BAV756S; BAW56 series

High-speed switching diodes

Rev. 6 — 18 March 2015 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 and benefits

- 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
- AEC-Q101 qualified

1.3 Applications

- High-speed switching
- General-purpose switching

1.4 Quick reference data

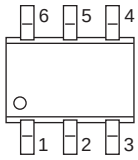
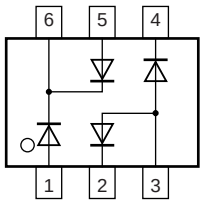
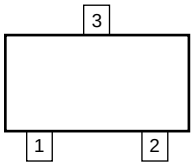
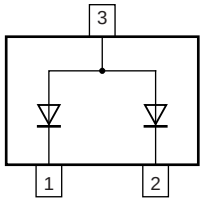
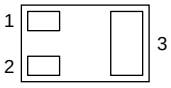
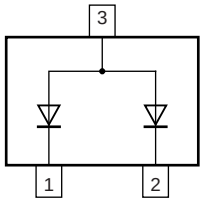
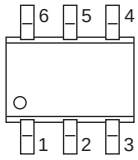
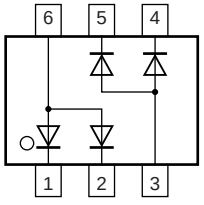
Table 2. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per diode						
I_R	reverse current	V_R = 80 V	-	-	0.5	µA
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)		 006aab103
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)	 006aaa144	 006aab099
2	cathode (diode 2)		
3	common anode		
BAW56M			
1	cathode (diode 1)	 Transparent top view	 006aab099
2	cathode (diode 2)		
3	common anode		
BAW56S			
1	cathode (diode 1)		 006aab102
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		
	Name	Description	Version
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 °C	-	250	mA
	BAW56	$T_{amb} \leq$ 25 °C	-	215	mA
	BAW56M	$T_{amb} \leq$ 25 °C	-	150	mA
	BAW56S	T_s = 60 °C	-	250	mA
	BAW56T	T_s = 90 °C	-	150	mA
	BAW56W	$T_{amb} \leq$ 25 °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 μs	-	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 °C	-	350	mW
	BAW56	$T_{amb} \leq$ 25 °C	-	250	mW
	BAW56M	$T_{amb} \leq$ 25 °C [3]	-	250	mW
	BAW56S	T_s = 60 °C	-	350	mW
	BAW56T	T_s = 90 °C [4]	-	170	mW
	BAW56W	$T_{amb} \leq$ 25 °C	-	200	mW
Per device					
I_F	forward current				
	BAV756S	T_s = 60 °C	-	100	mA
	BAW56	$T_{amb} \leq$ 25 °C	-	125	mA
	BAW56M	$T_{amb} \leq$ 25 °C	-	75	mA
	BAW56S	T_s = 60 °C	-	100	mA
	BAW56T	T_s = 90 °C	-	75	mA
	BAW56W	$T_{amb} \leq$ 25 °C	-	130	mA
T_j	junction temperature		-	150	°C
T_{amb}	ambient temperature		−65	+150	°C
T_{stg}	storage temperature		−65	+150	°C

[1] T_j = 25 °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

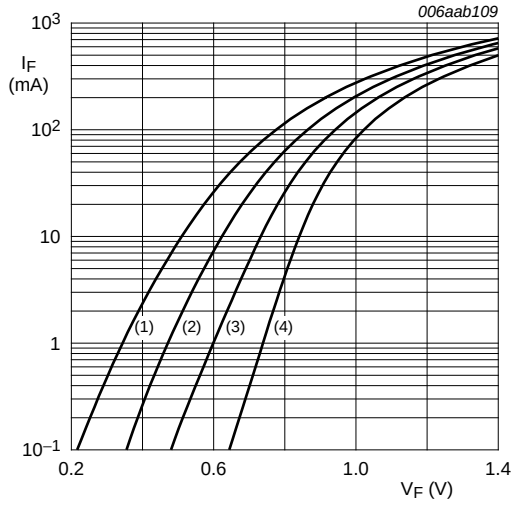
T_{amb} = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per diode						
V_F	forward voltage	[1]				
		I_F = 1 mA	-	-	715	mV
		I_F = 10 mA	-	-	855	mV
		I_F = 50 mA	-	-	1	V
		I_F = 150 mA	-	-	1.25	V
I_R	reverse current	V_R = 25 V	-	-	30	nA
		V_R = 80 V	-	-	0.5	μA
		V_R = 25 V; T_j = 150 °C	-	-	30	μA
		V_R = 80 V; T_j = 150 °C	-	-	150	μA
C_d	diode capacitance	V_R = 0 V; f = 1 MHz	-	-	2	pF
t_{rr}	reverse recovery time	[2]	-	-	4	ns
V_{FR}	forward recovery voltage	[3]	-	-	1.75	V

