

BAV756S; BAW56 series

High-speed switching diodes

Rev. 05 — 26 November 2007

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	Configuration
	NXP	JEITA	JEDEC		
BAV756S	SOT363	SC-88	-	very small	quadruple common anode/common cathode
BAW56	SOT23	-	TO-236AB	small	dual common anode
BAW56M	SOT883	SC-101	-	leadless ultra small	dual common anode
BAW56S	SOT363	SC-88	-	very small	quadruple common anode/common anode
BAW56T	SOT416	SC-75	-	ultra small	dual common anode
BAW56W	SOT323	SC-70	-	very small	dual common anode

1.2 Features

- High switching speed: $t_{rr} \leq 4$ ns
- Low leakage current
- Small SMD plastic packages
- Low capacitance: $C_d \leq 2$ pF
- Reverse voltage: $V_R \leq 90$ V

1.3 Applications

- High-speed switching
- General-purpose switching

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		-	-	90	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	Symbol
BAV756S			
1	anode (diode 1)		<p>006aab103</p>
2	cathode (diode 2)		
3	common anode (diode 2 and diode 3)		
4	cathode (diode 3)		
5	anode (diode 4)		
6	common cathode (diode 1 and diode 4)		
BAW56; BAW56T; BAW56W			
1	cathode (diode 1)	<p>006aaa144</p>	<p>006aab099</p>
2	cathode (diode 2)		
3	common anode		
BAW56M			
1	cathode (diode 1)	<p>Transparent top view</p>	<p>006aab099</p>
2	cathode (diode 2)		
3	common anode		
BAW56S			
1	cathode (diode 1)		<p>006aab102</p>
2	cathode (diode 2)		
3	common anode (diode 3 and diode 4)		
4	cathode (diode 3)		
5	cathode (diode 4)		
6	common anode (diode 1 and diode 2)		

3. Ordering information

Table 4. Ordering information

Type number	Package		Version
	Name	Description	
BAV756S	SC-88	plastic surface-mounted package; 6 leads	SOT363
BAW56	-	plastic surface-mounted package; 3 leads	SOT23
BAW56M	SC-101	leadless ultra small plastic package; 3 solder lands; body 1.0 × 0.6 × 0.5 mm	SOT883
BAW56S	SC-88	plastic surface-mounted package; 6 leads	SOT363
BAW56T	SC-75	plastic surface-mounted package; 3 leads	SOT416
BAW56W	SC-70	plastic surface-mounted package; 3 leads	SOT323

4. Marking

Table 5. Marking codes

Type number	Marking code ^[1]
BAV756S	A7*
BAW56	A1*
BAW56M	S5
BAW56S	A1*
BAW56T	A1
BAW56W	A1*

- [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
Per diode					
V_{RRM}	repetitive peak reverse voltage		-	90	V
V_R	reverse voltage		-	90	V
I_F	forward current				
	BAV756S	$T_s = 60\text{ °C}$	-	250	mA
	BAW56	$T_{amb} \leq 25\text{ °C}$	-	215	mA
	BAW56M	$T_{amb} \leq 25\text{ °C}$	-	150	mA
	BAW56S	$T_s = 60\text{ °C}$	-	250	mA
	BAW56T	$T_s = 90\text{ °C}$	-	150	mA
	BAW56W	$T_{amb} \leq 25\text{ °C}$	-	150	mA

Table 6. Limiting values ...continued
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
I_{FRM}	repetitive peak forward current		-	500	mA
I_{FSM}	non-repetitive peak forward current	square wave	[1]		
		$t_p = 1 \mu s$	-	4	A
		$t_p = 1 ms$	-	1	A
		$t_p = 1 s$	-	0.5	A
P_{tot}	total power dissipation		[2]		
	BAV756S	$T_s = 60 \text{ }^\circ\text{C}$	-	350	mW
	BAW56	$T_{amb} \leq 25 \text{ }^\circ\text{C}$	-	250	mW
	BAW56M	$T_{amb} \leq 25 \text{ }^\circ\text{C}$	[3]	250	mW
	BAW56S	$T_s = 60 \text{ }^\circ\text{C}$	-	350	mW
	BAW56T	$T_s = 90 \text{ }^\circ\text{C}$	[4]	170	mW
	BAW56W	$T_{amb} \leq 25 \text{ }^\circ\text{C}$	-	200	mW
Per device					
I_F	forward current				
	BAV756S	$T_s = 60 \text{ }^\circ\text{C}$	-	100	mA
	BAW56	$T_{amb} \leq 25 \text{ }^\circ\text{C}$	-	125	mA
	BAW56M	$T_{amb} \leq 25 \text{ }^\circ\text{C}$	-	75	mA
	BAW56S	$T_s = 60 \text{ }^\circ\text{C}$	-	100	mA
	BAW56T	$T_s = 90 \text{ }^\circ\text{C}$	-	75	mA
	BAW56W	$T_{amb} \leq 25 \text{ }^\circ\text{C}$	-	130	mA
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] $T_j = 25 \text{ }^\circ\text{C}$ prior to surge.

