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Kind regards,

Team Nexperia

# 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			Configuration	Package configuration
	NXP	JEITA	JEDEC		
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:  $t_{rr} \leq 4$  ns
- Low leakage current
- Small SMD plastic packages
- Low capacitance:  $C_d \leq 1.5$  pF
- Reverse voltage:  $V_R \leq 100$  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

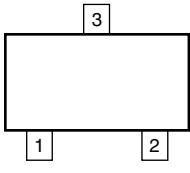
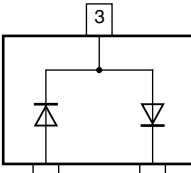
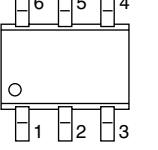
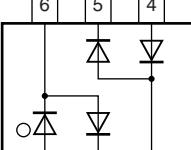
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per diode</b>						
$I_R$	reverse current	$V_R = 80$ V	-	-	0.5	$\mu A$
$V_R$	reverse voltage		-	-	100	V
$t_{rr}$	reverse recovery time		[1]	-	4	ns

[1] 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

Pin	Description	Simplified outline	Graphic symbol
<b>BAV99; BAV99W</b>			
1	anode (diode 1)		
2	cathode (diode 2)		
3	cathode (diode 1), anode (diode 2)		
<b>BAV99S</b>			
1	anode (diode 1)		
2	cathode (diode 2)		
3	cathode (diode 3), anode (diode 4)		
4	anode (diode 3)		
5	cathode (diode 4)		
6	cathode (diode 1), anode (diode 2)		

## 3. Ordering information

Table 4. Ordering information

Type number	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	
<b>Per diode</b>						
$V_{RRM}$	repetitive peak reverse voltage		-	100	V	
$V_R$	reverse voltage		-	100	V	
$I_F$	forward current					
	BAV99	[1]	-	215	mA	
		[2]	-	125	mA	
	BAV99S	[1]	-	200	mA	
	BAV99W	[1]	-	150	mA	
		[2]	-	130	mA	
$I_{FRM}$	repetitive peak forward current		-	500	mA	
$I_{FSM}$	non-repetitive peak forward current	square wave	[3]			
		$t_p = 1 \mu s$	-	4	A	
		$t_p = 1 ms$	-	1	A	
		$t_p = 1 s$	-	0.5	A	
$P_{tot}$	total power dissipation		[1][4]			
	BAV99	$T_{amb} \leq 25^\circ C$	-	250	mW	
	BAV99S	$T_{sp} \leq 85^\circ C$	[5]	-	250	mW
	BAV99W	$T_{amb} \leq 25^\circ C$	-	200	mW	
<b>Per device</b>						
$T_j$	junction temperature		-	150	°C	
$T_{amb}$	ambient temperature		-65	+150	°C	
$T_{stg}$	storage temperature		-65	+150	°C	

[1] Single diode loaded.

[2] Double diode loaded.

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

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

[5] Soldering points at pins 2, 3, 5 and 6.

## 6. Thermal characteristics

**Table 7. Thermal characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	<a href="#">[1]</a> <a href="#">[2]</a>			
	BAV99		-	-	500	K/W
	BAV99W		-	-	625	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		<a href="#">[3]</a>			
	BAV99		-	-	360	K/W
	BAV99S		<a href="#">[3]</a>		260	K/W
	BAV99W		-	-	300	K/W

[1] Single diode loaded.

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

[3] Soldering points at pins 2, 3, 5 and 6.

