

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

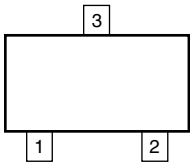
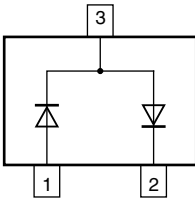
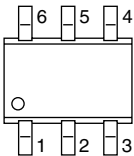
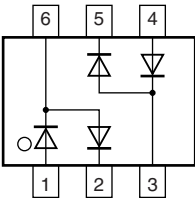
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per diode						
I_R	reverse current	$V_R = 80$ V	-	-	0.5	μ A
V_R	reverse voltage		-	-	100	V
t_{rr}	reverse recovery time		[1]	-	4	ns

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



2. Pinning information

Table 3. Pinning

Pin	Description	Simplified outline	Graphic symbol
BAV99; BAV99W			
1	anode (diode 1)	 006aaa144	 006aaa763
2	cathode (diode 2)		
3	cathode (diode 1), anode (diode 2)		
BAV99S			
1	anode (diode 1)		 006aab101
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 ^[1]
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_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	$T_{amb} \leq 25 \text{ }^\circ\text{C}$	-	250	mW
	BAV99S	$T_{sp} \leq 85 \text{ }^\circ\text{C}$	[5] -	250	mW
	BAV99W	$T_{amb} \leq 25 \text{ }^\circ\text{C}$	-	200	mW
Per device					
T_j	junction temperature		-	150	$^\circ\text{C}$
T_{amb}	ambient temperature		-65	+150	$^\circ\text{C}$
T_{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.

[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	[1][2]			
	BAV99		-	-	500	K/W
	BAV99W		-	-	625	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point					
	BAV99		-	-	360	K/W
	BAV99S	[3]	-	-	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

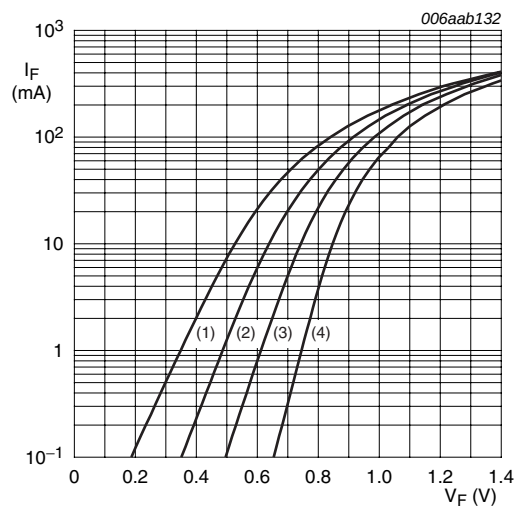
Table 8. Characteristics

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per diode						
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	μA
		$V_R = 25\text{ V}; T_j = 150\text{ }^{\circ}\text{C}$	-	-	30	μA
		$V_R = 80\text{ V}; T_j = 150\text{ }^{\circ}\text{C}$	-	-	50	μA
C_d	diode capacitance	$f = 1\text{ MHz}; V_R = 0\text{ V}$	-	-	1.5	pF
t_{rr}	reverse recovery time	[1]	-	-	4	ns
V_{FR}	forward recovery voltage	[2]	-	-	1.75	V

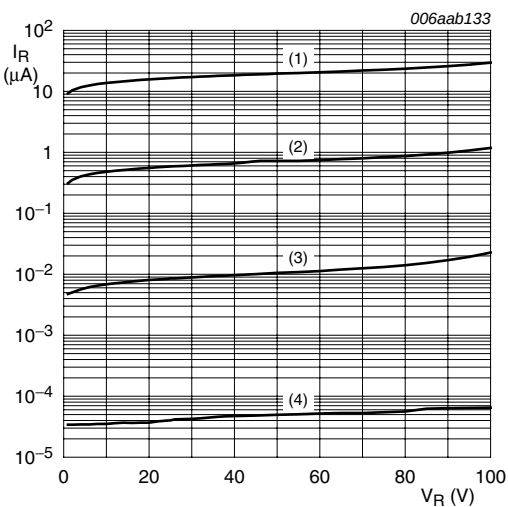
[1] When switched from $I_F = 10\text{ mA}$ to $I_R = 10\text{ mA}$; $R_L = 100\text{ }\Omega$; measured at $I_R = 1\text{ mA}$.

