

# 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
<b>Per diode</b>						
$V_R$	reverse voltage		-	-	100	V
$I_R$	reverse current	$V_R = 80\text{ V}$	-	-	0.5	$\mu\text{A}$
$t_{rr}$	reverse recovery time		[1]	-	4	ns

[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. Pinning information**

**Table 3. Pinning**

Pin	Description	Simplified outline	Graphic symbol	
<b>BAS16; BAS16T; BAS16W</b>				
1	anode	<p>006aaa144</p>	<p>006aaa764</p>	
2	not connected			
3	cathode			
<b>BAS16H; BAS16J; BAS316; BAS516</b>				
1	cathode	[1]	<p>001aab540</p>	<p>006aab040</p>
2	anode	[1]		
<b>BAS16L</b>				
1	cathode	[1]	<p>Transparent top view</p>	<p>006aab040</p>
2	anode	[1]		
<b>BAS16VV; BAS16VY</b>				
1	anode (diode 1)	<p>001aab555</p>	<p>006aab106</p>	
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.

### 3. Ordering information

Table 4. Ordering information

Type number	Package		Version
	Name	Description	
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 <sup>[1]</sup>
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

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

**Table 6. Limiting values ...continued**

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

Symbol	Parameter	Conditions	Min	Max	Unit
<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] 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<sup>2</sup>.
- [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]	-	-	700 K/W
			[5]			
			[3][4]	-	-	410 K/W
		[5]				
	BAS16W		[1]	-	-	625 K/W
$R_{th(j-t)}$	thermal resistance from junction to tie-point					
	BAS16		-	-	330	K/W
	BAS16W		-	-	300	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					
	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<sup>2</sup>.

[5] Single diode loaded.

[6] Soldering point of cathode tab.

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

## 7. Characteristics

**Table 8. Characteristics**

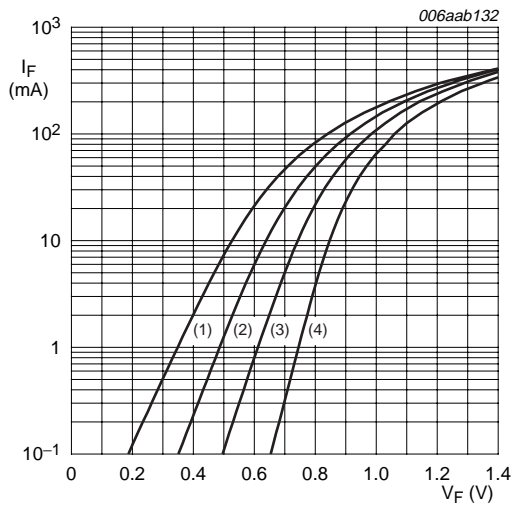
$T_{amb} = 25\text{ °C}$  unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per diode</b>						
$V_F$	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
		$V_R = 25\text{ V}; T_j = 150\text{ °C}$	-	-	30	μA
		$V_R = 80\text{ V}; T_j = 150\text{ °C}$	-	-	50	μA
$C_d$	diode capacitance	$f = 1\text{ MHz}; V_R = 0\text{ V}$				
		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:  $t_p \leq 300\text{ μs}; \delta \leq 0.02$ .

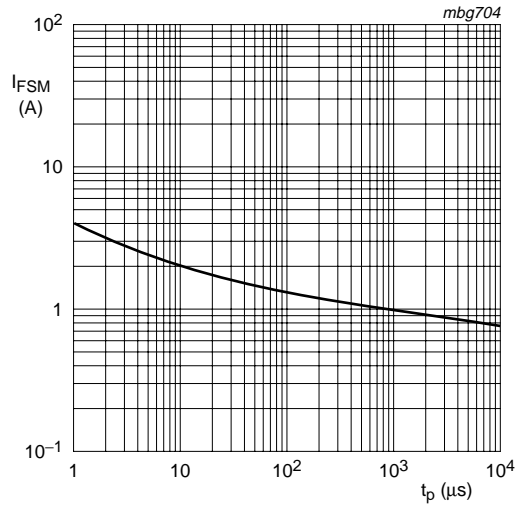
[2] When switched from  $I_F = 10\text{ mA}$  to  $I_R = 10\text{ mA}; R_L = 100\text{ Ω}$ ; measured at  $I_R = 1\text{ mA}$ .

