BAS16 series

High-speed switching diodes

Rev. 05 — 25 August 2008 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		
BAS16	SOT23	-	TO-236AB	single	small
BAS16H	SOD123F	-	-	single	small and flat lead
BAS16J	SOD323F	SC-90	-	single	very small and flat lead
BAS16L	SOD882	-	-	single	leadless ultra small
BAS16T	SOT416	SC-75	-	single	ultra small
BAS16VV	SOT666	-	-	triple isolated	ultra small and flat lead
BAS16VY	SOT363	SC-88	-	triple isolated	very small
BAS16W	SOT323	SC-70	-	single	very small
BAS316	SOD323	SC-76	-	single	very small
BAS516	SOD523	SC-79	-	single	ultra small and flat lead

1.2 Features

- High switching speed: $t_{rr} \leq 4$ ns
- Low leakage current
- Repetitive peak reverse voltage: $V_{RRM} \leq 100$ V
- Low capacitance
- Reverse voltage: $V_R \leq 100$ V
- Small SMD plastic packages

1.3 Applications

- High-speed switching
- General-purpose switching

1.4 Quick reference data

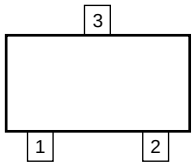
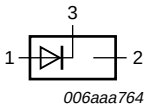
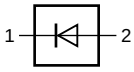
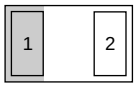
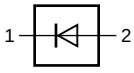
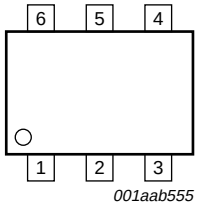
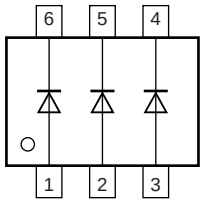
Table 2. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Per diode							
V_R	reverse voltage			-	-	100	V
I_R	reverse current	V_R = 80 V		-	-	0.5	µA
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
BAS16; BAS16T; BAS16W				
1	anode		 006aaa144	 006aaa764
2	not connected			
3	cathode			
BAS16H; BAS16J; BAS316; BAS516				
1	cathode	[1]	 001aab540	 006aab040
2	anode			
BAS16L				
1	cathode	[1]	 Transparent top view	 006aab040
2	anode			
BAS16VV; BAS16VY				
1	anode (diode 1)		 001aab555	 006aab106
2	anode (diode 2)			
3	anode (diode 3)			
4	cathode (diode 3)			
5	cathode (diode 2)			
6	cathode (diode 1)			

[1] The marking bar indicates the cathode.

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3. Ordering information

Table 4. Ordering information

Type number	Package		
	Name	Description	Version
BAS16	-	plastic surface-mounted package; 3 leads	SOT23
BAS16H	-	plastic surface-mounted package; 2 leads	SOD123F
BAS16J	SC-90	plastic surface-mounted package; 2 leads	SOD323F
BAS16L	-	leadless ultra small plastic package; 2 terminals; body 1.0 × 0.6 × 0.5 mm	SOD882
BAS16T	SC-75	plastic surface-mounted package; 3 leads	SOT416
BAS16VV	-	plastic surface-mounted package; 6 leads	SOT666
BAS16VY	SC-88	plastic surface-mounted package; 6 leads	SOT363
BAS16W	SC-70	plastic surface-mounted package; 3 leads	SOT323
BAS316	SC-76	plastic surface-mounted package; 2 leads	SOD323
BAS516	SC-79	plastic surface-mounted package; 2 leads	SOD523

4. Marking

Table 5. Marking codes

Type number	Marking code[1]
BAS16	A6*
BAS16H	A1
BAS16J	AR
BAS16L	S2
BAS16T	A6
BAS16VV	53
BAS16VY	16*
BAS16W	A6*
BAS316	A6
BAS516	6

[1] * = -: made in Hong Kong
* = p: made in Hong Kong
* = t: made in Malaysia
* = W: made in China

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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					
	BAS16		[1]	-	215	mA
	BAS16H BAS16L		[2]	-	215	mA
	BAS16T		[1]	-	155	mA
	BAS16VV BAS16VY		[1][3]	-	200	mA
	BAS16W		[1]	-	175	mA
	BAS16J BAS316 BAS516		[1]	-	250	mA
I_{FRM}	repetitive peak forward current	$t_p \leq 0.5$ µs; $\delta \leq 0.25$		-	500	mA
I_{FSM}	non-repetitive peak forward current	square wave	[4]			
		t_p = 1 µs		-	4	A
		t_p = 1 ms		-	1	A
		t_p = 1 s		-	0.5	A
P_{tot}	total power dissipation					
	BAS16	$T_{amb} \leq 25$ °C	[1]	-	250	mW
	BAS16H	$T_{amb} \leq 25$ °C	[2][5][6]	-	380	mW
			[5][6][7]	-	830	mW
	BAS16J	$T_{amb} \leq 25$ °C	[5][6][7]	-	550	mW
	BAS16L	$T_{amb} \leq 25$ °C	[2][5][6]	-	250	mW
	BAS16T	$T_{sp} \leq 90$ °C	[1]	-	170	mW
	BAS16VV	$T_{amb} \leq 25$ °C	[1][3][5][8]	-	180	mW
	BAS16VY	$T_{sp} \leq 85$ °C	[1][3][8]	-	250	mW
	BAS16W	$T_{amb} \leq 25$ °C	[1]	-	200	mW
	BAS316	$T_{sp} \leq 90$ °C	[1][6]	-	400	mW
	BAS516	$T_{sp} \leq 90$ °C	[1][5][6]	-	500	mW

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Table 6. Limiting values *…continued*

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

Symbol	Parameter	Conditions	Min	Max	Unit
Per device					
T_j	junction temperature		-	150	°C
T_{amb}	ambient temperature		–65	+150	°C
T_{stg}	storage temperature		–65	+150	°C

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

[2] Device mounted on an FR4 PCB with 60 μm copper strip line.

[3] Single diode loaded.

[4] T_j = 25 °C prior to surge.

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

[6] Soldering point of cathode tab.

[7] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 cm^2.