## 7. Characteristics

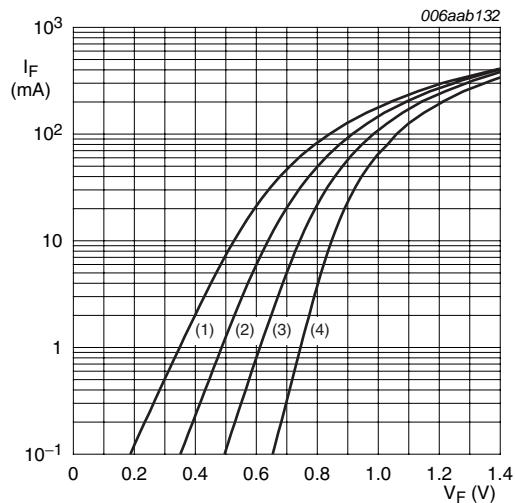
**Table 8. Characteristics**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
<b>Per diode</b>							
$V_F$	forward voltage	$I_F = 1 \text{ mA}$	-	-	715	mV	
		$I_F = 10 \text{ mA}$	-	-	855	mV	
		$I_F = 50 \text{ mA}$	-	-	1	V	
		$I_F = 150 \text{ mA}$	-	-	1.25	V	
$I_R$	reverse current	$V_R = 25 \text{ V}$	-	-	30	nA	
		$V_R = 80 \text{ V}$	-	-	0.5	$\mu\text{A}$	
		$V_R = 25 \text{ V}; T_j = 150^\circ\text{C}$	-	-	30	$\mu\text{A}$	
		$V_R = 80 \text{ V}; T_j = 150^\circ\text{C}$	-	-	50	$\mu\text{A}$	
$C_d$	diode capacitance	$f = 1 \text{ MHz}; V_R = 0 \text{ V}$	-	-	1.5	pF	
$t_{rr}$	reverse recovery time		<a href="#">[1]</a>		-	4	ns
$V_{FR}$	forward recovery voltage	<a href="#">[2]</a>		-	-	1.75	V
		<a href="#">[2]</a>		-	-	1.75	V

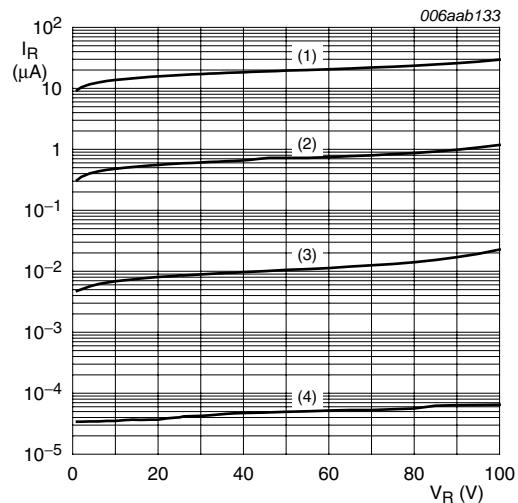
[1] When switched from  $I_F = 10 \text{ mA}$  to  $I_R = 10 \text{ mA}$ ;  $R_L = 100 \Omega$ ; measured at  $I_R = 1 \text{ mA}$ .

[2] When switched from  $I_F = 10 \text{ mA}$ ;  $t_r = 20 \text{ ns}$ .



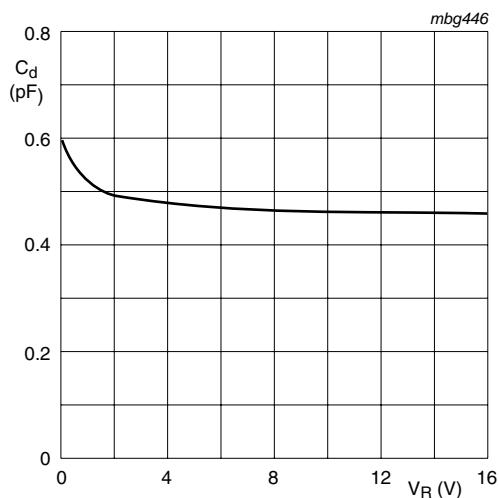
- (1)  $T_{amb} = 150 \text{ }^{\circ}\text{C}$
- (2)  $T_{amb} = 85 \text{ }^{\circ}\text{C}$
- (3)  $T_{amb} = 25 \text{ }^{\circ}\text{C}$
- (4)  $T_{amb} = -40 \text{ }^{\circ}\text{C}$