[1] Pulse test: $t_p \leq 300$ μs; $\delta \leq 0.02$.

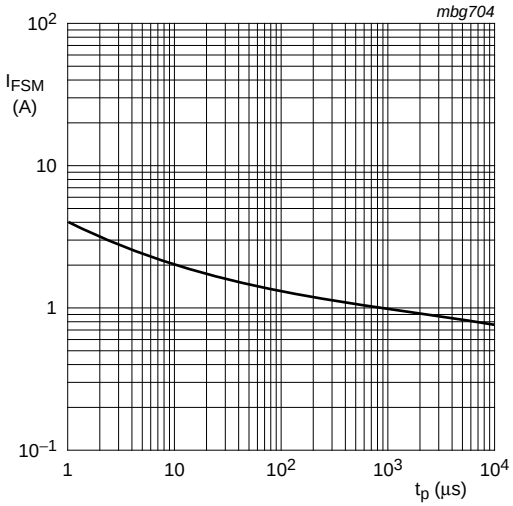
[2] When switched from I_F = 10 mA to I_R = 10 mA; R_L = 100 Ω; measured at I_R = 1 mA.

[3] When switched from I_F = 10 mA; t_r = 20 ns.



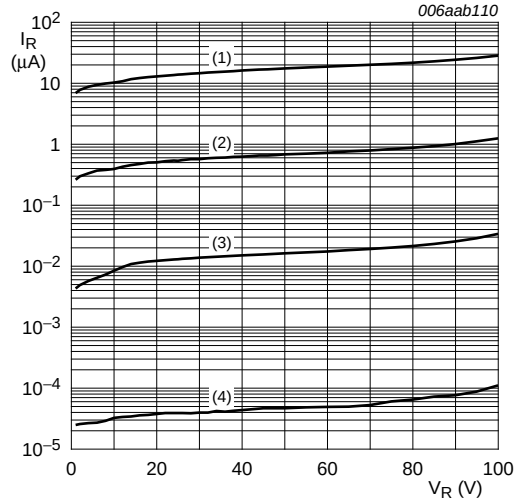
(1) T_{amb} = 150 °C
(2) T_{amb} = 85 °C
(3) T_{amb} = 25 °C
(4) T_{amb} = −40 °C

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



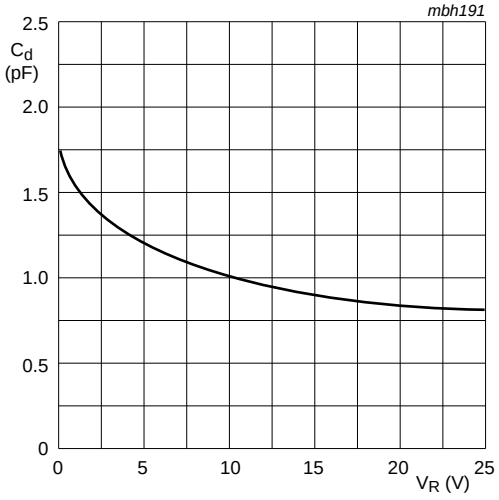
Based on square wave currents.
T_j = 25 °C; prior to surge

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



(1) T_{amb} = 150 °C
(2) T_{amb} = 85 °C
(3) T_{amb} = 25 °C
(4) T_{amb} = −40 °C