[8] Soldering points at pins 4, 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					
	BAS16		[1]	-	-	500	K/W
	BAS16H		[2][3]	-	-	330	K/W
			[3][4]	-	-	150	K/W
	BAS16J		[3][4]	-	-	230	K/W
	BAS16L		[2][3]	-	-	500	K/W
	BAS16VV		[2][3][5]	-	-	700	K/W
			[3][4][5]	-	-	410	K/W
	BAS16W		[1]	-	-	625	K/W
$R_{th(j-t)}$	thermal resistance from junction to tie-point						
	BAS16			-	-	330	K/W
	BAS16W			-	-	300	K/W

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Table 7. Thermal characteristics *...continued*

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-sp)}$	thermal resistance from junction to solder point						
	BAS16H		[6]	-	-	70	K/W
	BAS16J		[6]	-	-	55	K/W
	BAS16T			-	-	350	K/W
	BAS16VY		[5][7]	-	-	260	K/W
	BAS316		[6]	-	-	150	K/W
	BAS516		[6]	-	-	120	K/W

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

[2] Device mounted on an FR4 PCB with 60 µm copper strip line.

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

[4] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 cm^2.

[5] Single diode loaded.

[6] Soldering point of cathode tab.

[7] Soldering points at pins 4, 5 and 6.

7. Characteristics

Table 8. Characteristics

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

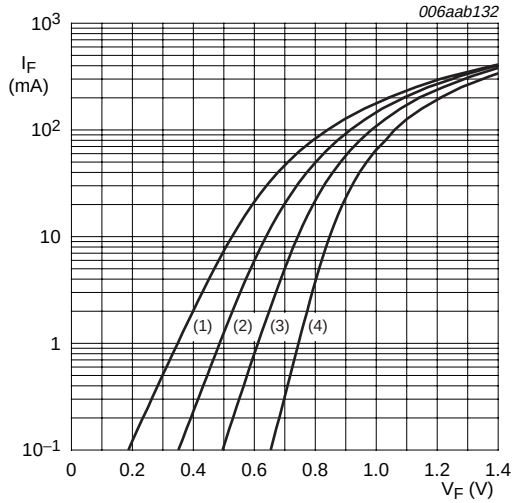
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Per diode							
V_F	forward voltage		[1]				
		I_F = 1 mA		-	-	715	mV
		I_F = 10 mA		-	-	855	mV
		I_F = 50 mA		-	-	1	V
		I_F = 150 mA		-	-	1.25	V
I_R	reverse current	V_R = 25 V		-	-	30	nA
		V_R = 80 V		-	-	0.5	µA
		V_R = 25 V; T_j = 150 °C		-	-	30	µA
		V_R = 80 V; T_j = 150 °C		-	-	50	µA
C_d	diode capacitance	f = 1 MHz; V_R = 0 V					
	BAS16; BAS16H; BAS16J; BAS16L; BAS16T; BAS16VV; BAS16VY; BAS16W; BAS316			-	-	1.5	pF
	BAS516			-	-	1	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.

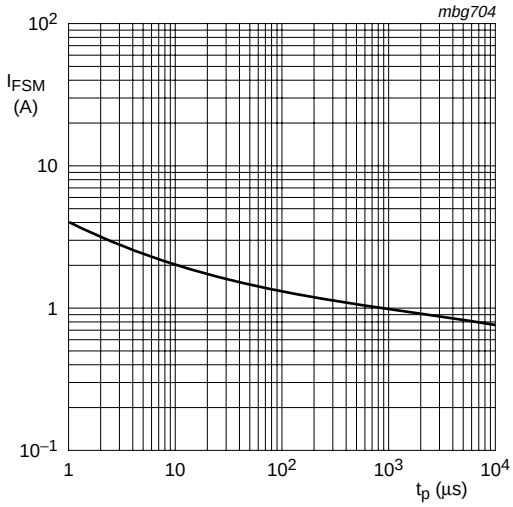
[3] When switched from I_F = 10 mA; t_r = 20 ns.

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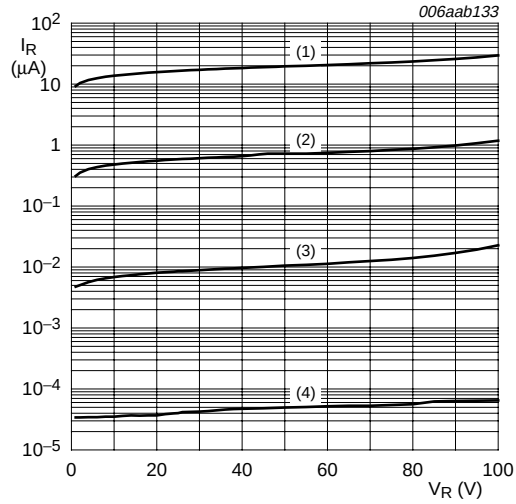
(1) T_{amb} = 150 °C
(2) T_{amb} = 85 °C
(3) T_{amb} = 25 °C
(4) T_{amb} = −40 °C

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



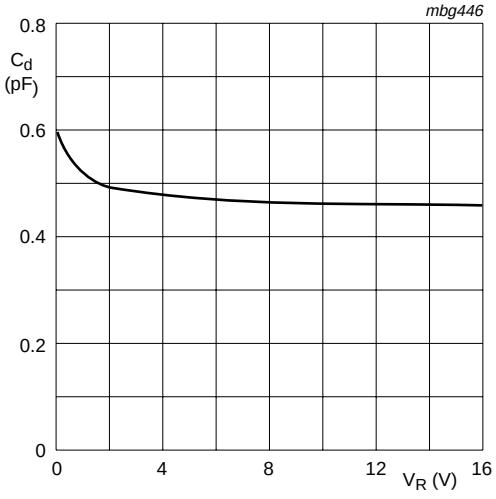
Based on square wave currents.
T_j = 25 °C; prior to surge