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

[3] Reflow soldering is the only recommended soldering method.

[4] Single diode loaded.

6. Thermal characteristics

Table 7. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per diode						
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]			
	BAW56		-	-	500	K/W
	BAW56M		[2]	-	500	K/W
	BAW56W		-	-	625	K/W

Table 7. Thermal characteristics ...continued

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-sp)}$	thermal resistance from junction to solder point					
	BAV756S		-	-	255	K/W
	BAW56		-	-	360	K/W
	BAW56S		-	-	255	K/W
	BAW56T		-	-	350	K/W
	BAW56W		-	-	300	K/W

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

[2] Reflow soldering is the only recommended soldering method.

7. Characteristics

Table 8. Characteristics

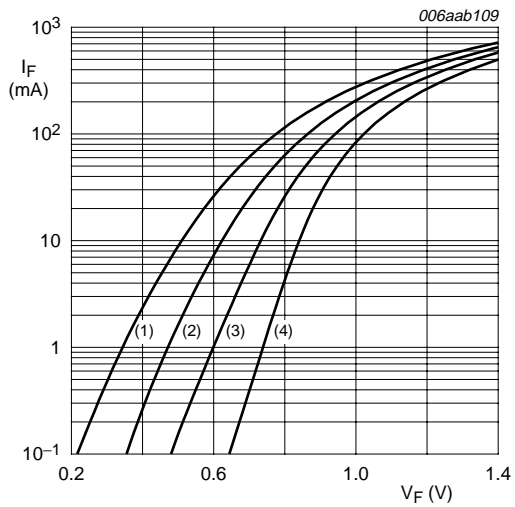
$T_{amb} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per diode						
V_F	forward voltage					[1]
		$I_F = 1\text{ mA}$	-	-	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
		$V_R = 80\text{ V}; T_j = 150\text{ }^{\circ}\text{C}$	-	-	150	μA
C_d	diode capacitance	$V_R = 0\text{ V}; f = 1\text{ MHz}$	-	-	2	pF
t_{rr}	reverse recovery time		[2]	-	4	ns
V_{FR}	forward recovery voltage		[3]	-	1.75	V

[1] Pulse test: $t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02$.

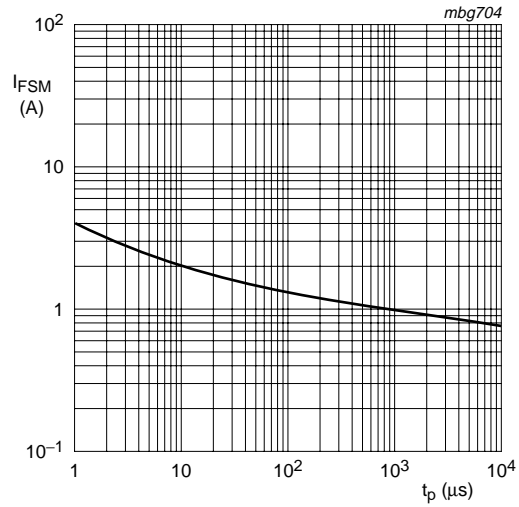
[2] When switched from $I_F = 10\text{ mA}$ to $I_R = 10\text{ mA}; R_L = 100\text{ }\Omega$; measured at $I_R = 1\text{ mA}$.

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



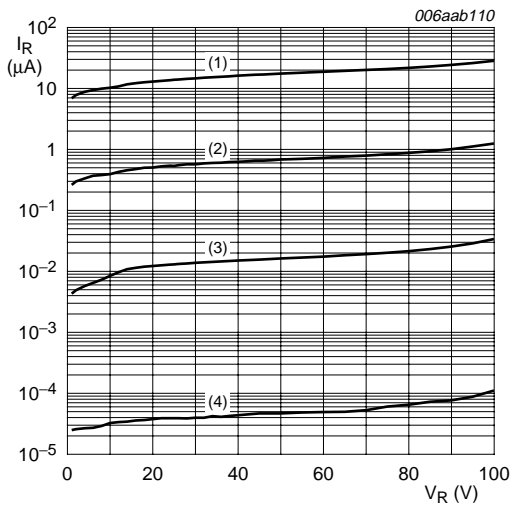
- (1) $T_{\text{amb}} = 150^\circ\text{C}$
- (2) $T_{\text{amb}} = 85^\circ\text{C}$
- (3) $T_{\text{amb}} = 25^\circ\text{C}$
- (4) $T_{\text{amb}} = -40^\circ\text{C}$