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



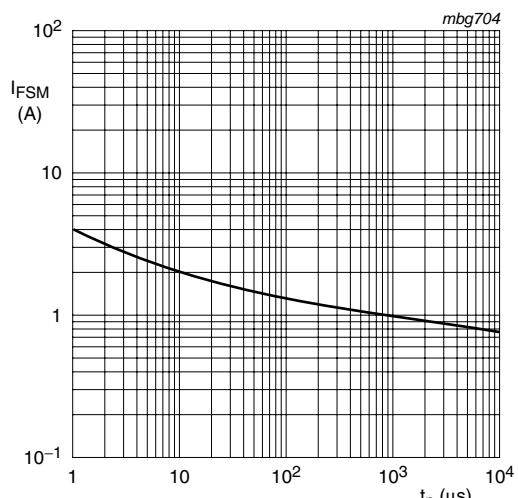
- (1)  $T_{amb} = 150 \text{ }^{\circ}\text{C}$
- (2)  $T_{amb} = 85 \text{ }^{\circ}\text{C}$
- (3)  $T_{amb} = 25 \text{ }^{\circ}\text{C}$
- (4)  $T_{amb} = -40 \text{ }^{\circ}\text{C}$

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



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

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

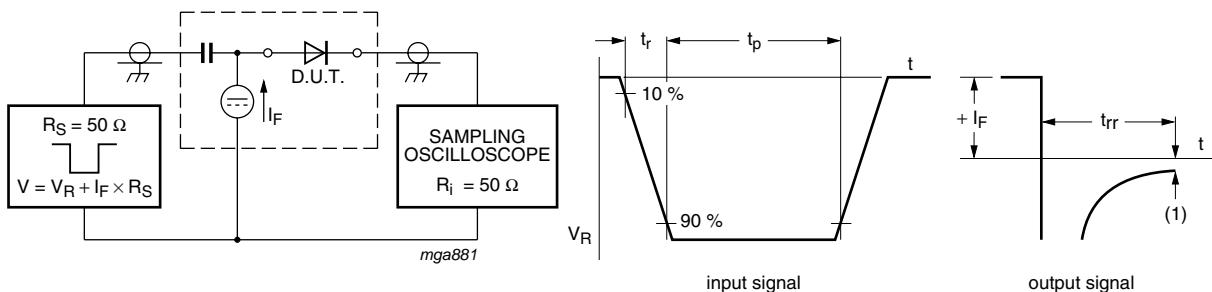


Based on square wave currents.