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

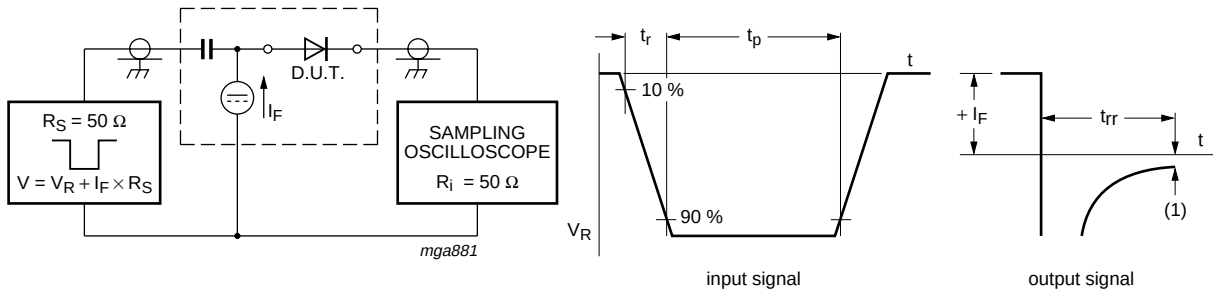


f = 1 MHz; T_{amb} = 25 °C

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

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8. Test information

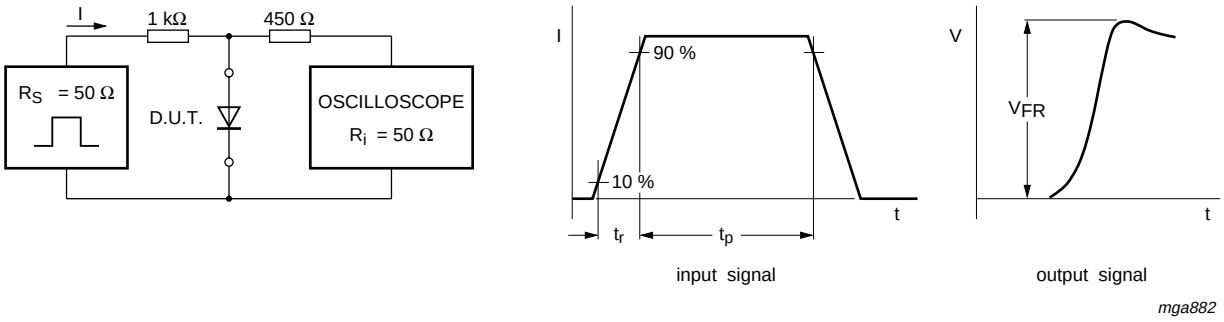


(1) I_R = 1 mA

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 δ ≤ 0.005

Fig 6. Forward recovery voltage test circuit and waveforms

9. Package outline

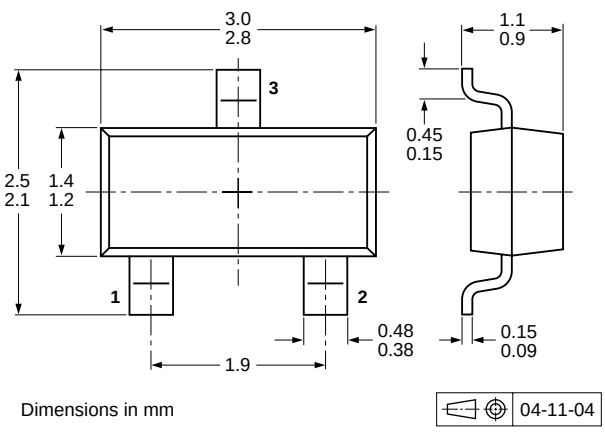


Fig 7. Package outline BAS16 (SOT23/TO-236AB)

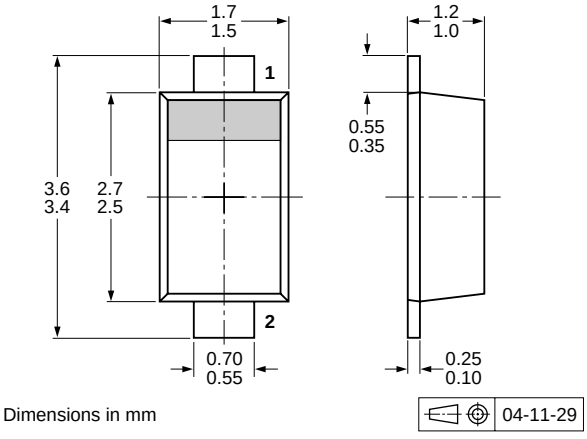


Fig 8. Package outline BAS16H (SOD123F)

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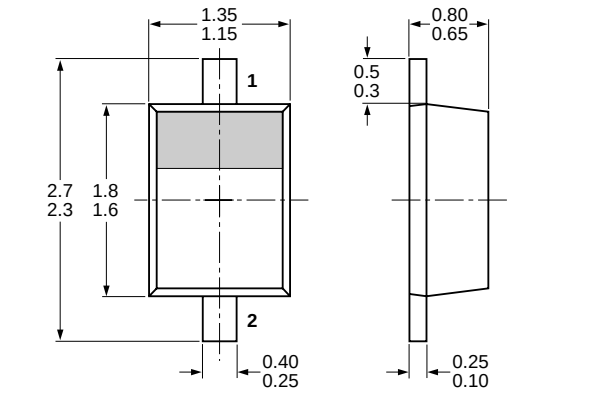


Fig 9. Package outline BAS16J (SOD323F/SC-90)

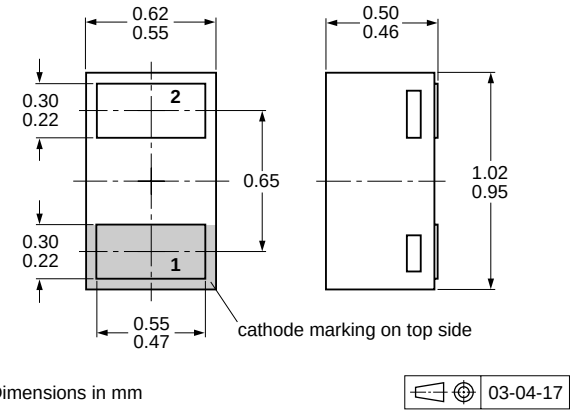


Fig 10. Package outline BAS16L (SOD882)