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



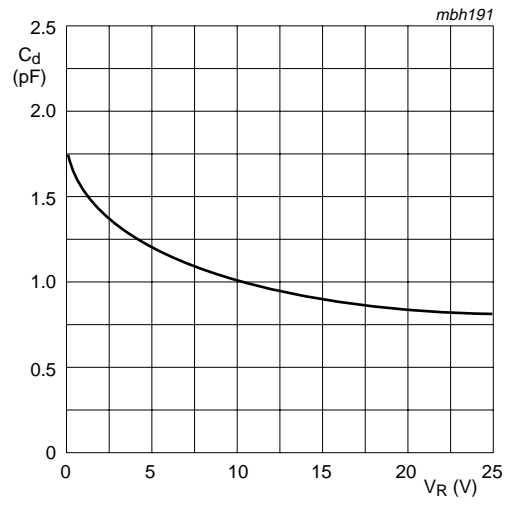
Based on square wave currents.
 $T_j = 25^\circ\text{C}$; prior to surge

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



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

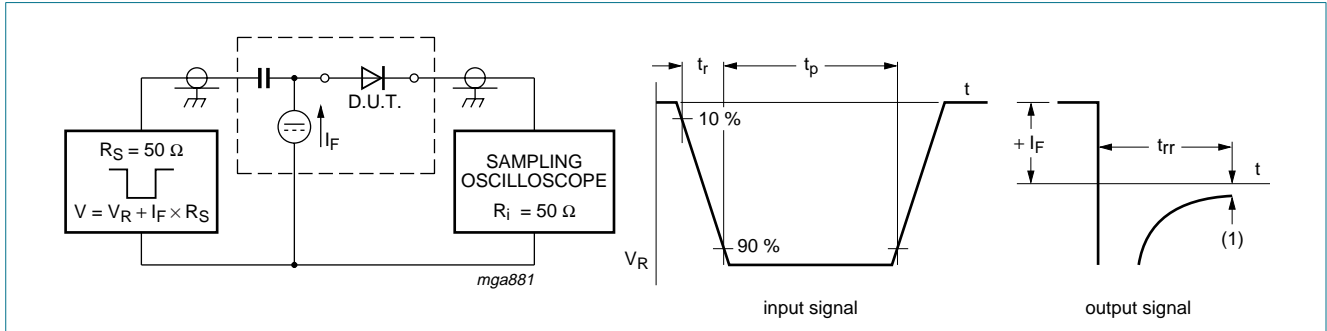
Fig 3. Reverse current as a function of reverse voltage; typical values