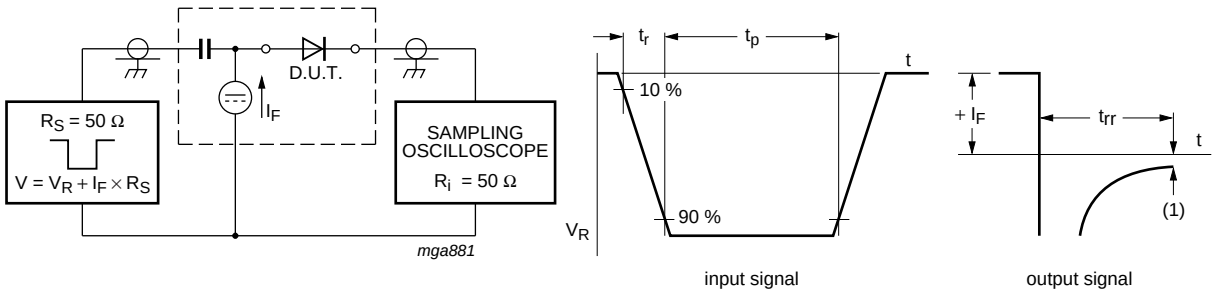
Fig 3. Reverse current as a function of reverse voltage; typical values



f = 1 MHz; T_{amb} = 25 °C

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

8. Test information

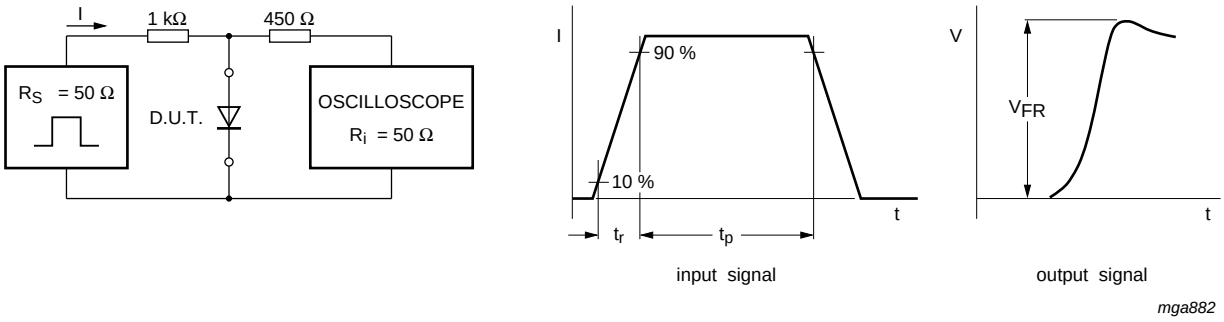


(1) I_R = 1 mA

Input signal: reverse pulse rise time t_r = 0.6 ns; reverse voltage pulse duration t_p = 100 ns; duty cycle δ = 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 $t_p \geq$ 100 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

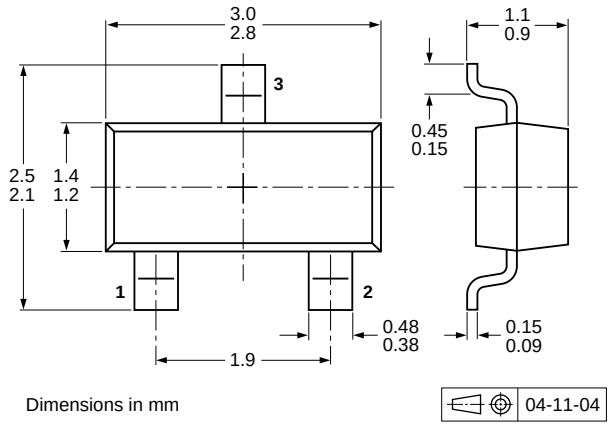


Fig 7. Package outline BAW56 (SOT23/TO-236AB)