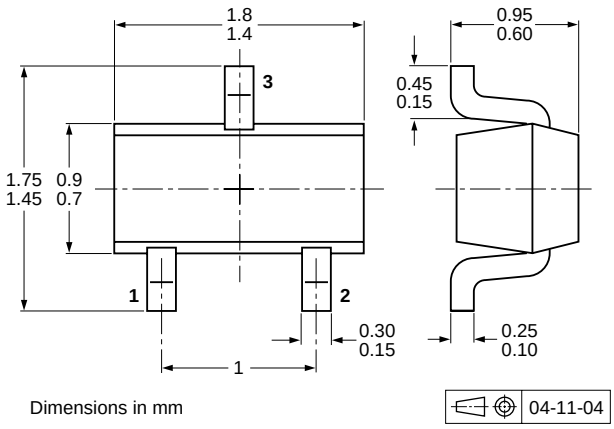


Fig 11. Package outline BAS16T (SOT416/SC-75)

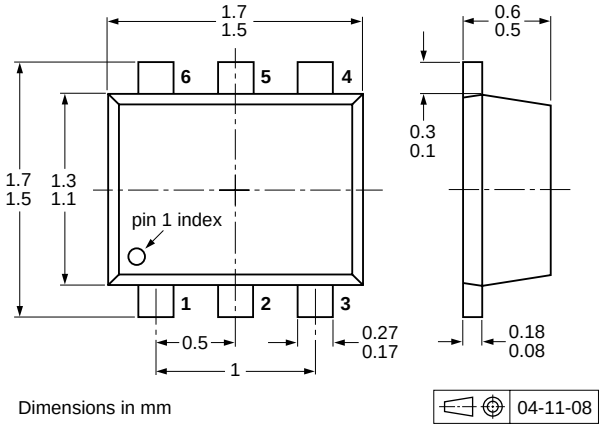


Fig 12. Package outline BAS16VV (SOT666)

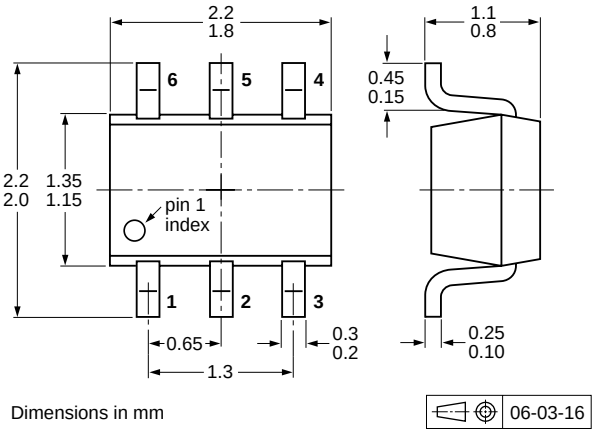


Fig 13. Package outline BAS16VY (SOT363)

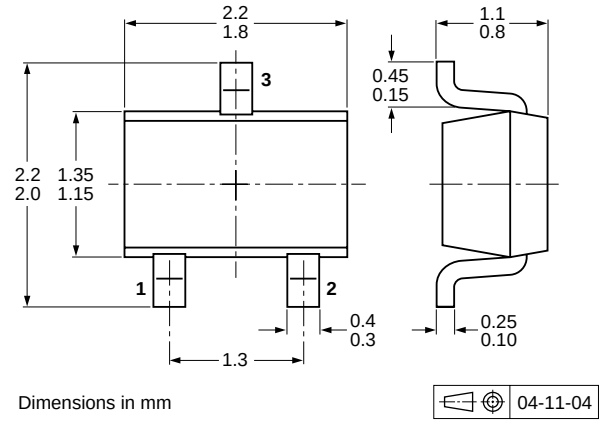


Fig 14. Package outline BAS16W (SOT323/SC-70)

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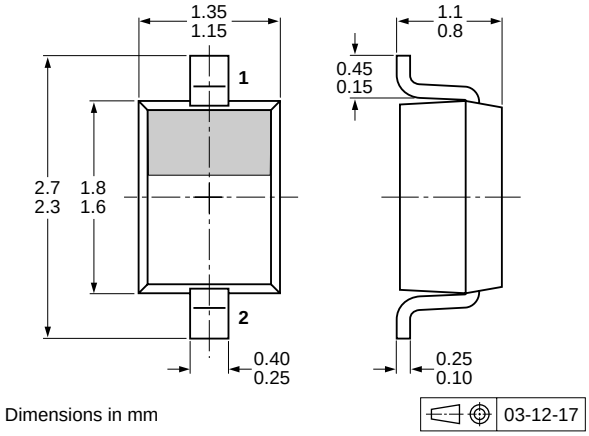


Fig 15. Package outline BAS316 (SOD323/SC-76)

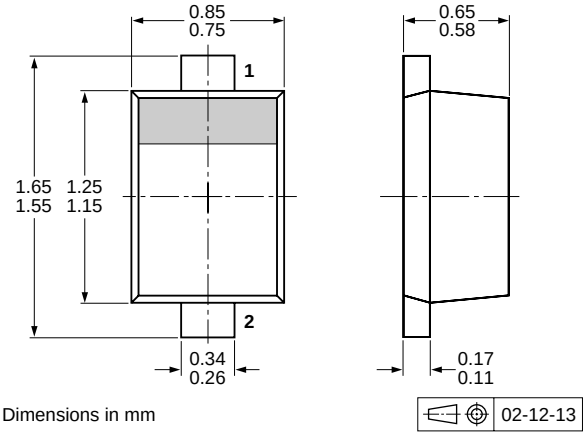


Fig 16. Package outline BAS516 (SOD523/SC-79)