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

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

8. Test information

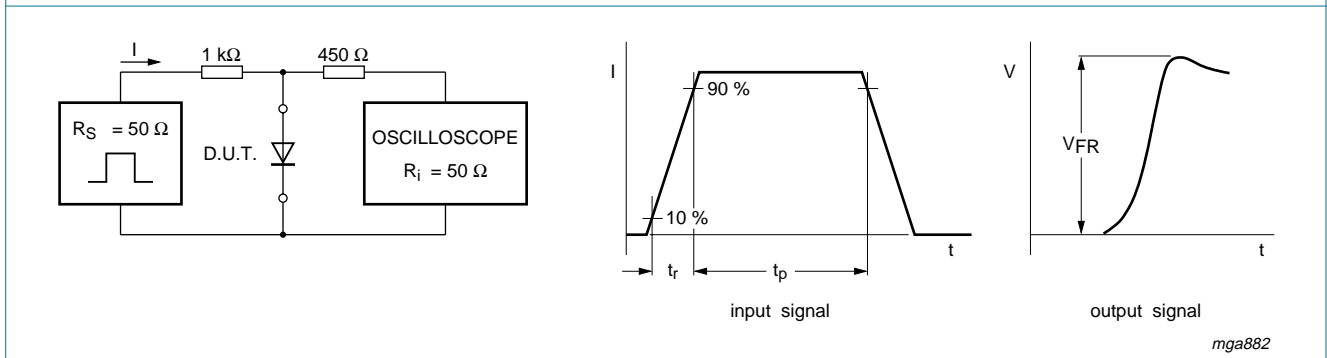


(1) $I_R = 1 \text{ mA}$

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 $t_r = 0.35 \text{ ns}$

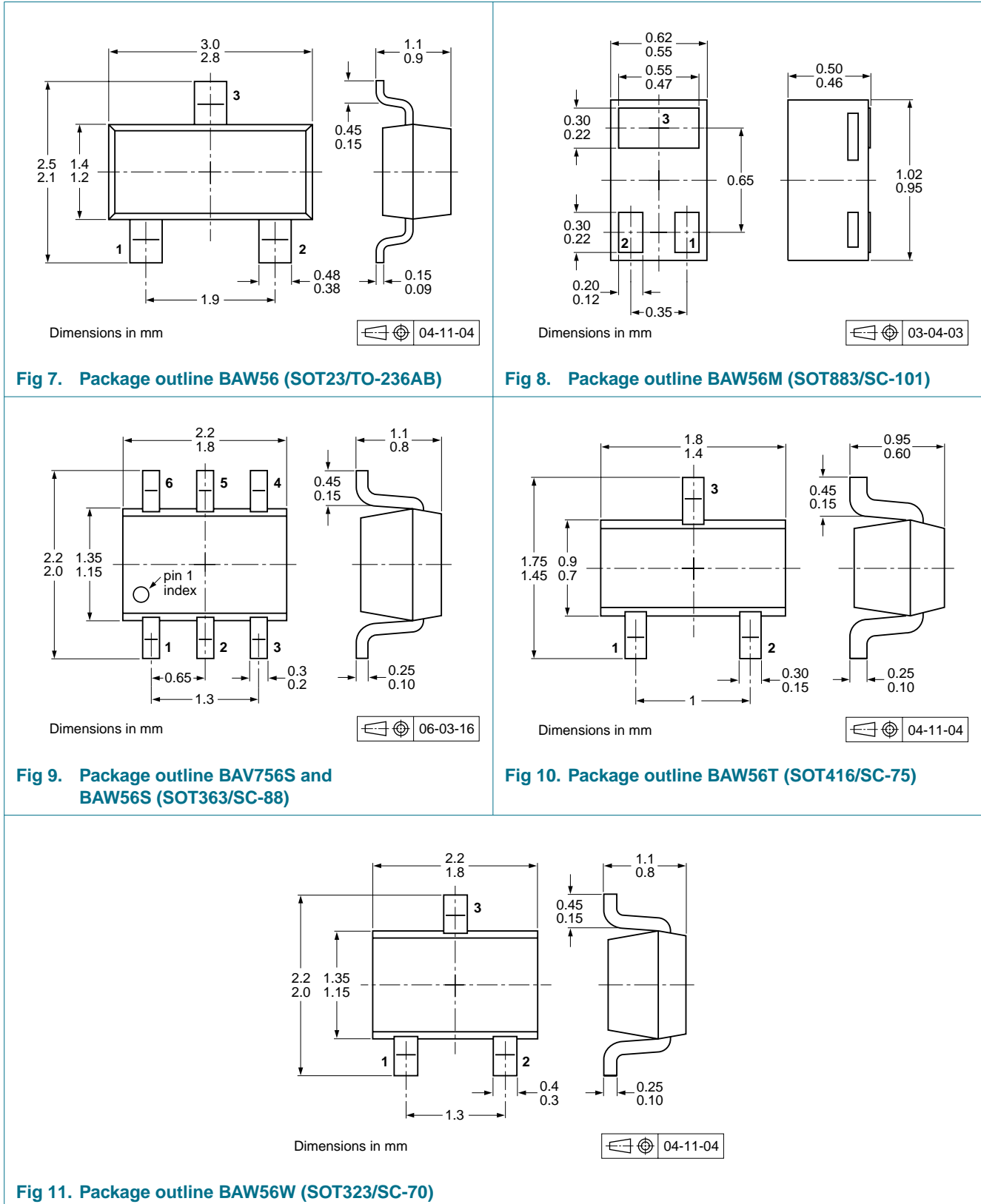
Fig 5. Reverse recovery time test circuit and waveforms