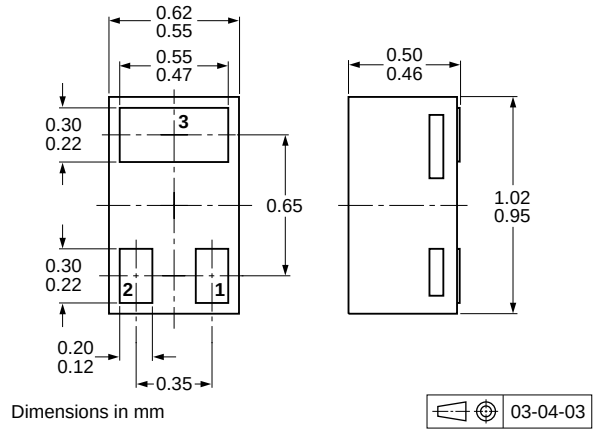


Fig 8. Package outline BAW56M (SOT883/SC-101)

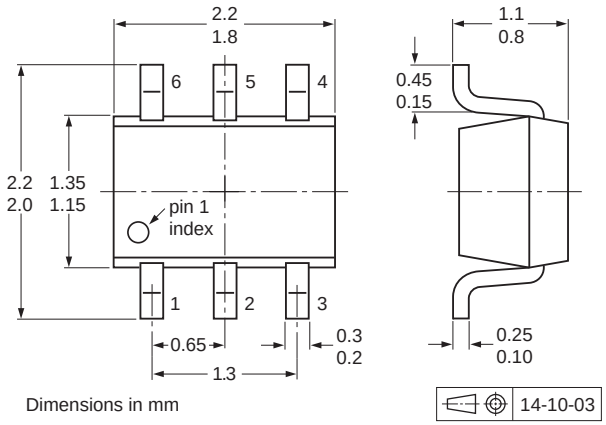


Fig 9. Package outline BAV756S and BAW56S (SOT363/SC-88)

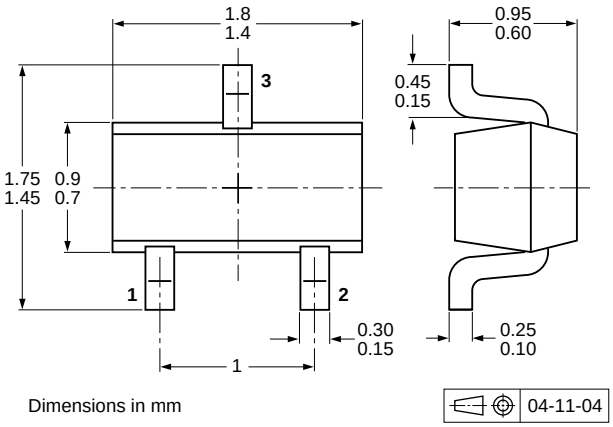


Fig 10. Package outline BAW56T (SOT416/SC-75)

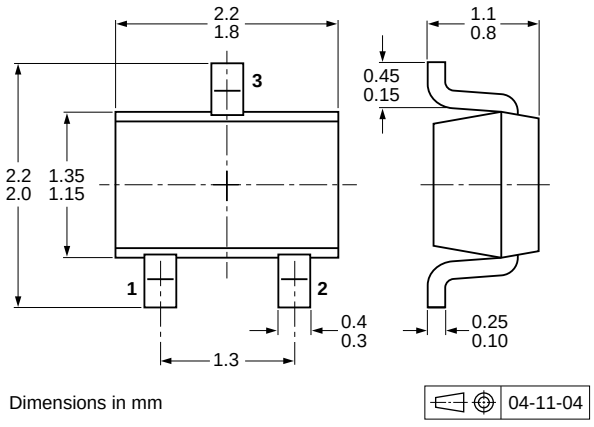


Fig 11. Package outline BAW56W (SOT323/SC-70)

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
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