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	4000	8000	10000
BAS16	SOT23	4 mm pitch, 8 mm tape and reel	-215	-	-	-235
BAS16H	SOD123F	4 mm pitch, 8 mm tape and reel	-115	-	-	-135
BAS16J	SOD323F	4 mm pitch, 8 mm tape and reel	-115	-	-	-135
BAS16L	SOD882	2 mm pitch, 8 mm tape and reel	-	-	-	-315
BAS16T	SOT416	4 mm pitch, 8 mm tape and reel	-115	-	-	-135
BAS16VV	SOT666	2 mm pitch, 8 mm tape and reel	-	-	-315	-
		4 mm pitch, 8 mm tape and reel	-	-115	-	-
BAS16VY	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
BAS16W	SOT323	4 mm pitch, 8 mm tape and reel	-115	-	-	-135
BAS316	SOD323	4 mm pitch, 8 mm tape and reel	-115	-	-	-135
BAS516	SOD523	2 mm pitch, 8 mm tape and reel	-	-	-315	-
		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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11. Soldering

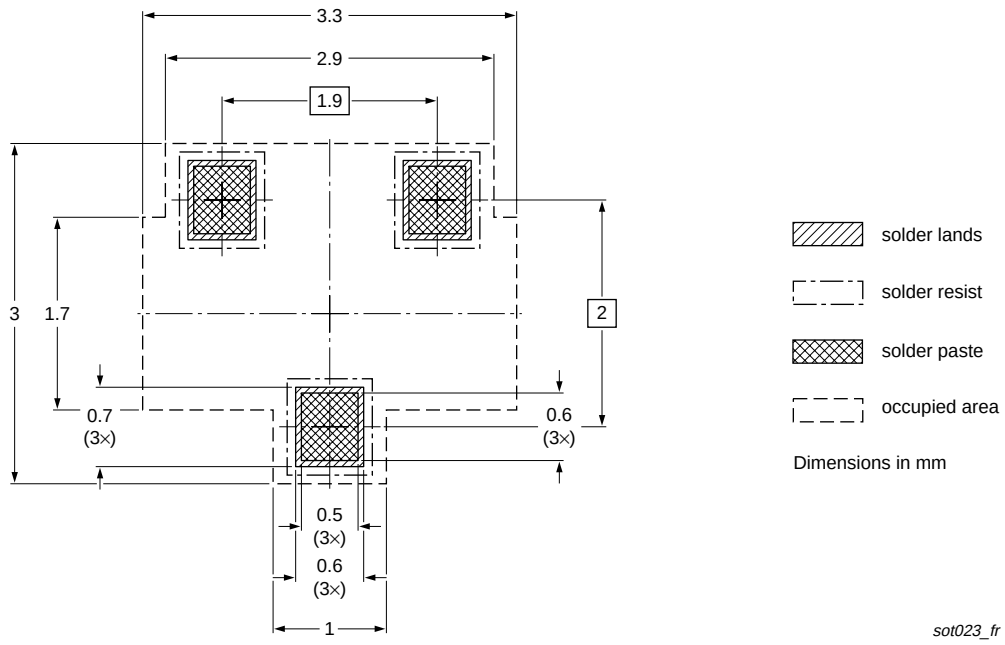


Fig 17. Reflow soldering footprint BAS16 (SOT23/TO-236AB)

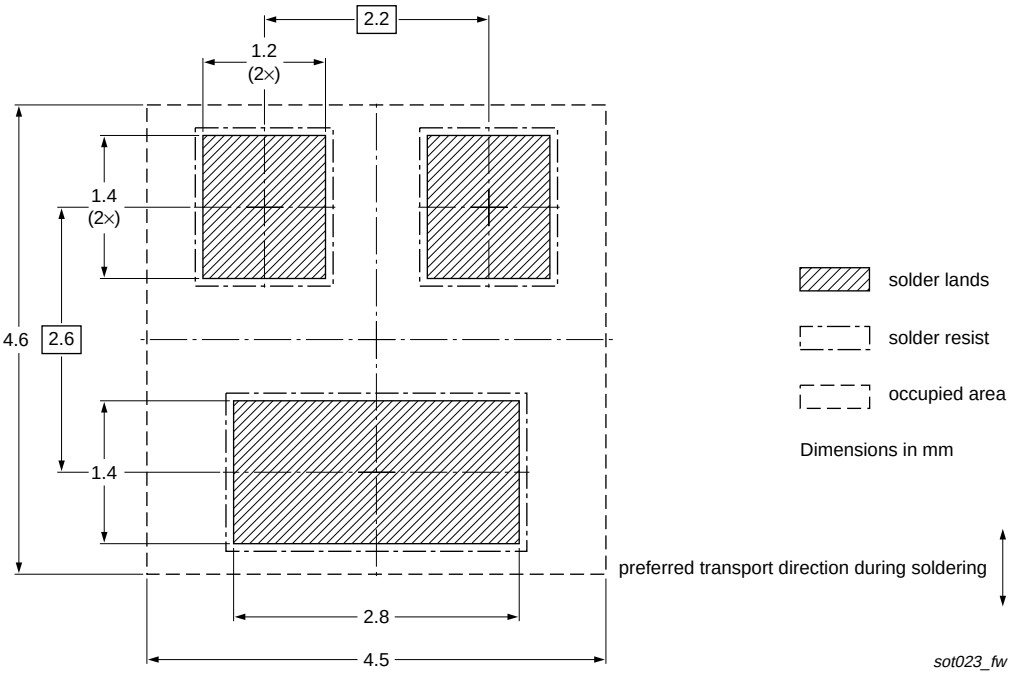
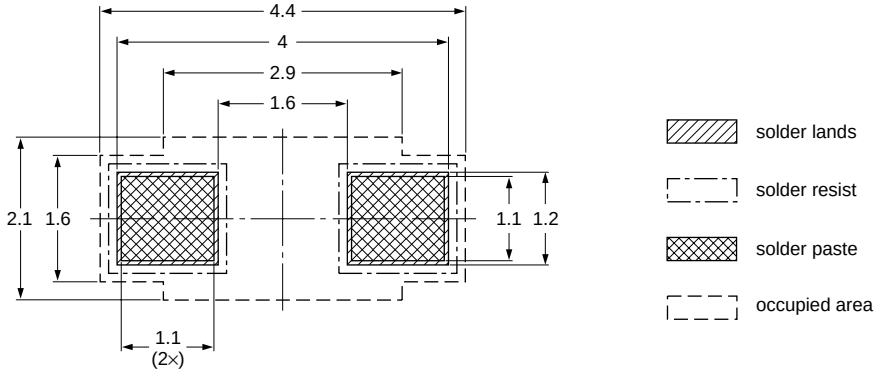