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



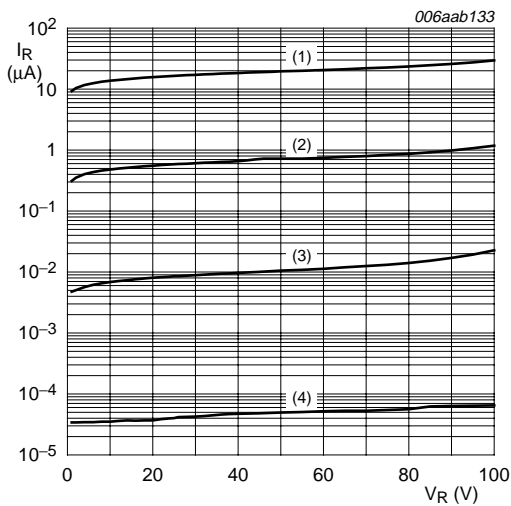
- (1)  $T_{amb} = 150\text{ °C}$
- (2)  $T_{amb} = 85\text{ °C}$
- (3)  $T_{amb} = 25\text{ °C}$
- (4)  $T_{amb} = -40\text{ °C}$

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



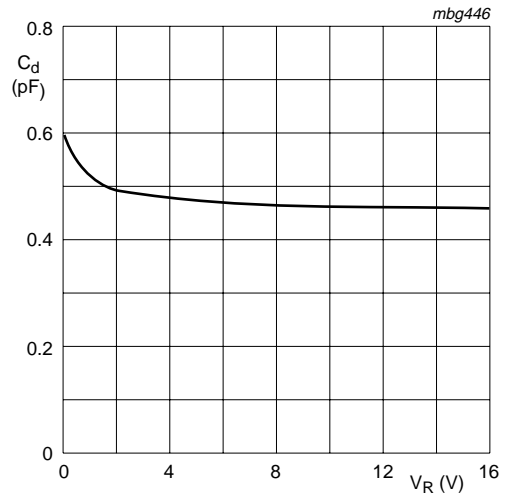
Based on square wave currents.  
 $T_j = 25\text{ °C}$ ; prior to surge

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



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

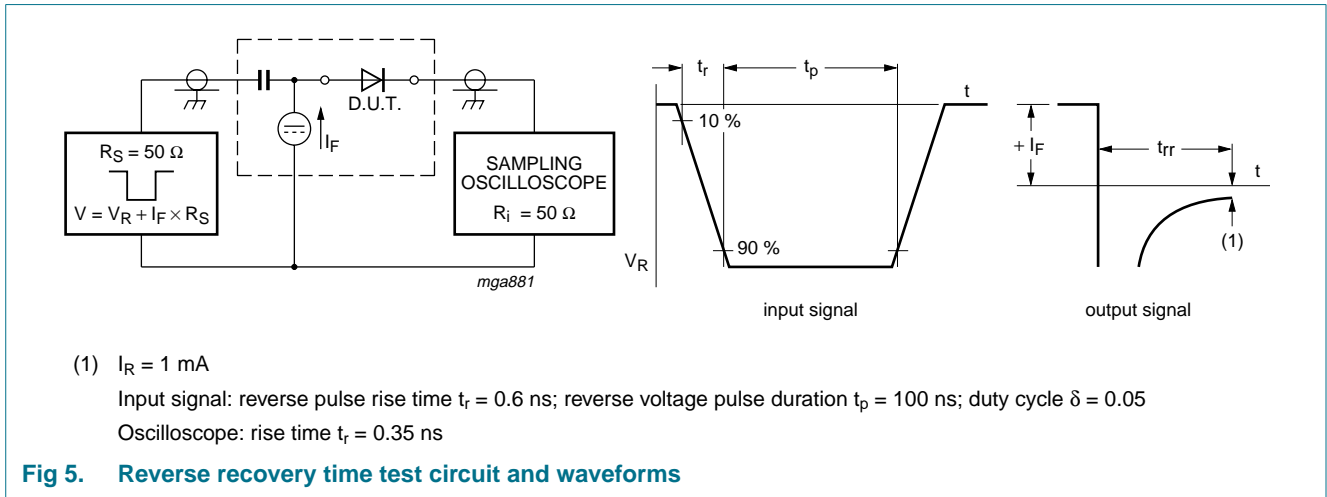
**Fig 3. Reverse current as a function of reverse voltage; typical values**