$T_j = 25 \text{ }^{\circ}\text{C}$ ; prior to surge

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

## 8. Test information

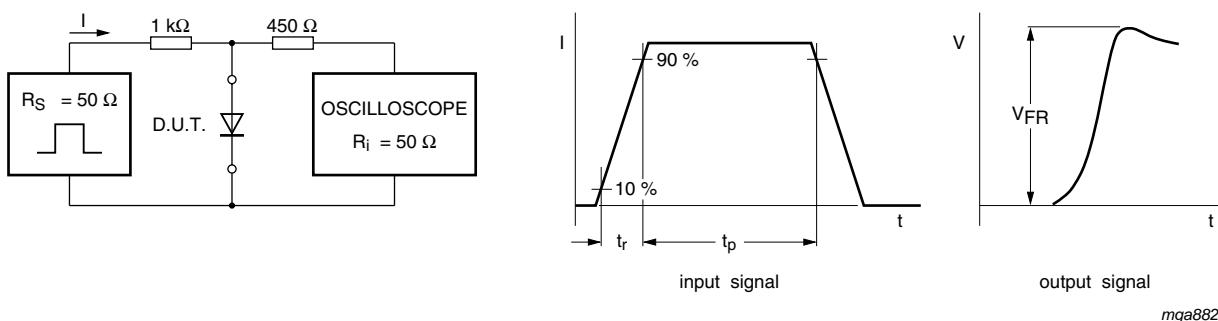


(1)  $I_R = 1 \text{ mA}$

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

Oscilloscope: rise time  $t_r = 0.35 \text{ ns}$

Fig 5. Reverse recovery time test circuit and waveforms



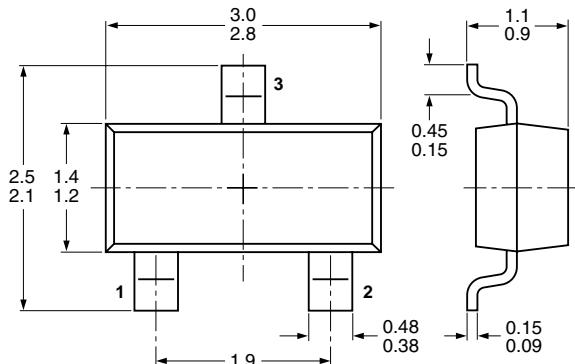
Input signal: forward pulse rise time  $t_r = 20 \text{ ns}$ ; forward current pulse duration  $t_p \geq 100 \text{ ns}$ ; duty cycle  $\delta \leq 0.005$

Fig 6. Forward recovery voltage test circuit and waveforms

### 8.1 Quality information

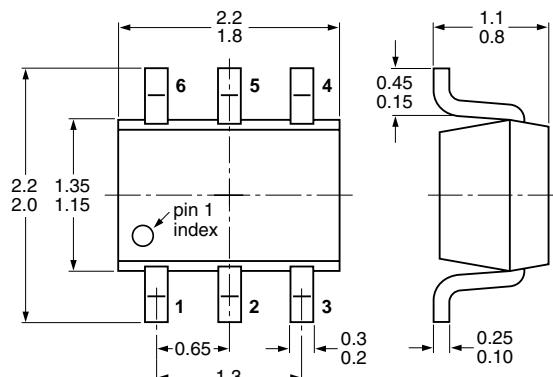
This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - *Stress test qualification for discrete semiconductors*, and is suitable for use in automotive applications.

## 9. Package outline



Dimensions in mm

04-11-04

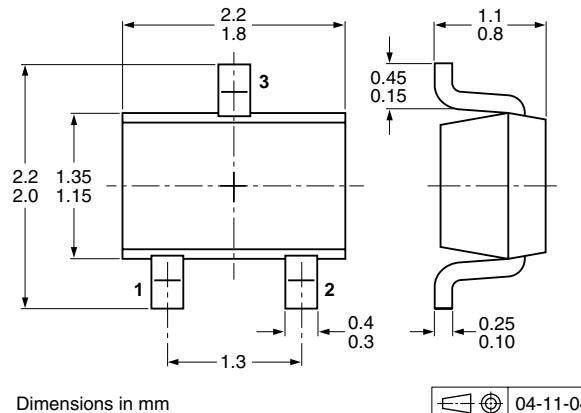


Dimensions in mm

06-03-16

Fig 7. Package outline BAV99 (SOT23/TO-236AB)

Fig 8. Package outline BAV99S (SOT363/SC-88)



Dimensions in mm

04-11-04

Fig 9. Package outline BAV99W (SOT323/SC-70)

## 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
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	[3] -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