Fig 18. Wave soldering footprint BAS16 (SOT23/TO-236AB)

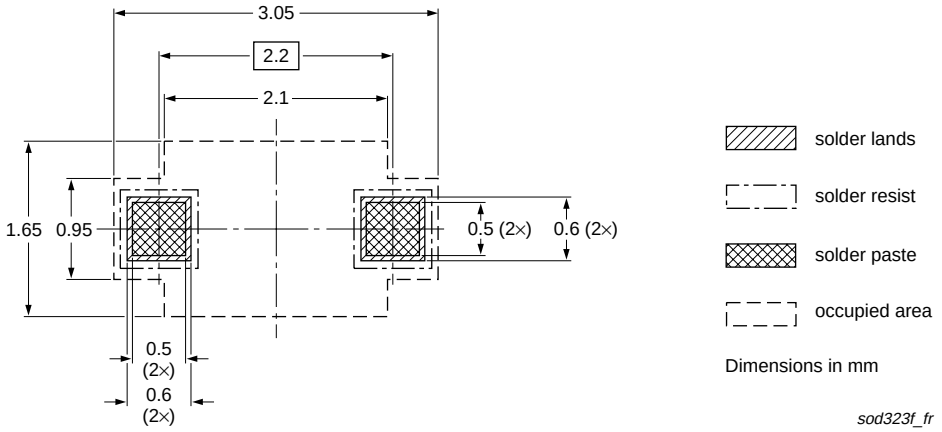
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Reflow soldering is the only recommended soldering method.

Dimensions in mm

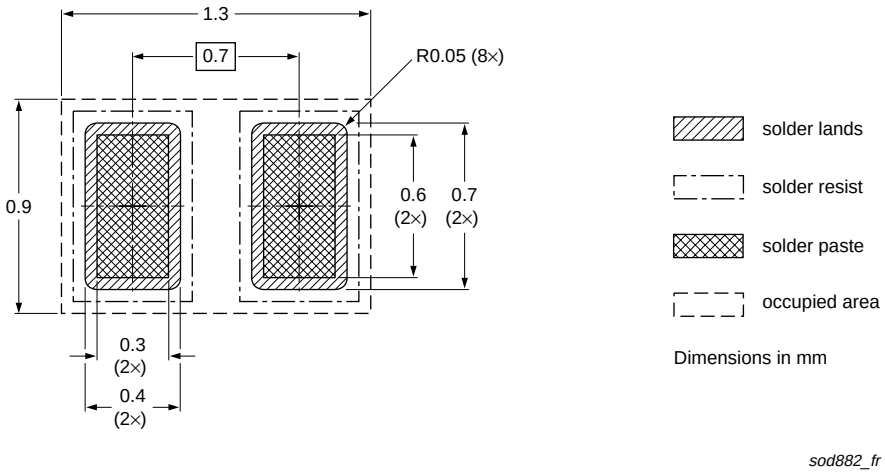
Fig 19. Reflow soldering footprint BAS16H (SOD123F)



Reflow soldering is the only recommended soldering method.

Fig 20. Reflow soldering footprint BAS16J (SOD323F)

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Reflow soldering is the only recommended soldering method.

Fig 21. Reflow soldering footprint BAS16L (SOD882)

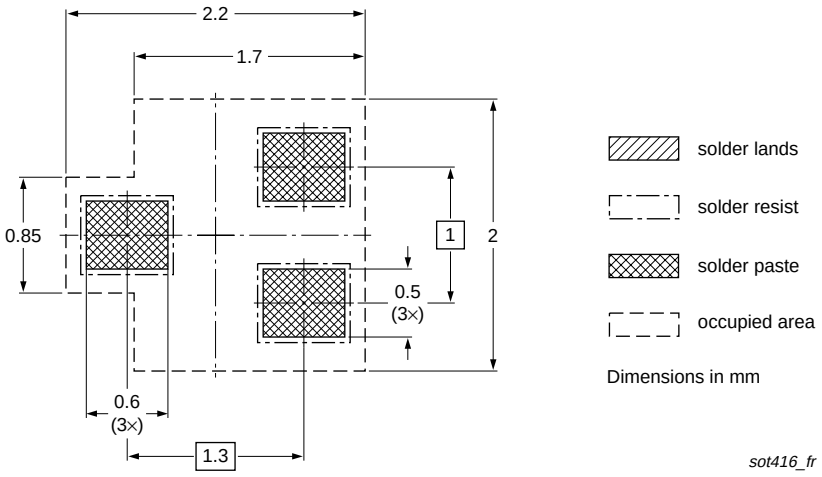
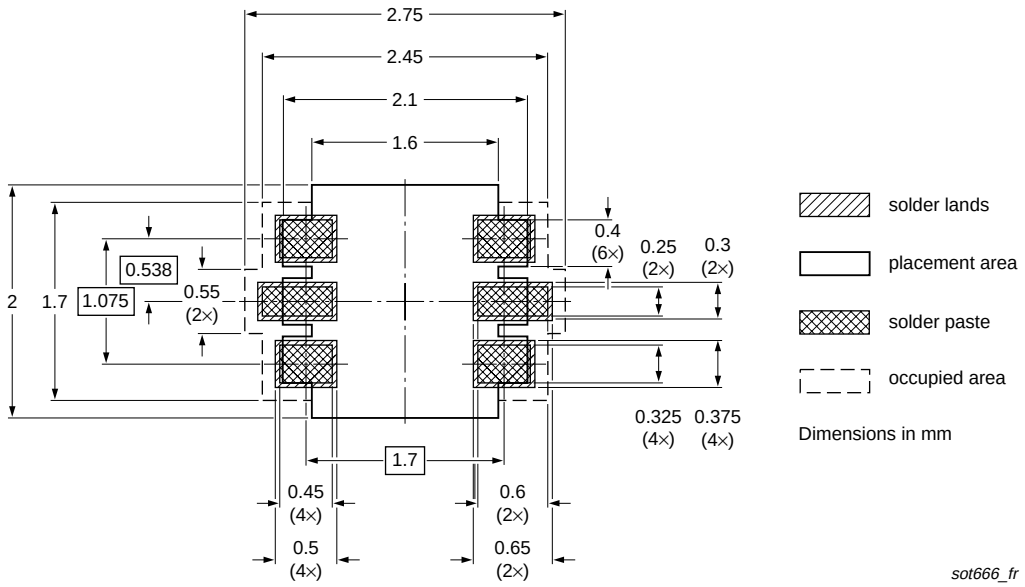


Fig 22. Reflow soldering footprint BAS16T (SOT416/SC-75)

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Reflow soldering is the only recommended soldering method.