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



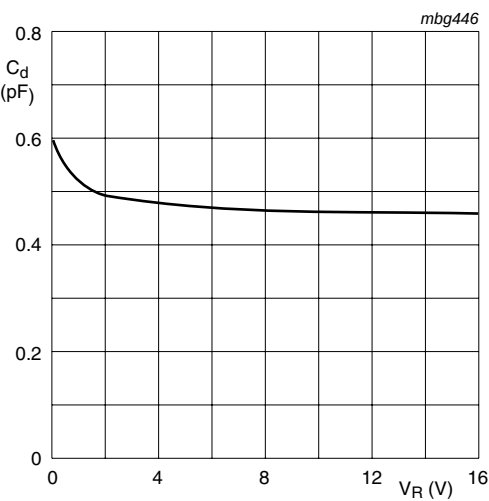
- (1) $T_{amb} = 150\text{ }^{\circ}\text{C}$
- (2) $T_{amb} = 85\text{ }^{\circ}\text{C}$
- (3) $T_{amb} = 25\text{ }^{\circ}\text{C}$
- (4) $T_{amb} = -40\text{ }^{\circ}\text{C}$

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



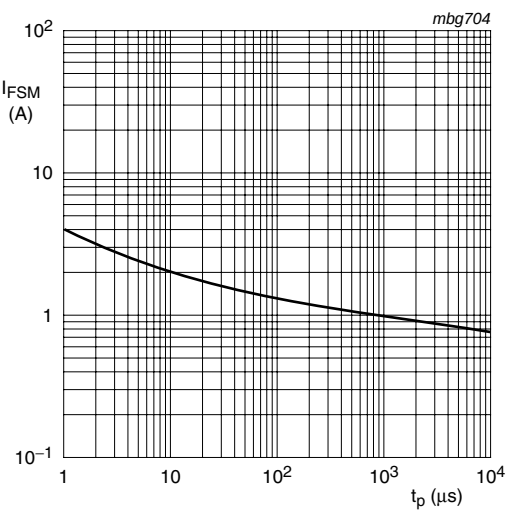
- (1) $T_{amb} = 150\text{ }^{\circ}\text{C}$
- (2) $T_{amb} = 85\text{ }^{\circ}\text{C}$
- (3) $T_{amb} = 25\text{ }^{\circ}\text{C}$
- (4) $T_{amb} = -40\text{ }^{\circ}\text{C}$

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

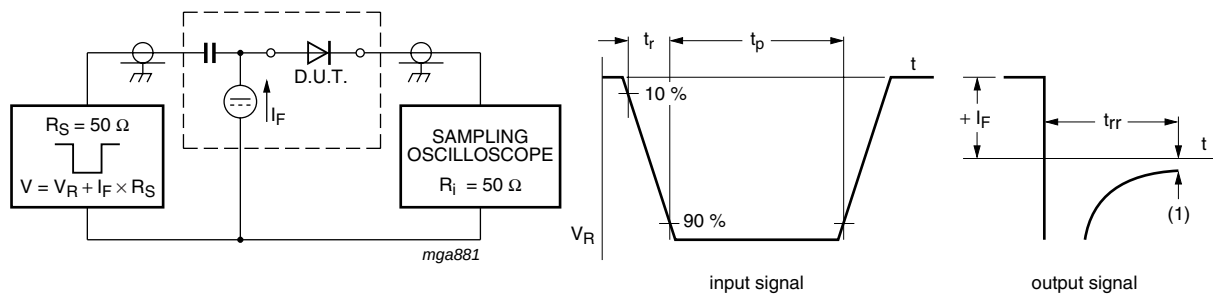


Based on square wave currents.

