2}$ 

10<sup>-3</sup>

10-4

10<sup>-5</sup>

- (2)  $T_{amb} = 85 \, ^{\circ}C$
- (3)  $T_{amb} = 25 \, ^{\circ}C$
- (4)  $T_{amb} = -40 \, ^{\circ}C$

Reverse current as a function of reverse Fig 2. voltage; typical values

40

(2)

(3)

(4)

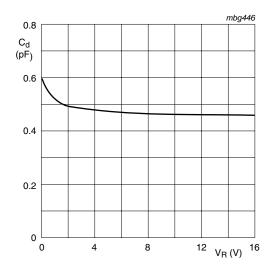
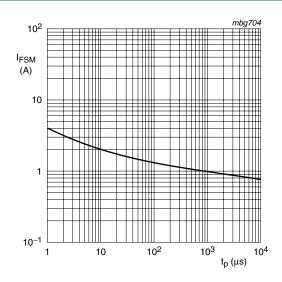


Fig 3. Diode capacitance as a function of reverse voltage; typical values

 $f = 1 \text{ MHz}; T_{amb} = 25 \text{ }^{\circ}\text{C}$ 

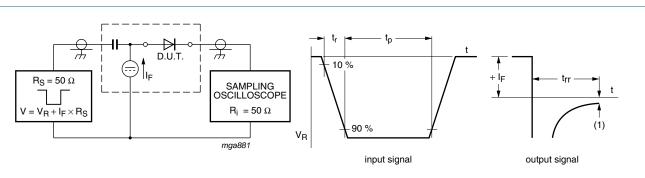


Based on square wave currents.

T<sub>i</sub> = 25 °C; prior to surge

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

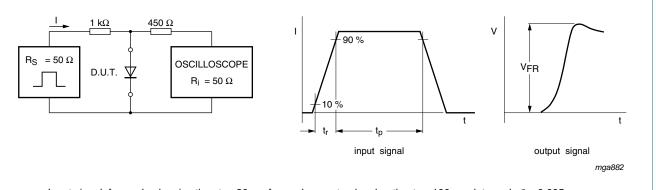
### 8. Test information



(1)  $I_R = 1 \text{ mA}$ 

Input signal: reverse pulse rise time  $t_r$  = 0.6 ns; reverse voltage pulse duration  $t_p$  = 100 ns; duty cycle  $\delta$  = 0.05 Oscilloscope: rise time  $t_r$  = 0.35 ns

#### Fig 5. Reverse recovery time test circuit and waveforms



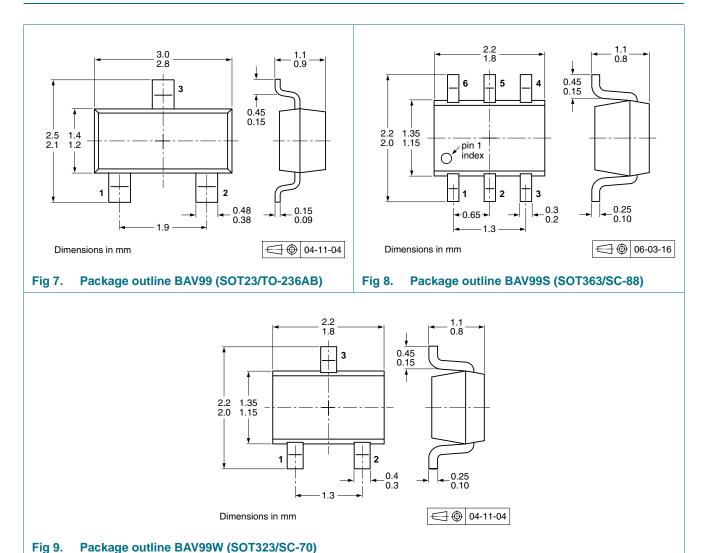
Input signal: forward pulse rise time  $t_r$  = 20 ns; forward current pulse duration  $t_p \ge 100$  ns; duty cycle  $\delta \le 0.005$ 

Fig 6. Forward recovery voltage 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.[1]

Type number Package Description		Description	Packing quantity	
			3000	10000
BAV99	SOT23	4 mm pitch, 8 mm tape and reel	-215	-235
BAV99S	SOT363	4 mm pitch, 8 mm tape and reel; T1 [2]	-115	-135
		4 mm pitch, 8 mm tape and reel; T2	-125	-165
BAV99W	SOT323	4 mm pitch, 8 mm tape and reel	-115	-135