## 11. Soldering

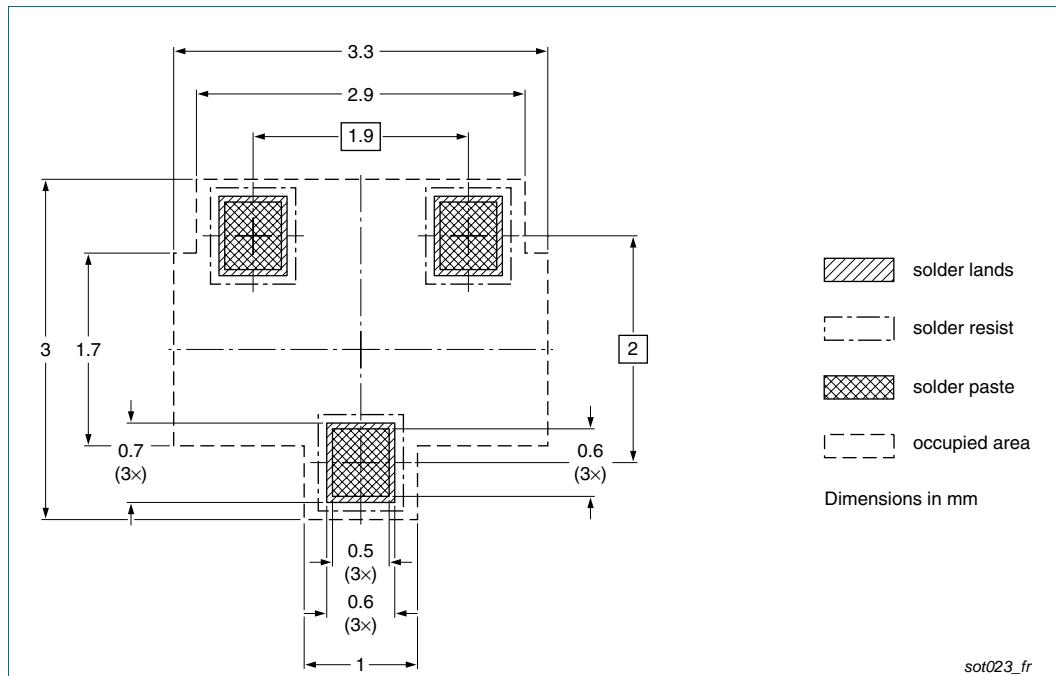


Fig 10. Reflow soldering footprint BAV99 (SOT23/TO-236AB)

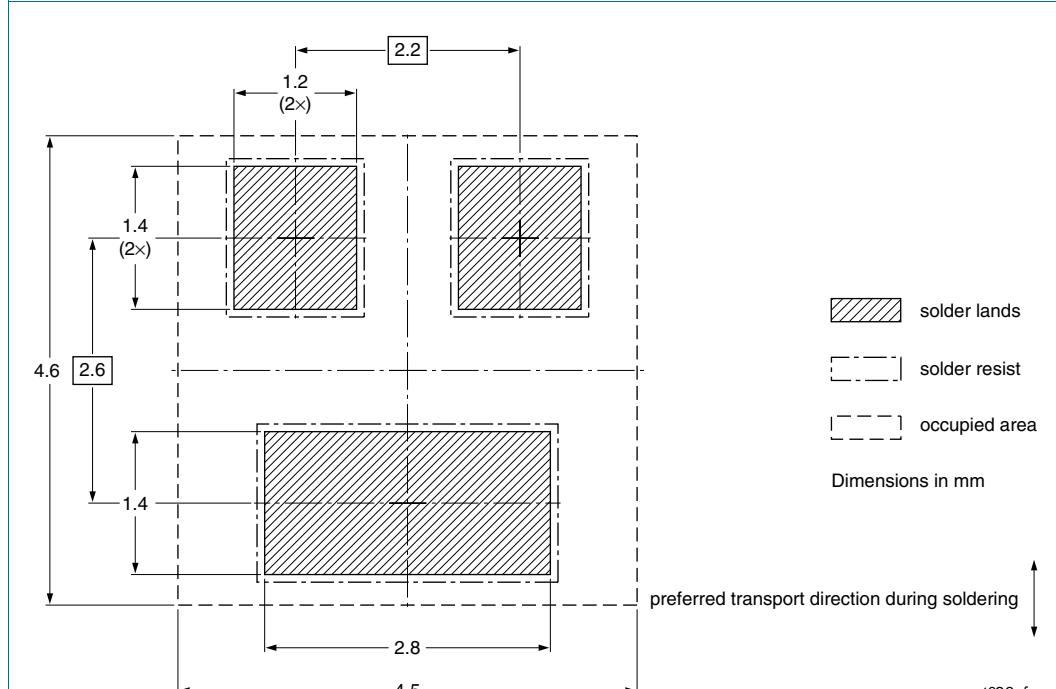


Fig 11. Wave soldering footprint BAV99 (SOT23/TO-236AB)