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

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

8. Test information

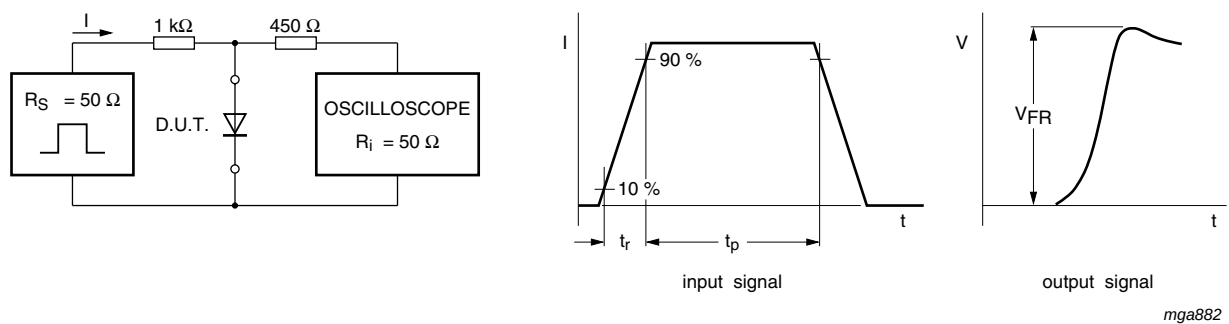


(1) $I_R = 1 \text{ mA}$

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

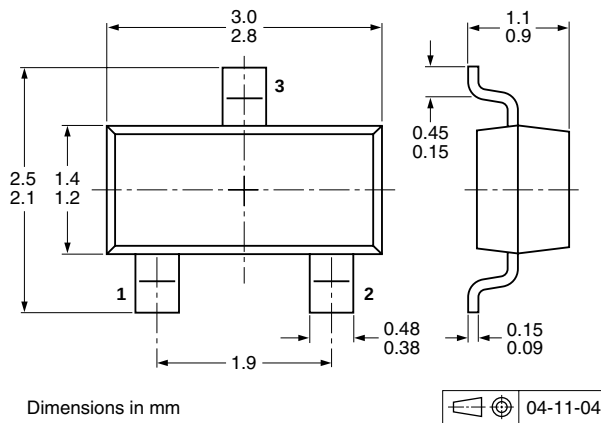


Fig 7. Package outline BAV99 (SOT23/TO-236AB)

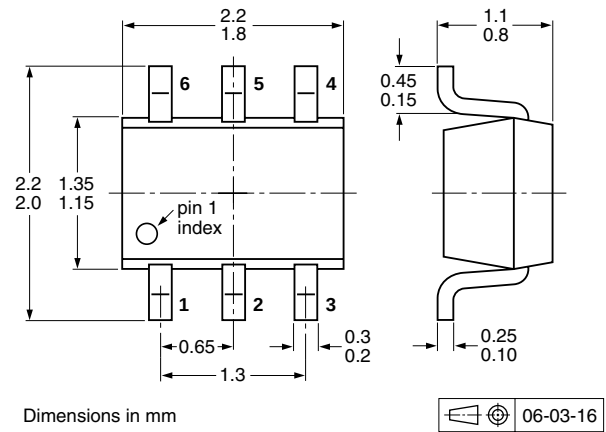


Fig 8. Package outline BAV99S (SOT363/SC-88)

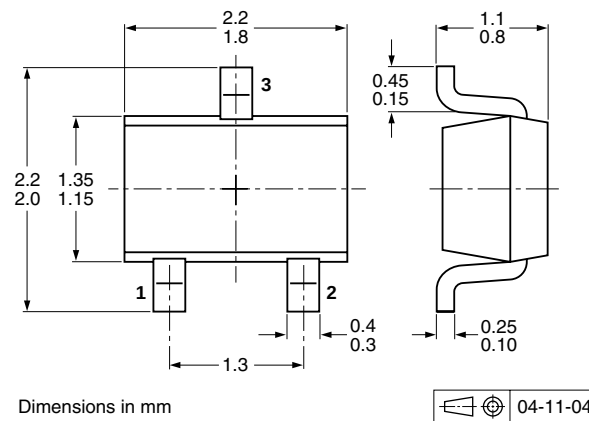


Fig 9. Package outline BAV99W (SOT323/SC-70)

10. Packing information

Table 9. Packing methods

The indicated -xxx are the last three digits of the 12NC ordering code.^[1]