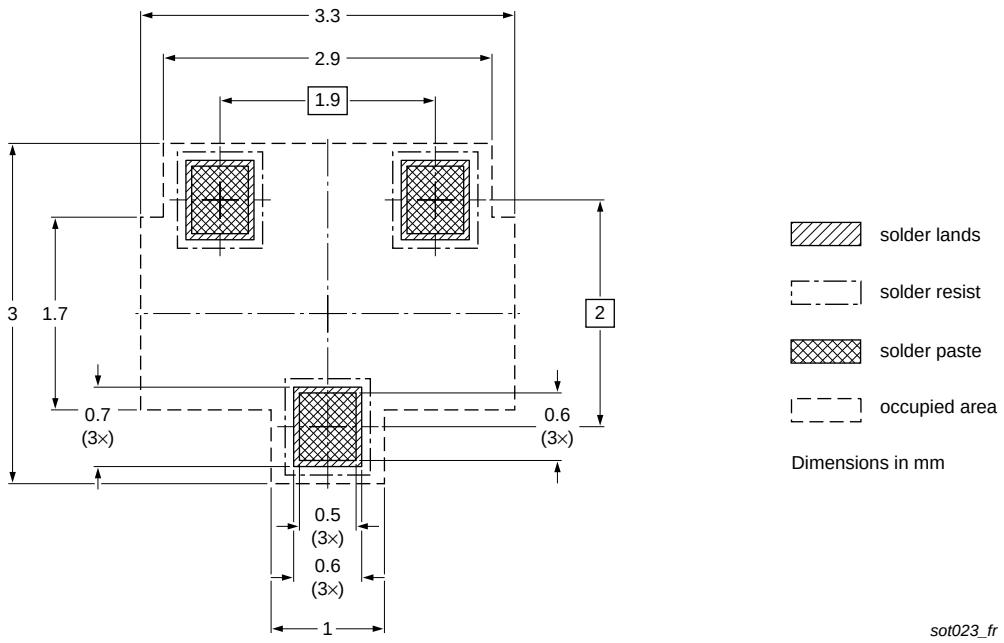


Fig 12. Reflow soldering footprint BAW56 (SOT23/TO-236AB)

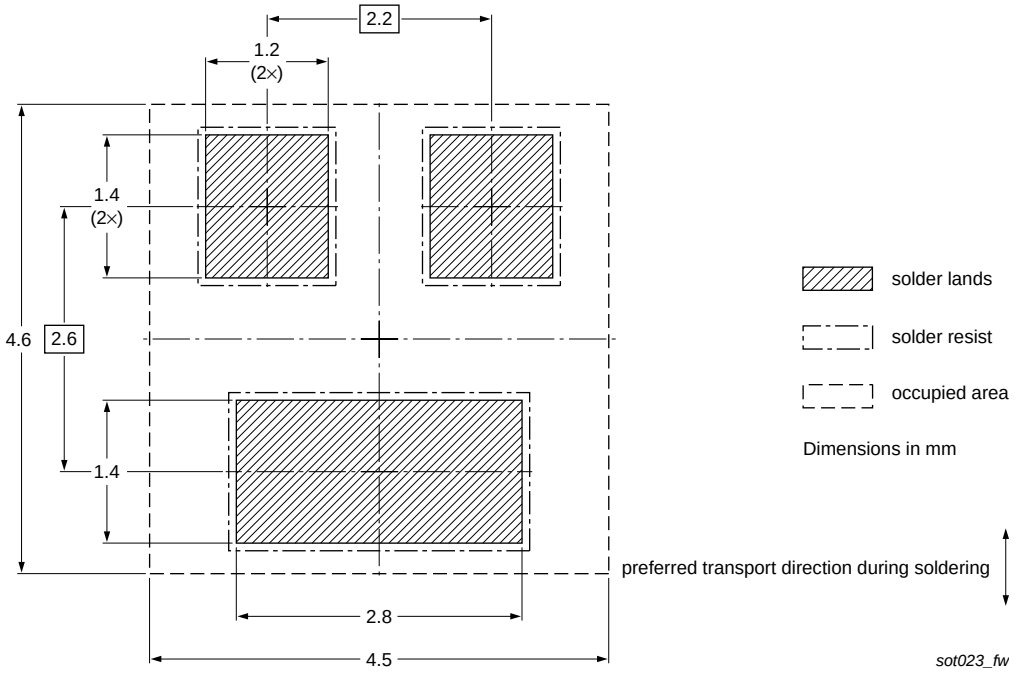
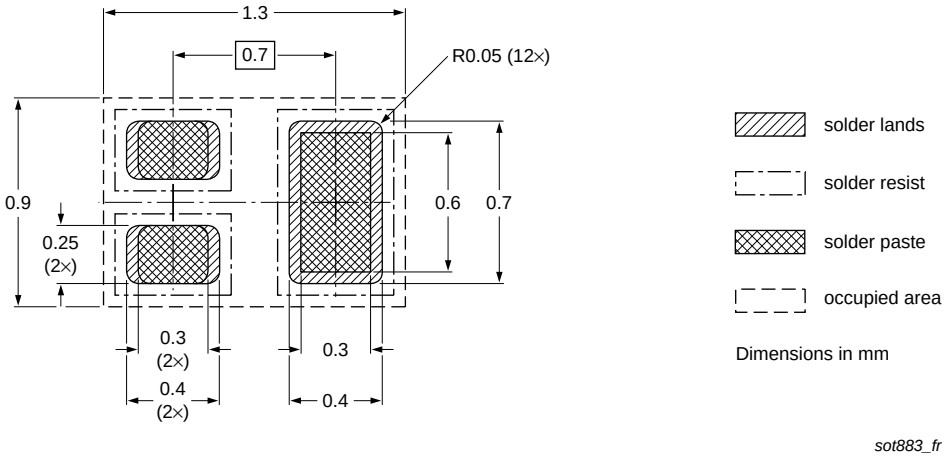