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

[2] T1: normal taping

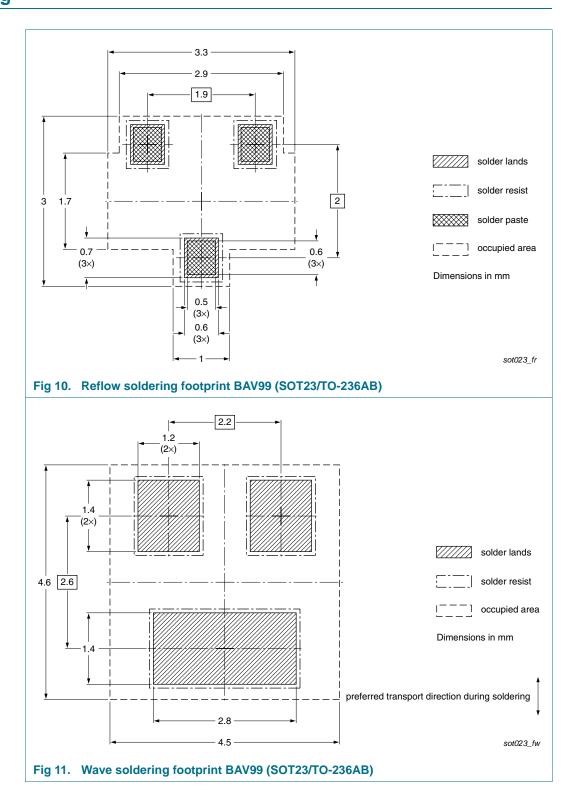
[3] T2: reverse taping

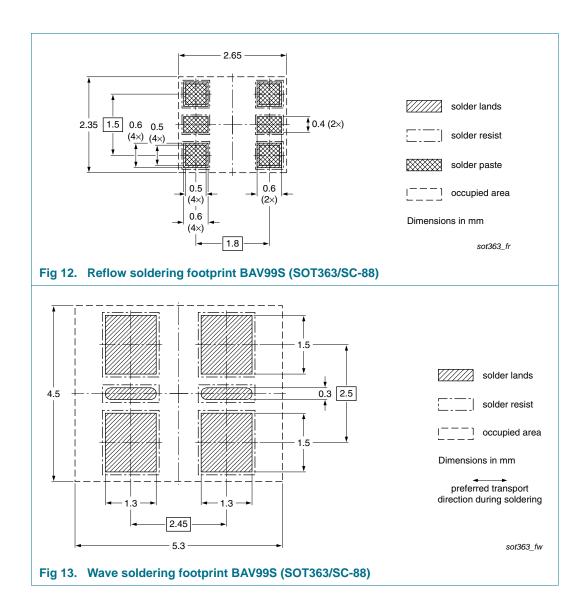
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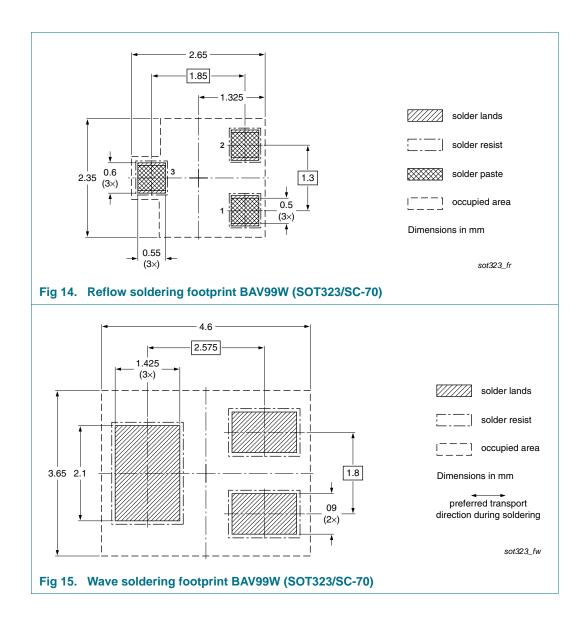
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### 11. Soldering







### 12. Revision history

### Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BAV99_SER_8	20101118	Product data sheet	-	BAV99_SER_7
Modifications:	<ul> <li>Section 4 "M</li> </ul>	arking": marking placeholder e	xplanation in table for	ooter updated
	<ul> <li>Section 5 "Li</li> </ul>	miting values": Ptot condition for	or BAV99S corrected	
	<ul> <li>Section 13 "L</li> </ul>	<u>egal information</u> ": updated		
BAV99_SER_7	20100414	Product data sheet	-	BAV99_SER_6
BAV99_SER_6	20100310	Product data sheet	-	BAV99_SER_5
BAV99_SER_5	20080820	Product data sheet	-	BAV99_4
				BAV99S_3 BAV99W 4
				DAV99VV_4
BAV99_4	20011015	Product specification	-	BAV99_3
BAV99S_3	20010514	Product specification	-	BAV99S_N_2
BAV99W_4	19990511	Product specification	-	BAV99W_3

### 13. Legal information

#### 13.1 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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### **Nexperia**

## **BAV99** series

**High-speed switching diodes** 

### 15. Contents

1	Product profile
1.1	General description
1.2	Features and benefits
1.3	Applications 1
1.4	Quick reference data 1
2	Pinning information 2
3	Ordering information
4	Marking 2
5	Limiting values 3
6	Thermal characteristics 4
7	Characteristics4
8	Test information 6
8.1	Quality information 6
9	Package outline
10	Packing information 7
11	Soldering 8
12	Revision history
13	Legal information
13.1	Data sheet status
13.2	Definitions
13.3	Disclaimers
13.4	Trademarks13
14	Contact information 13
15	Contents 14