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

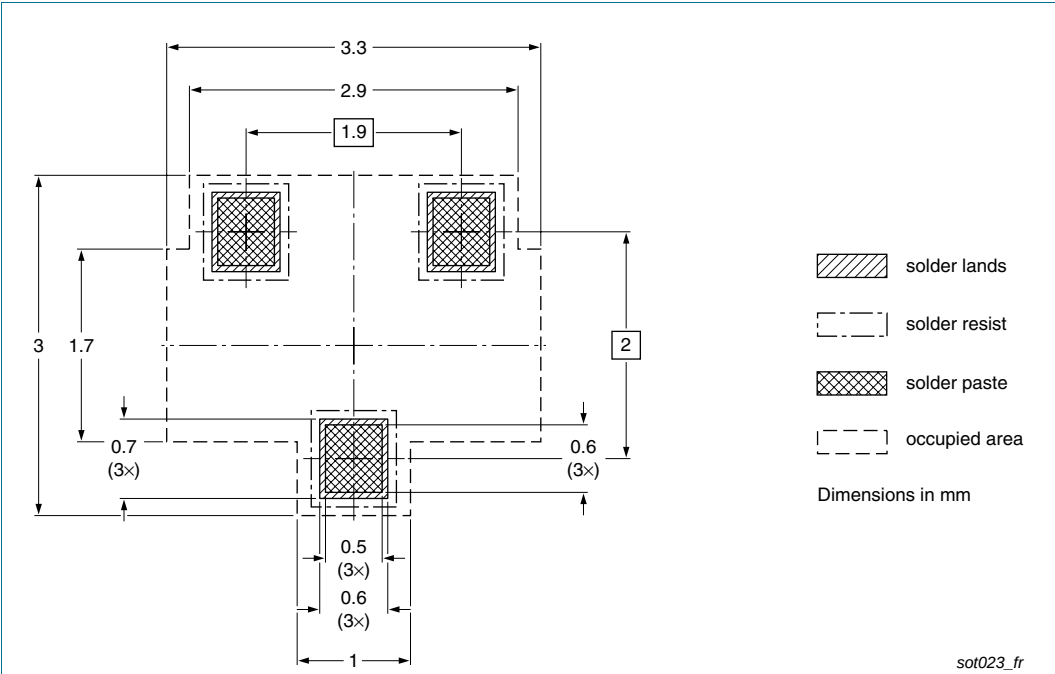


Fig 10. Reflow soldering footprint BAV99 (SOT23/TO-236AB)