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

9. Package outline



10. Packing information

Table 9. Packing methods

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

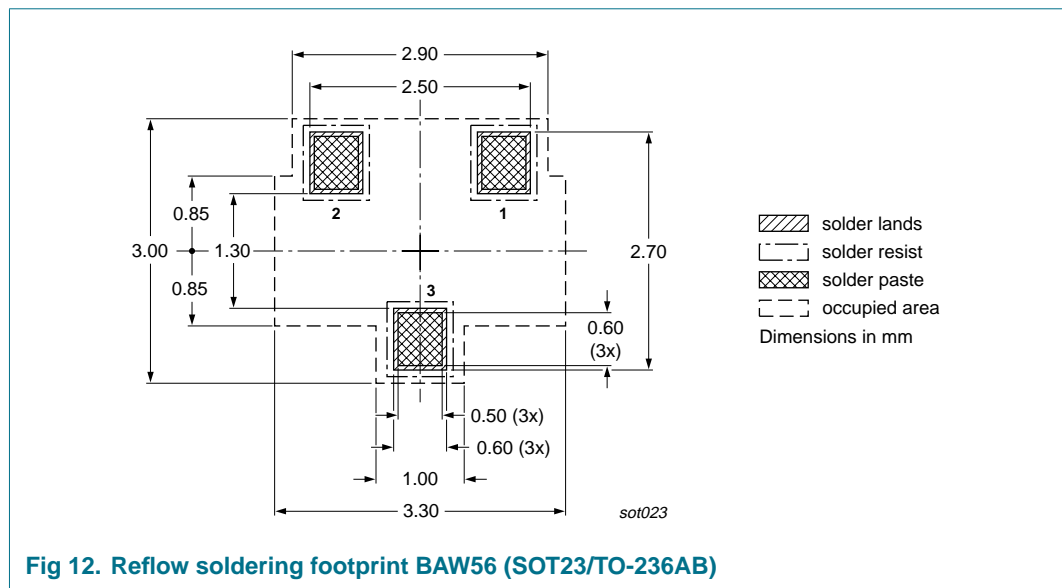
Type number	Package	Description	Packing quantity	
			3000	10000
BAV756S	SOT363	4 mm pitch, 8 mm tape and reel; T1	[2] -115	-135
		4 mm pitch, 8 mm tape and reel; T2	[3] -125	-165
BAW56	SOT23	4 mm pitch, 8 mm tape and reel	-215	-235
BAW56M	SOT883	2 mm pitch, 8 mm tape and reel	-	-315
BAW56S	SOT363	4 mm pitch, 8 mm tape and reel; T1	[2] -115	-135
		4 mm pitch, 8 mm tape and reel; T2	[3] -125	-165
BAW56T	SOT416	4 mm pitch, 8 mm tape and reel	-115	-135
BAW56W	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



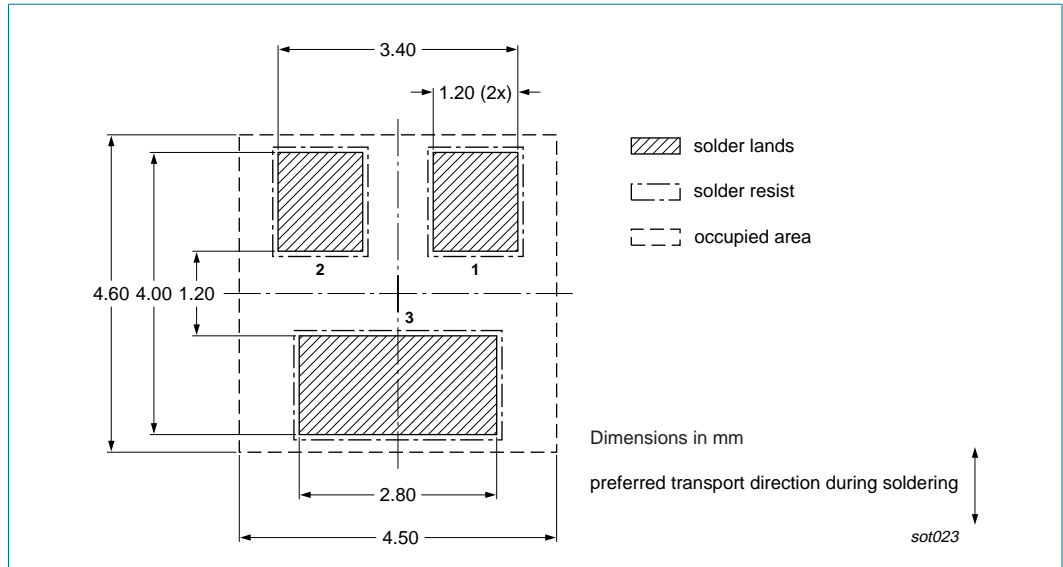
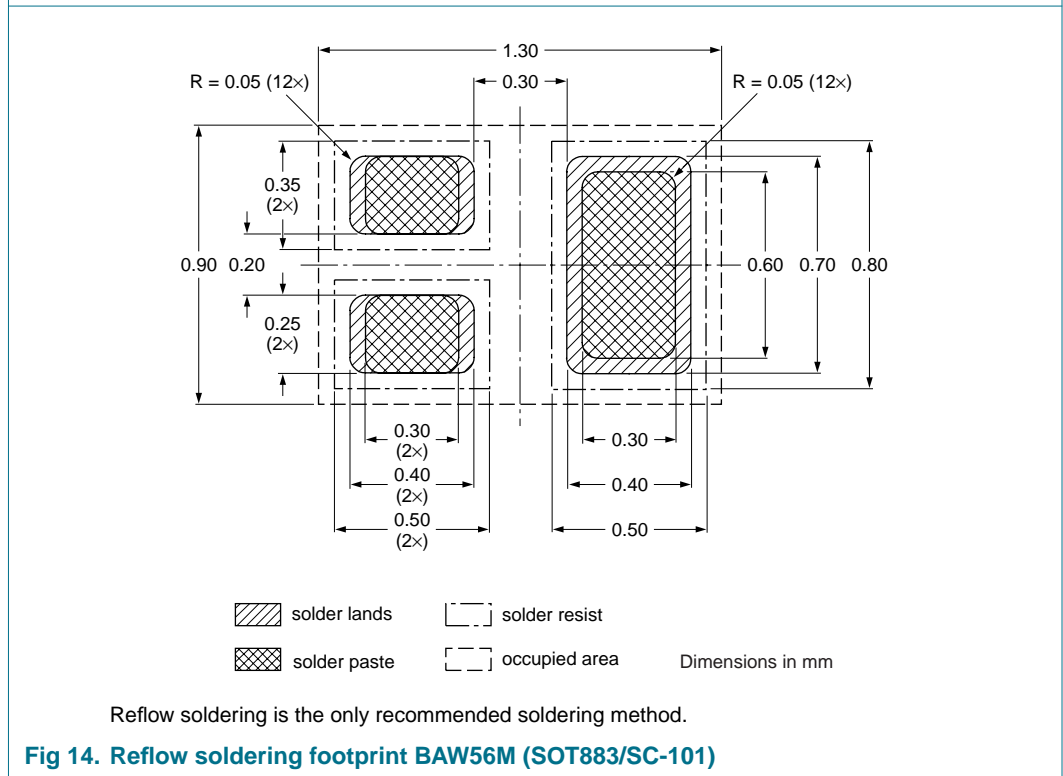