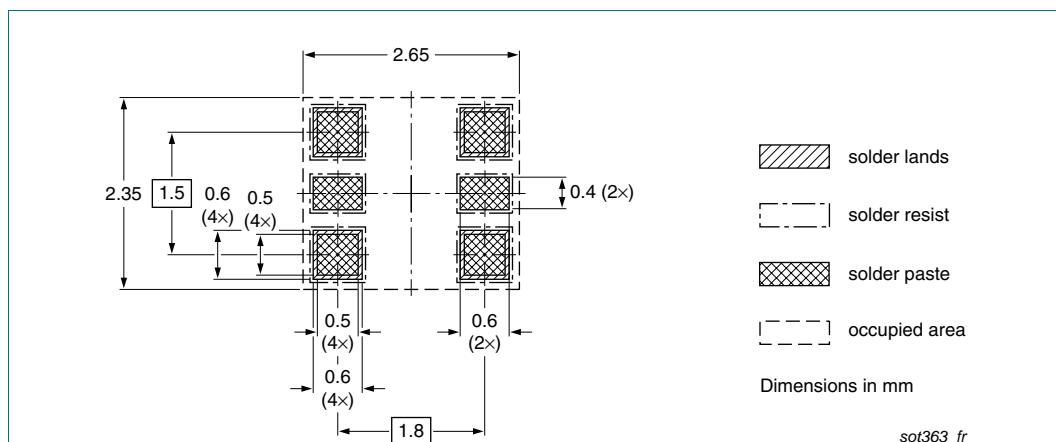


Fig 12. Reflow soldering footprint BAV99S (SOT363/SC-88)

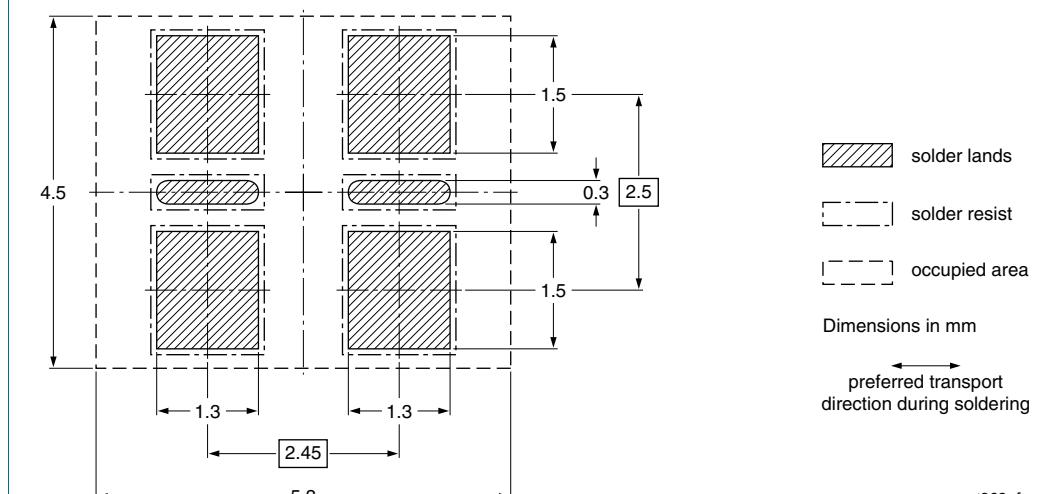


Fig 13. Wave soldering footprint BAV99S (SOT363/SC-88)