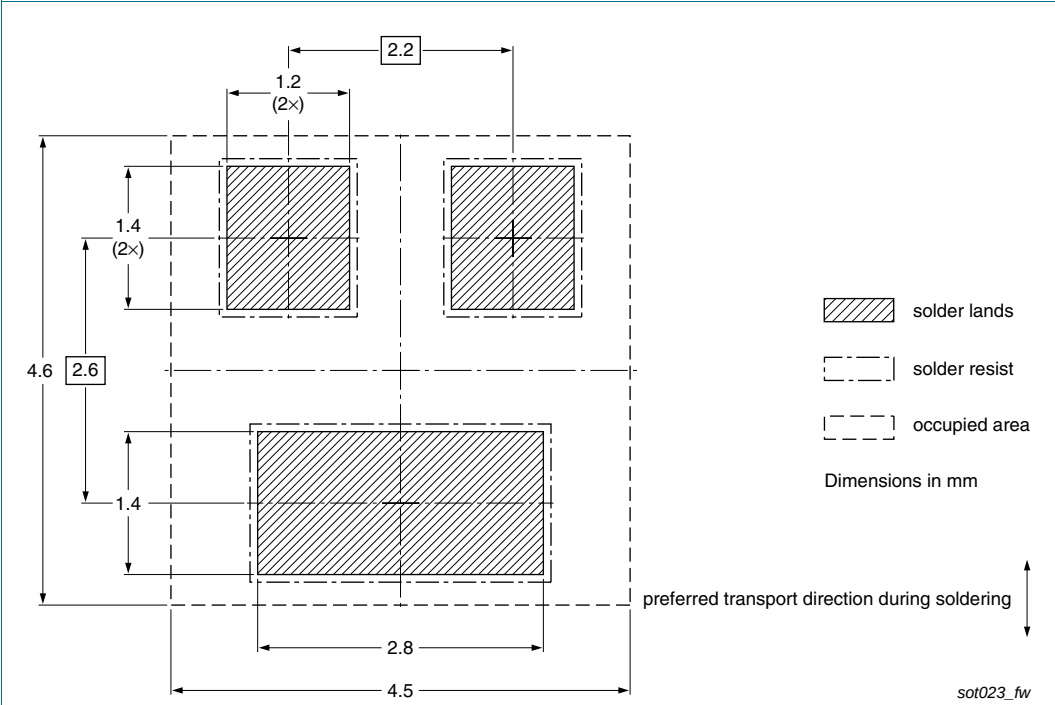


Fig 11. Wave soldering footprint BAV99 (SOT23/TO-236AB)

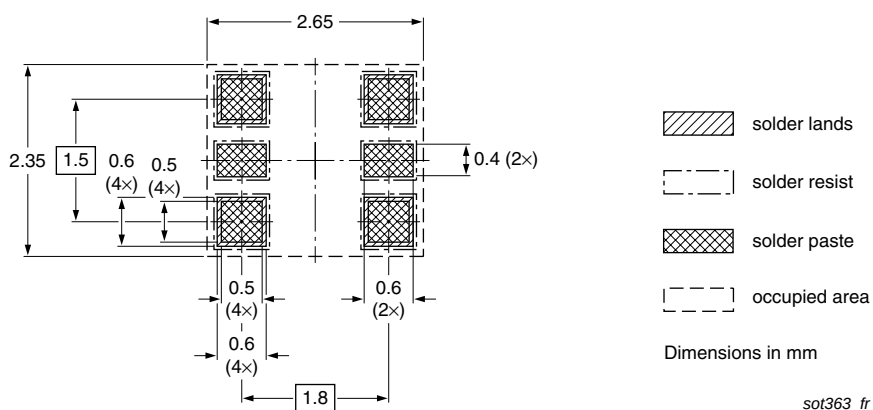


Fig 12. Reflow soldering footprint BAV99S (SOT363/SC-88)

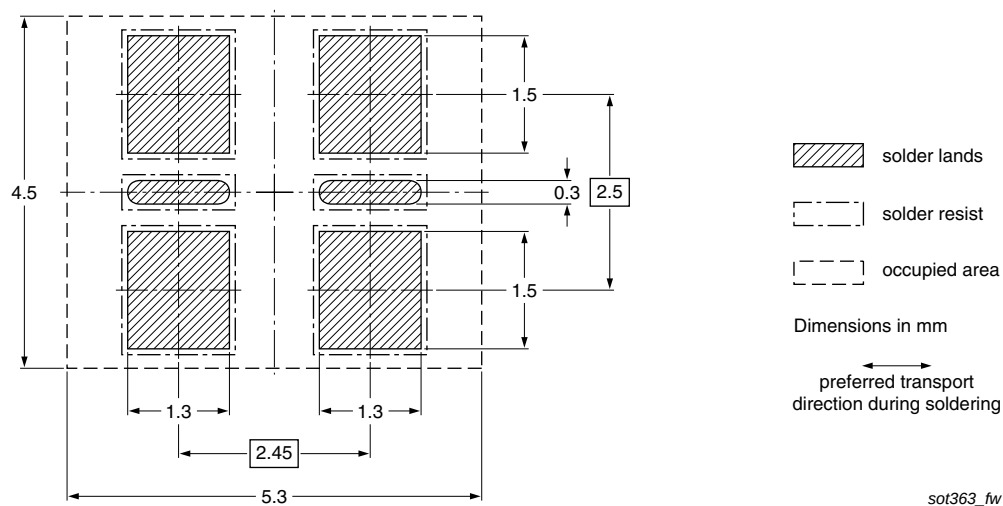


Fig 13. Wave soldering footprint BAV99S (SOT363/SC-88)