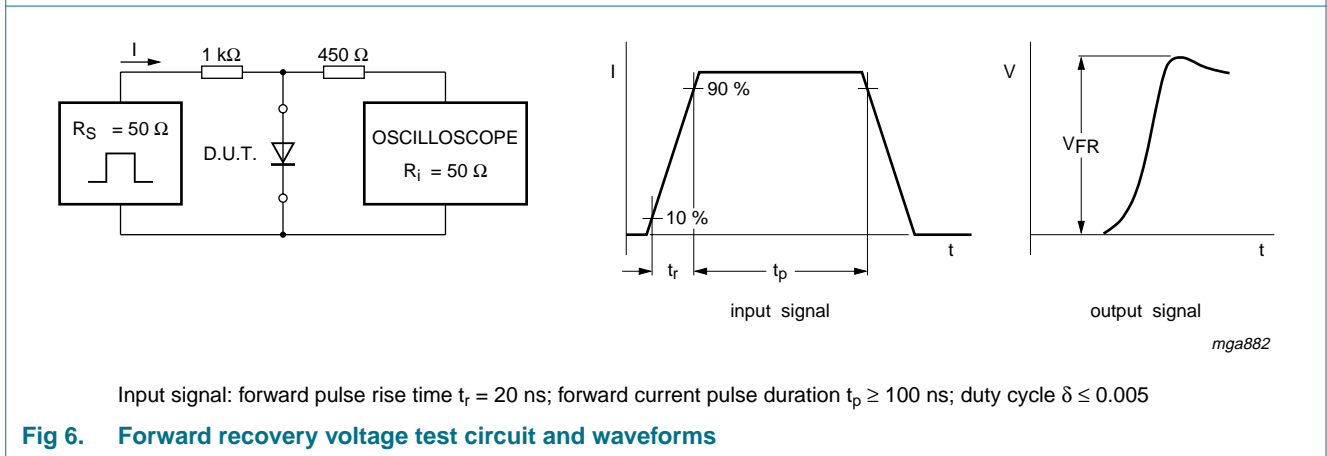
$f = 1\text{ MHz}$ ;  $T_{amb} = 25\text{ °C}$