Fig 23. Reflow soldering footprint BAS16VV (SOT666)

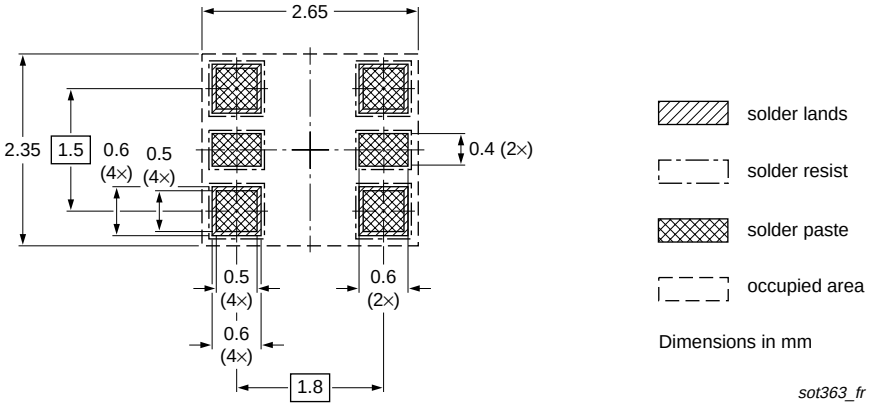


Fig 24. Reflow soldering footprint BAS16VY (SOT363/SC-88)

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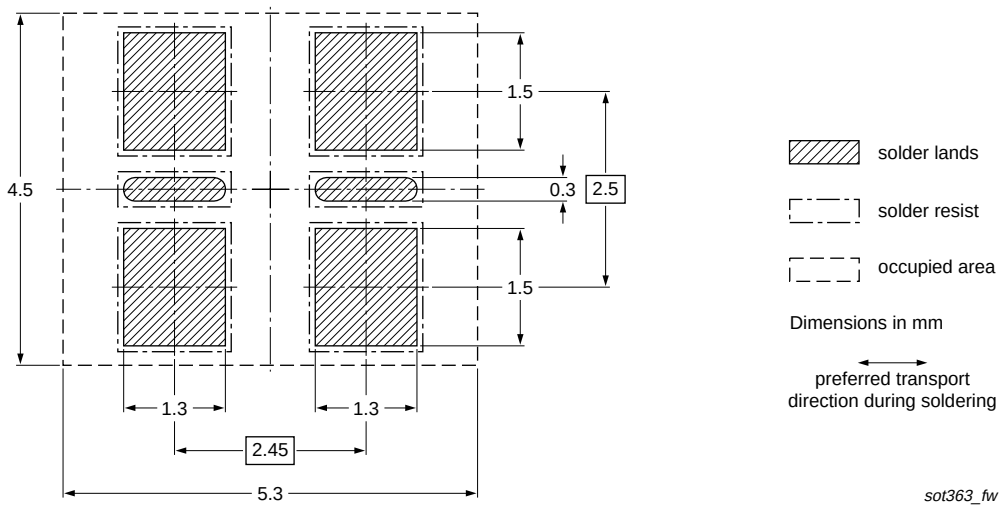


Fig 25. Wave soldering footprint BAS16VY (SOT363/SC-88)

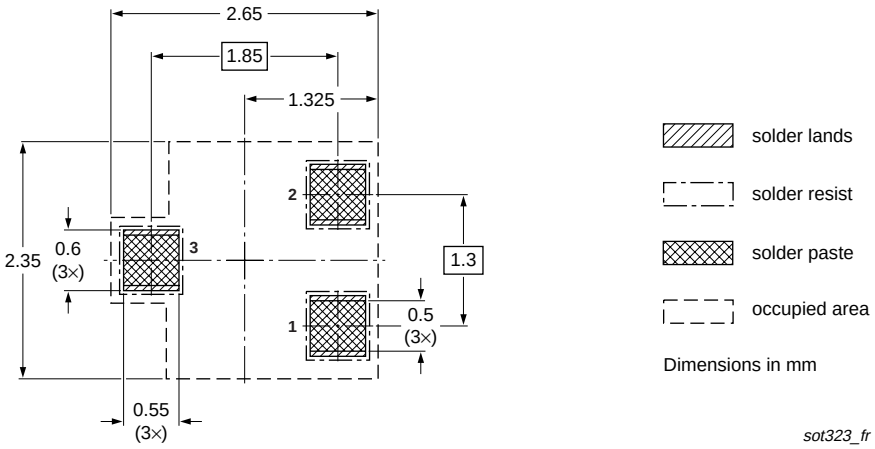


Fig 26. Reflow soldering footprint BAS16W (SOT323/SC-70)

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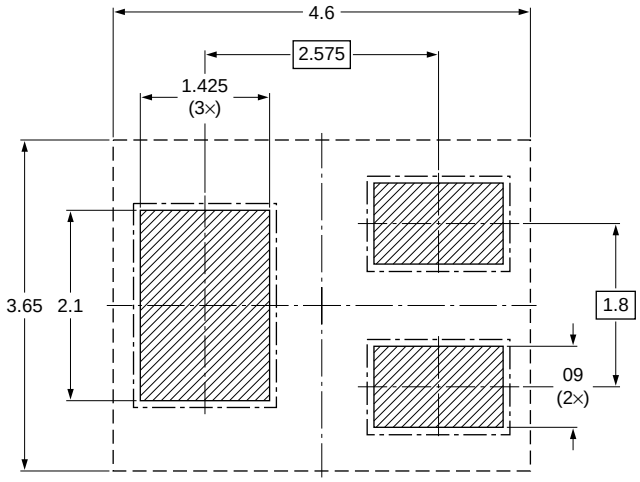