Fig 13. Wave soldering footprint BAW56 (SOT23/TO-236AB)



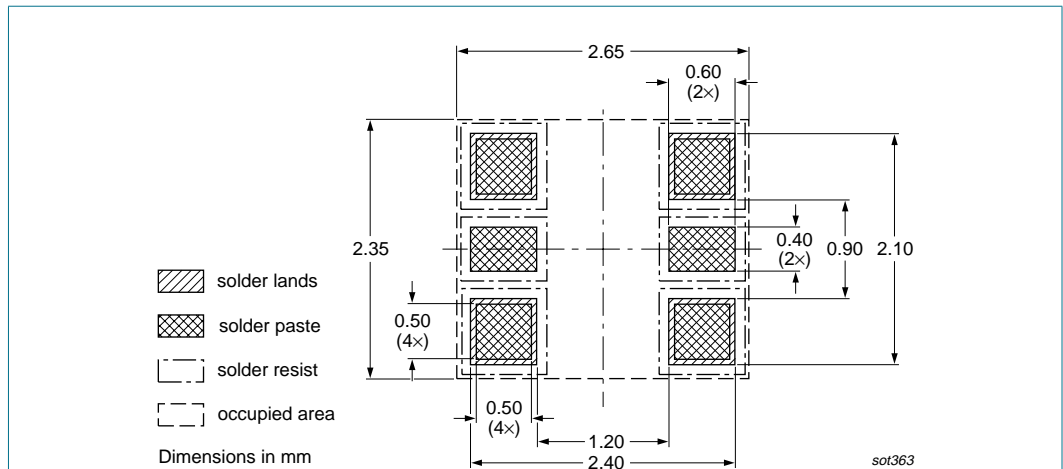


Fig 15. Reflow soldering footprint BAV756S and BAW56S (SOT363/SC-88)