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

**8. Test information**

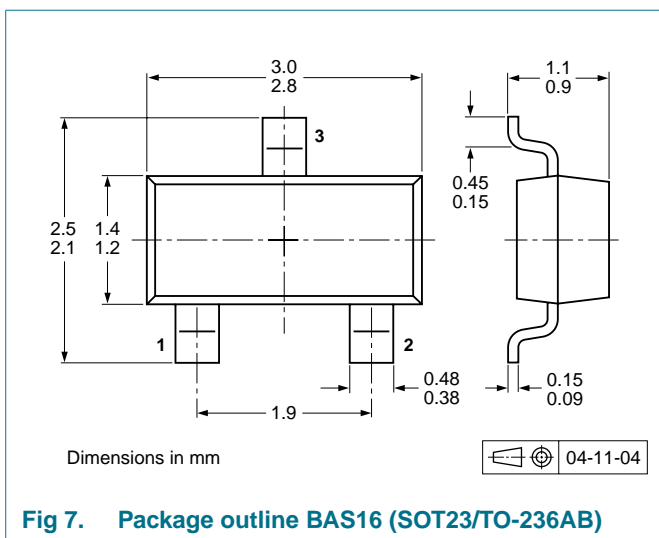


**Fig 5. Reverse recovery time test circuit and waveforms**

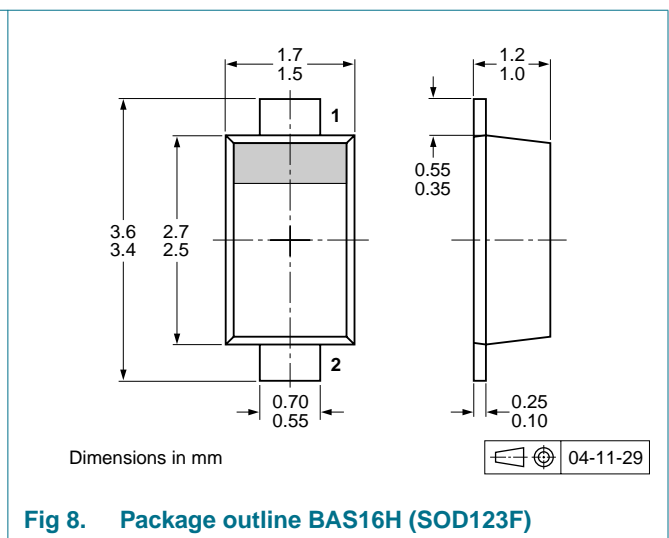


**Fig 6. Forward recovery voltage test circuit and waveforms**

**9. Package outline**

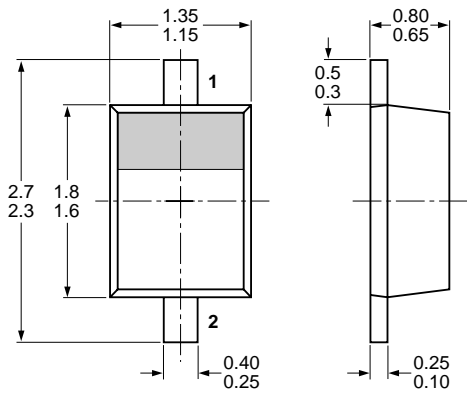


**Fig 7. Package outline BAS16 (SOT23/TO-236AB)**



**Fig 8. Package outline BAS16H (SOD123F)**

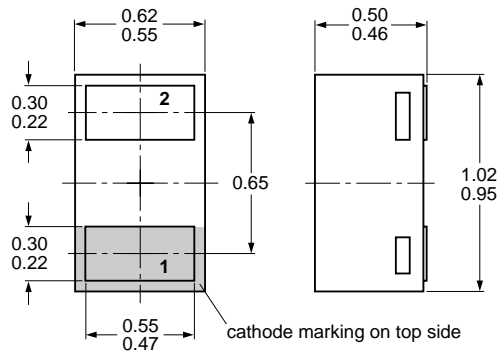




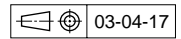
Dimensions in mm



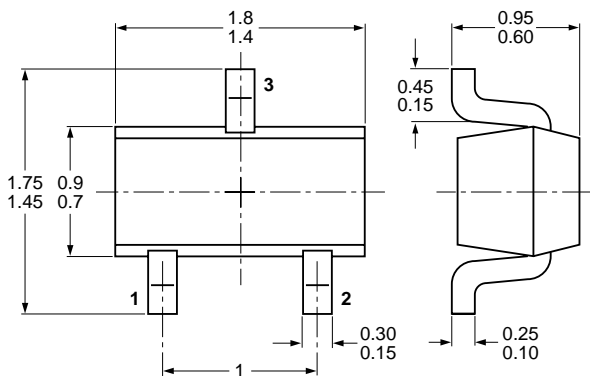
**Fig 9. Package outline BAS16J (SOD323F/SC-90)**