Fig 13. Wave soldering footprint BAW56 (SOT23/TO-236AB)



Reflow soldering is the only recommended soldering method.

Fig 14. Reflow soldering footprint BAW56M (SOT883/SC-101)

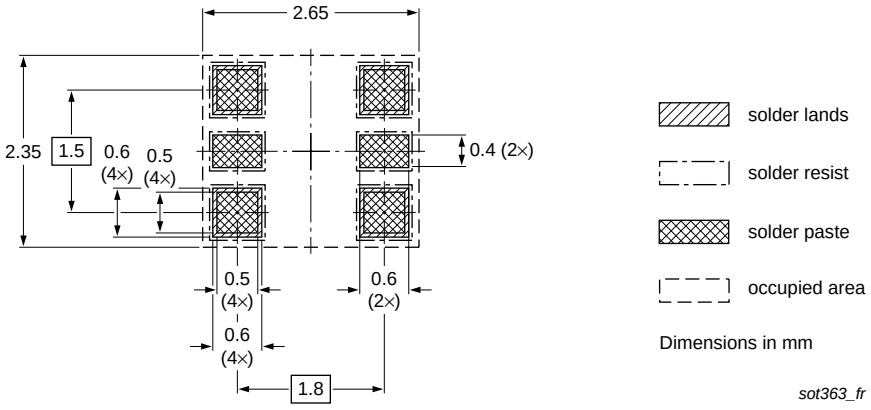


Fig 15. Reflow soldering footprint BAV756S and BAW56S (SOT363/SC-88)

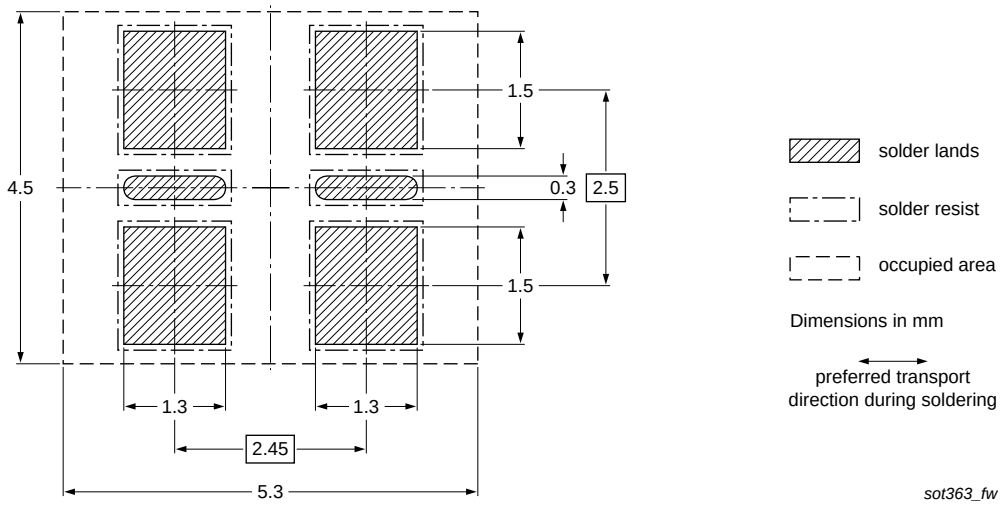


Fig 16. Wave soldering footprint BAV756S and BAW56S (SOT363/SC-88)