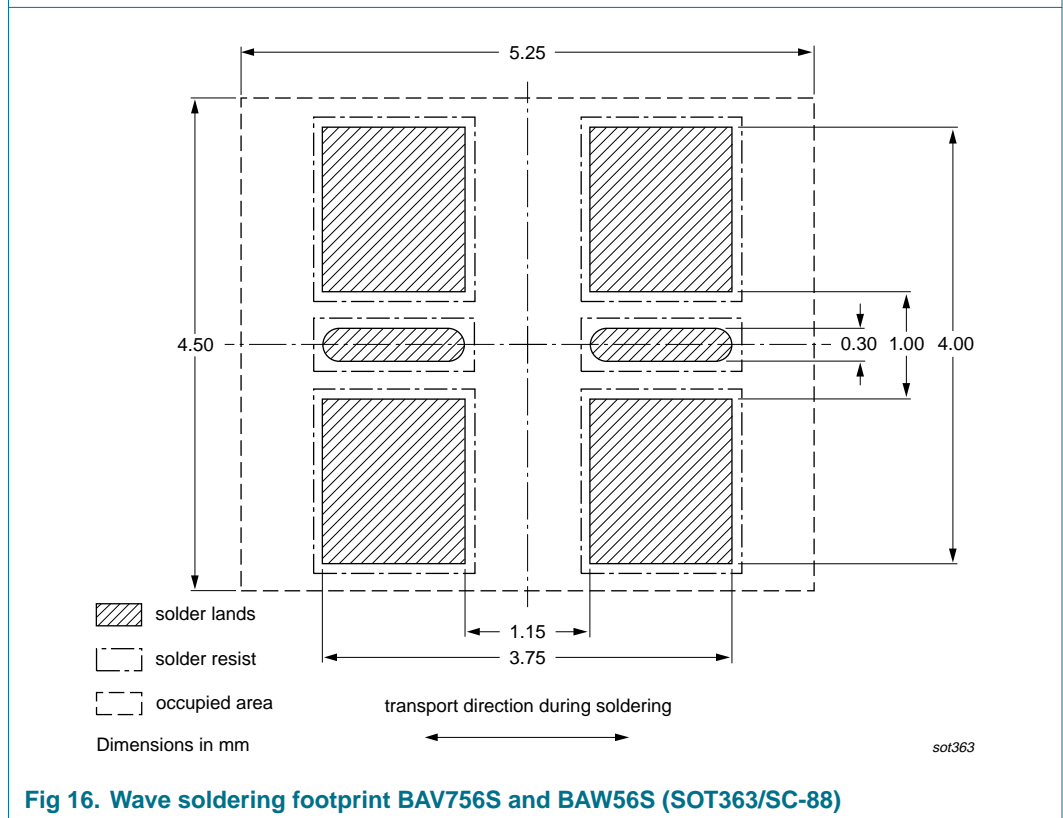


Fig 16. Wave soldering footprint BAV756S and BAW56S (SOT363/SC-88)

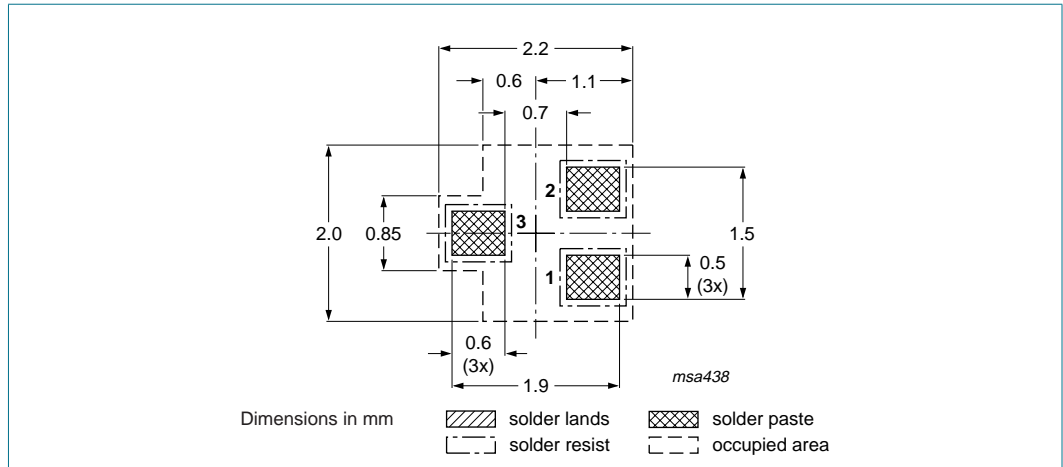


Fig 17. Reflow soldering footprint BAW56T (SOT416/SC-75)

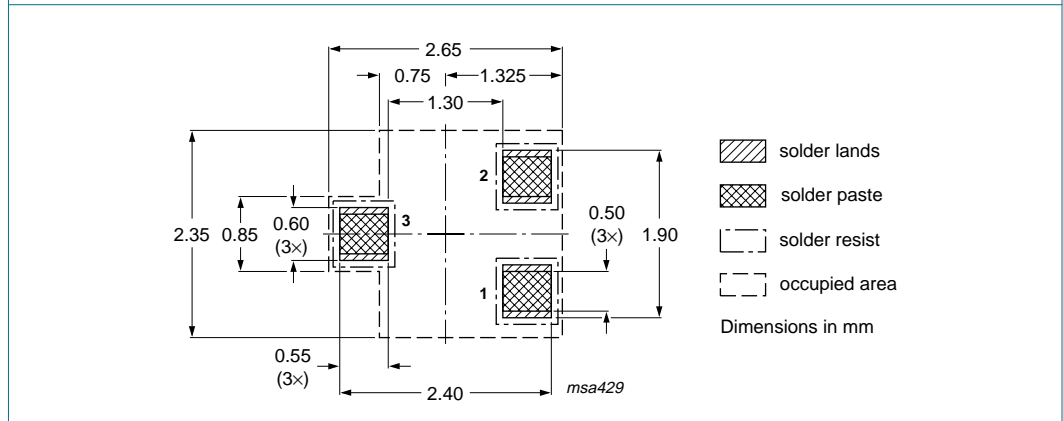


Fig 18. Reflow soldering footprint BAW56W (SOT323/SC-70)