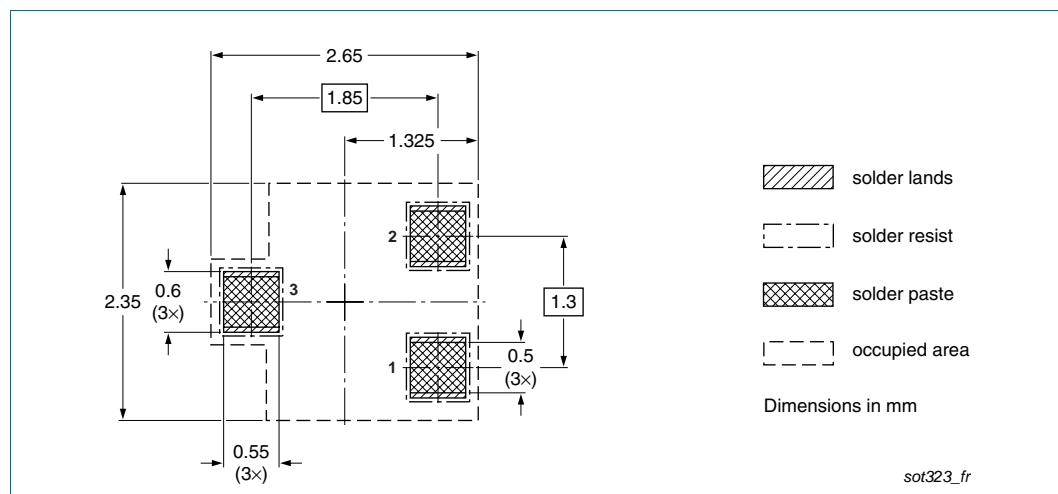


Fig 14. Reflow soldering footprint BAV99W (SOT323/SC-70)

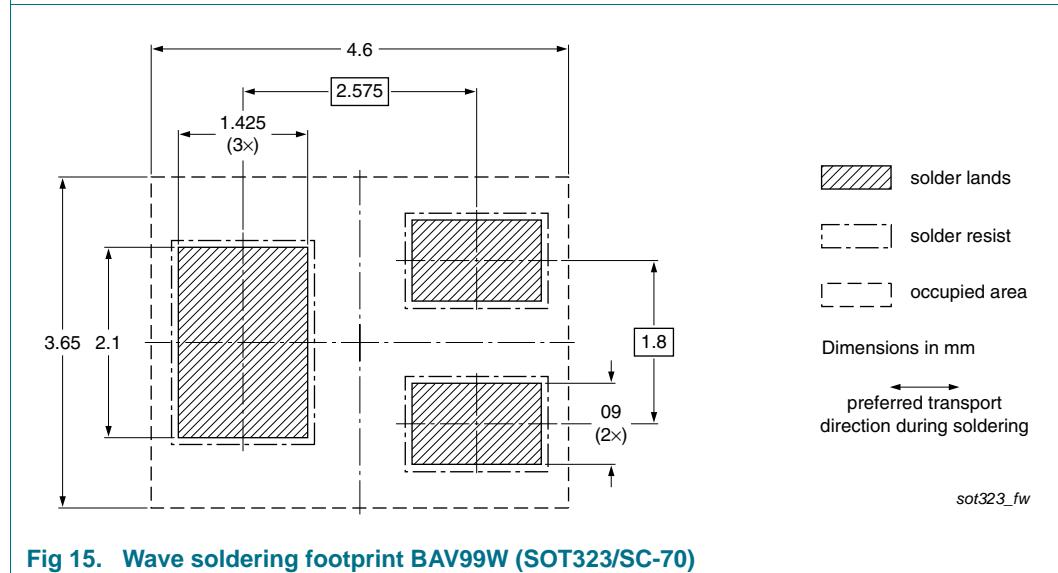


Fig 15. Wave soldering footprint BAV99W (SOT323/SC-70)

## 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 style="list-style-type: none"><li>• <a href="#">Section 4 "Marking"</a>: marking placeholder explanation in table footer updated</li><li>• <a href="#">Section 5 "Limiting values"</a>: <math>P_{tot}</math> condition for BAV99S corrected</li><li>• <a href="#">Section 13 "Legal information"</a>: updated</li></ul>
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
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 <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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