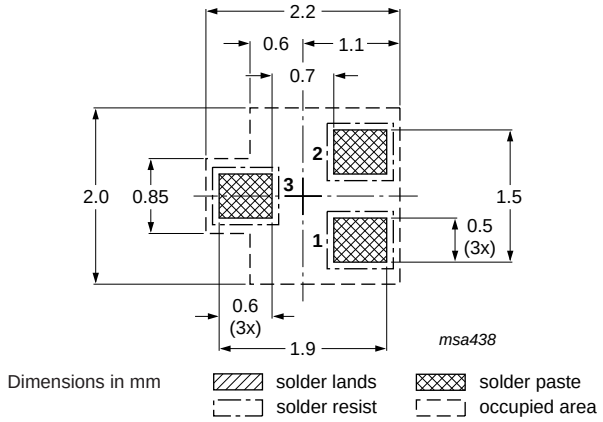


Fig 17. Reflow soldering footprint BAW56T (SOT416/SC-75)

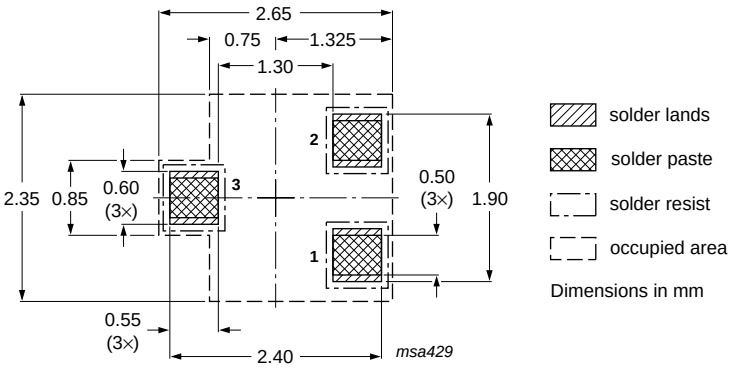


Fig 18. Reflow soldering footprint BAW56W (SOT323/SC-70)

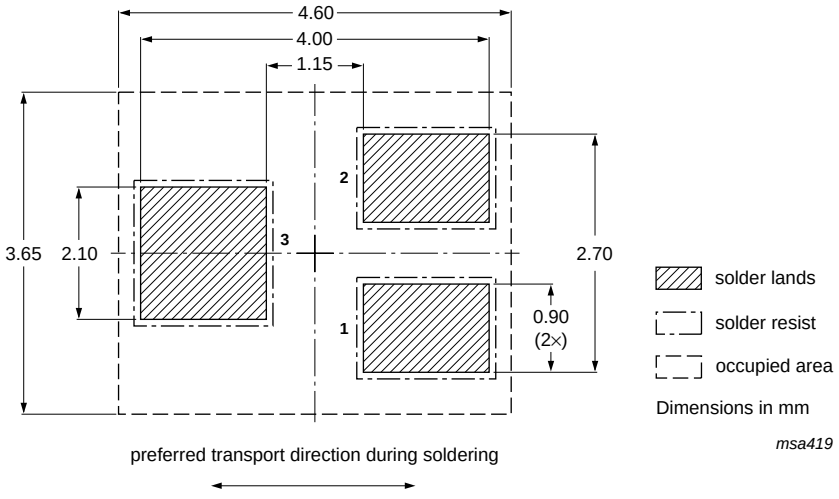


Fig 19. Wave soldering footprint BAW56W (SOT323/SC-70)

12. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BAV756S_BAW56_SER v.6	20150318	Product data sheet	-	BAV756S_BAW56_SER_5
Modifications:	• 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.			
BAV756S_BAW56_SER_5	20071126	Product data sheet	-	BAV756S_2 BAW56_4 BAW56S_2 BAW56T_2 BAW56W_4
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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nxp.com.

13.2 Definitions

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14. Contact information

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