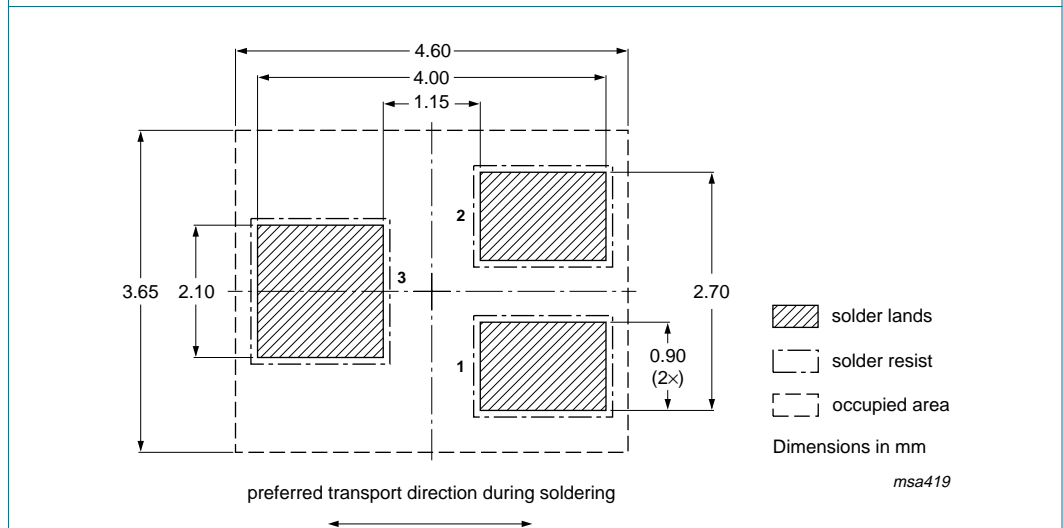


Fig 19. Wave soldering footprint BAW56W (SOT323/SC-70)

12. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BAV756S_BAW56_SER_5	20071126	Product data sheet	-	BAV756S_2 BAW56_4 BAW56S_2 BAW56T_2 BAW56W_4
<p>Modifications:</p> <ul style="list-style-type: none"> • The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. • Legal texts have been adapted to the new company name where appropriate. • Type number BAW56M added • Section 1.1 “General description”: amended • Table 1 “Product overview”: added • Table 2 “Quick reference data”: added • Table 6 “Limiting values”: for BAV756S, BAW56, BAW56S, BAW56T and BAW56W change of V_{RRM} maximum value from 85 V to 90 V • Table 6 “Limiting values”: for BAV756S, BAW56, BAW56S, BAW56T and BAW56W change of V_R maximum value from 75 V to 90 V • Table 8 “Characteristics”: for BAV756S, BAW56, BAW56S, BAW56T and BAW56W change of I_R condition V_R from 75 V to 80 V for $T_j = 25\text{ °C}$ • Table 8 “Characteristics”: for BAV756S change of I_R maximum value from 2.5 μA to 0.5 μA for $T_j = 25\text{ °C}$ • Table 8 “Characteristics”: for BAW56, BAW56S, BAW56T and BAW56W change of I_R maximum value from 1 μA to 0.5 μA for $T_j = 25\text{ °C}$ • Table 8 “Characteristics”: for BAV756S, BAW56, BAW56S, BAW56T and BAW56W change of I_R condition V_R from 75 V to 80 V for $T_j = 150\text{ °C}$ • Table 8 “Characteristics”: for BAV756S change of I_R maximum value from 60 μA to 30 μA for I_R condition $V_R = 25\text{ V}$; $T_j = 150\text{ °C}$ • Table 8 “Characteristics”: for BAV756S change of I_R maximum value from 100 μA to 150 μA for $T_j = 150\text{ °C}$ • Table 8 “Characteristics”: for BAW56, BAW56S, BAW56T and BAW56W change of I_R maximum value from 50 μA to 150 μA for $T_j = 150\text{ °C}$ • Section 8 “Test information”: added • Section 10 “Packing information”: added • Section 11 “Soldering”: added • Section 13 “Legal information”: updated 				
BAV756S_2	19971021	Product specification	-	BAV756S_1
BAW56_4	20030325	Product specification	-	BAW56_3
BAW56S_2	19971021	Product specification	-	BAW56S_1
BAW56T_2	19971219	Product specification	-	-
BAW56W_4	19990511	Product specification	-	BAW56W_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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