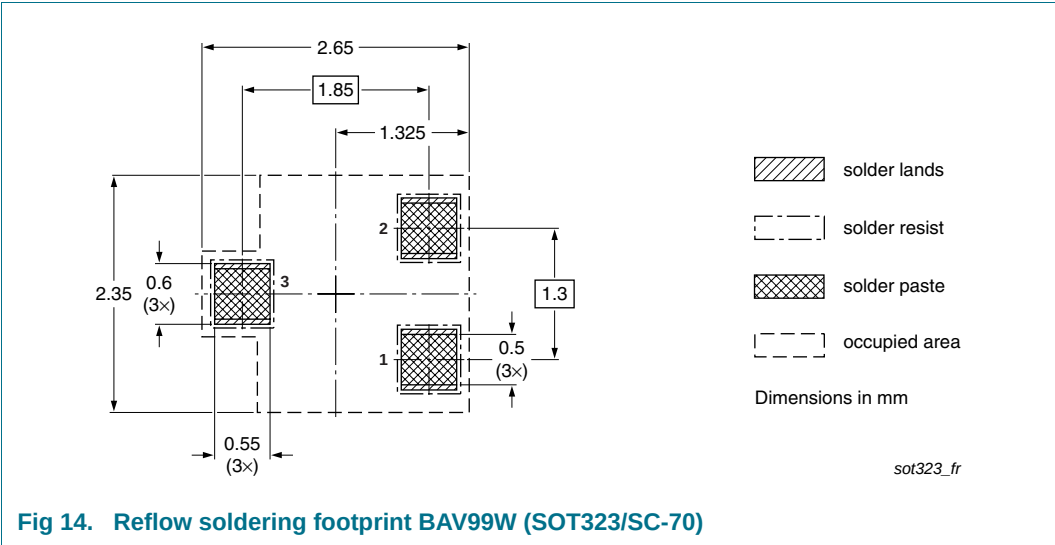


Fig 14. Reflow soldering footprint BAV99W (SOT323/SC-70)

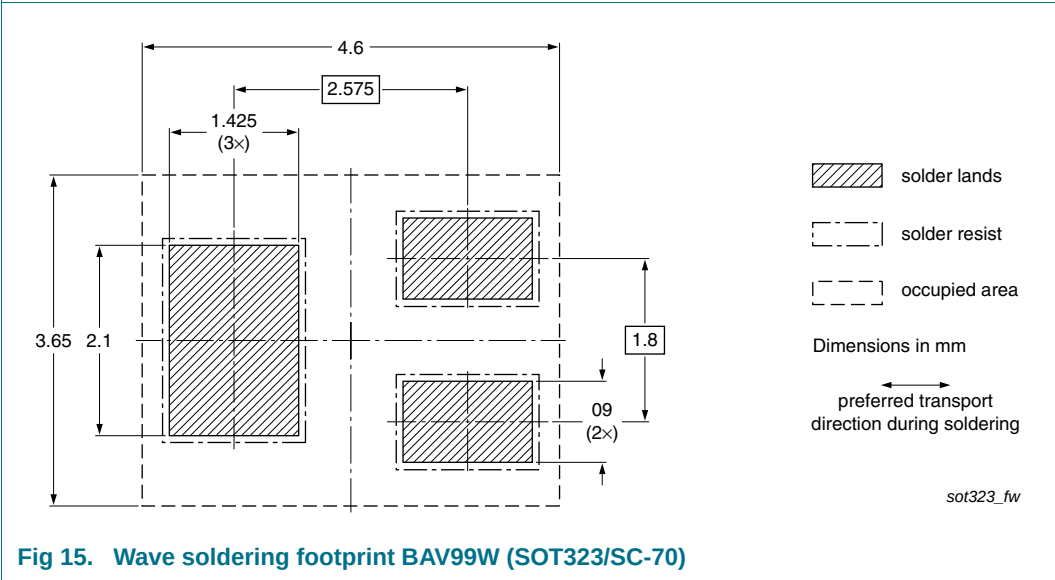


Fig 15. Wave soldering footprint BAV99W (SOT323/SC-70)

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:	• Section 4 "Marking": marking placeholder explanation in table footer updated • Section 5 "Limiting values": P_{tot} condition for BAV99S corrected • Section 13 "Legal information": 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
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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