Fig 27. Wave soldering footprint BAS16W (SOT323/SC-70)

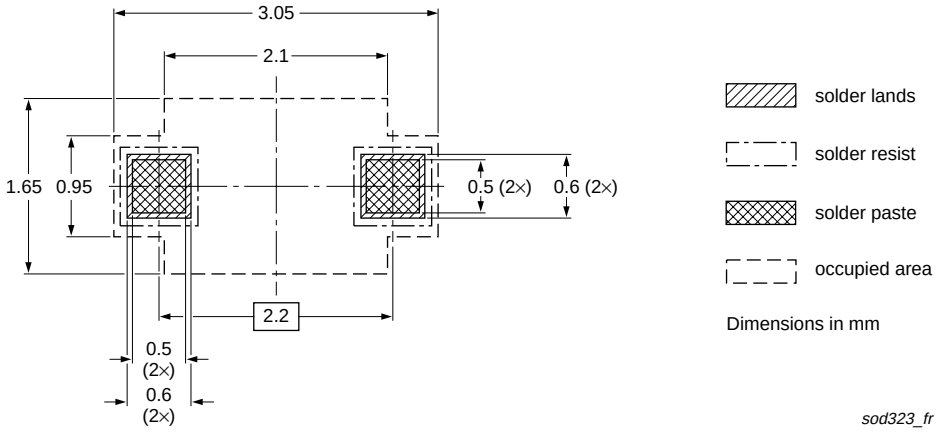


Fig 28. Reflow soldering footprint BAS316 (SOD323/SC-76)

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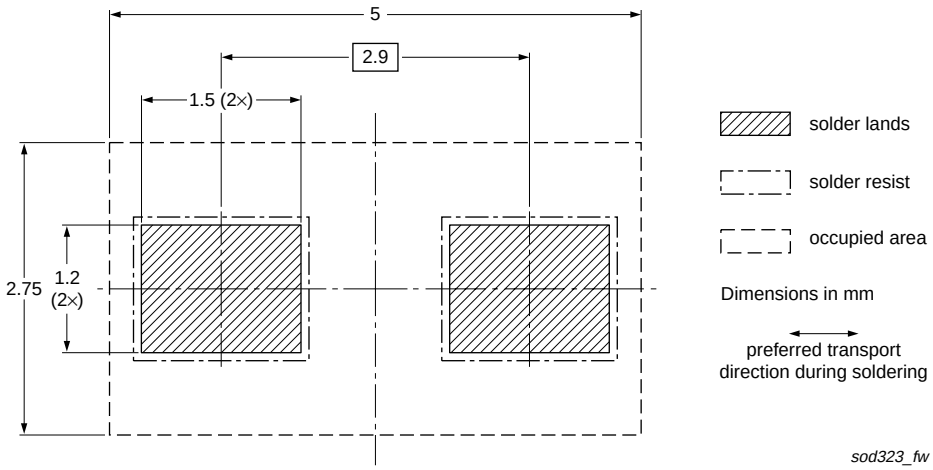
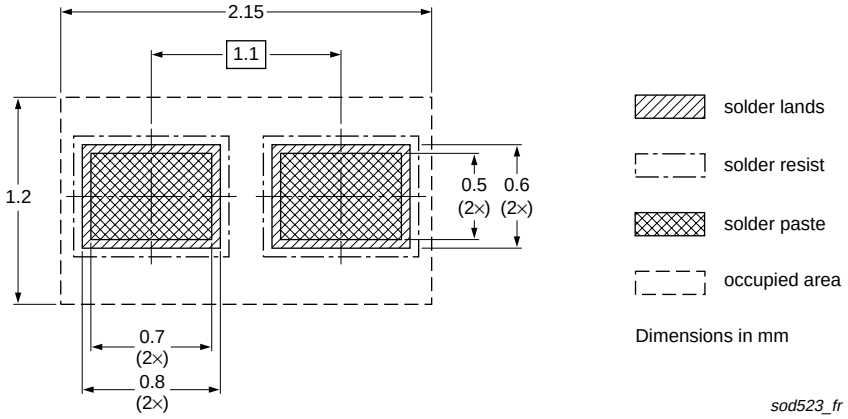


Fig 29. Wave soldering footprint BAS316 (SOD323/SC-76)



Reflow soldering is the only recommended soldering method.

Fig 30. Reflow soldering footprint BAS516 (SOD523/SC-79)

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12. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BAS16_SER_5	20080825	Product data sheet	-	BAS16_4 BAS16H_1 BAS16J_1 BAS16L_1 BAS16T_1 BAS16VV_BAS16VY_3 BAS16W_4 BAS316_4 BAS516_1
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. • Table 5 “Marking codes”: marking code amended for BAS16W • Table 6 “Limiting values”: for BAS16, BAS16T, BAS16W and BAS516 change of V_{RRM} maximum value from 85 V to 100 V • Table 6 “Limiting values”: for BAS16, BAS16L, BAS16T, BAS16W and BAS516 change of V_R maximum value from 75 V to 100 V • Table 8 “Characteristics”: change of I_R condition V_R from 75 V to 80 V for T_j = 25 °C • Table 8 “Characteristics”: change of I_R maximum value from 1.0 µA to 0.5 µA for V_R = 80 V and T_j = 25 °C • Table 8 “Characteristics”: change of I_R condition V_R from 75 V to 80 V for T_j = 150 °C • Section 13 “Legal information”: updated			
BAS16_4	20011010	Product specification	-	BAS16_3
BAS16H_1	20050415	Product data sheet	-	-
BAS16J_1	20070308	Product data sheet	-	-
BAS16L_1	20030623	Product specification	-	-
BAS16T_1	19980120	Product specification	-	-
BAS16VV_BAS16VY_3	20070420	Product data sheet	-	BAS16VV_BAS16VY_2
BAS16W_4	19990506	Product specification	-	BAS16W_3
BAS316_4	20040204	Product specification	-	BAS316_3
BAS516_1	19980831	Product specification	-	-

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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.

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