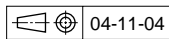
Dimensions in mm



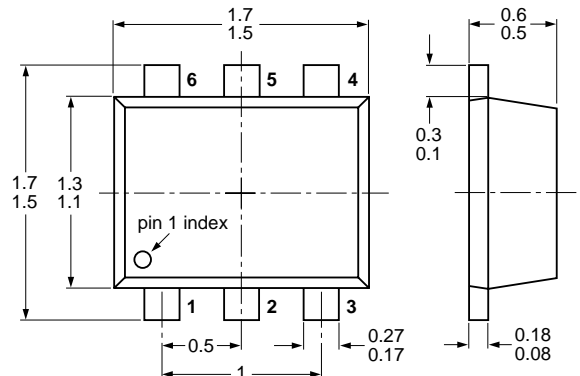
**Fig 10. Package outline BAS16L (SOD882)**



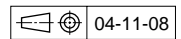
Dimensions in mm



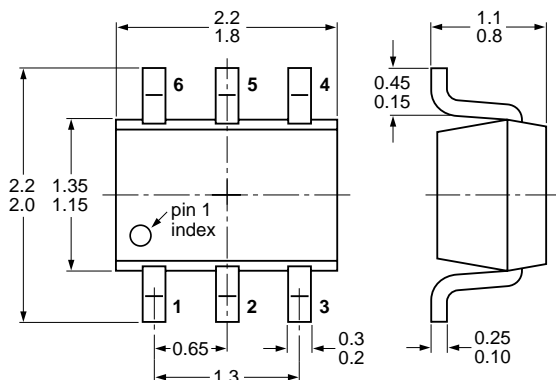
**Fig 11. Package outline BAS16T (SOT416/SC-75)**



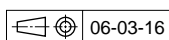
Dimensions in mm



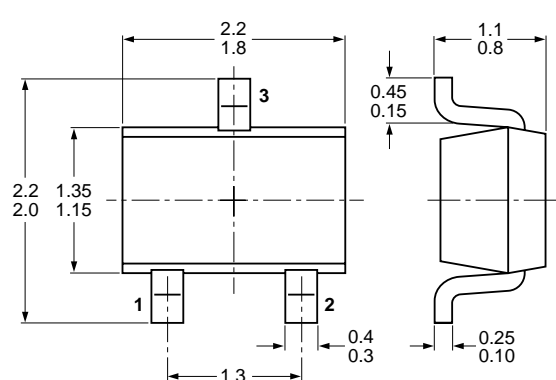
**Fig 12. Package outline BAS16VV (SOT666)**



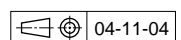
Dimensions in mm



**Fig 13. Package outline BAS16VY (SOT363)**



Dimensions in mm



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

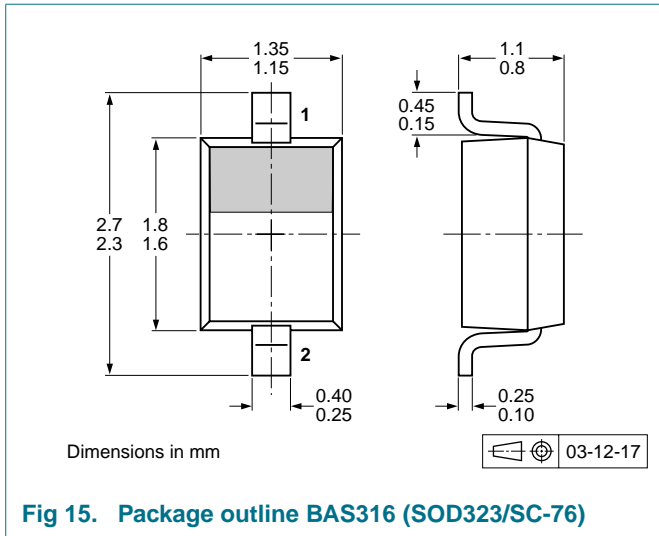


Fig 15. Package outline BAS316 (SOD323/SC-76)

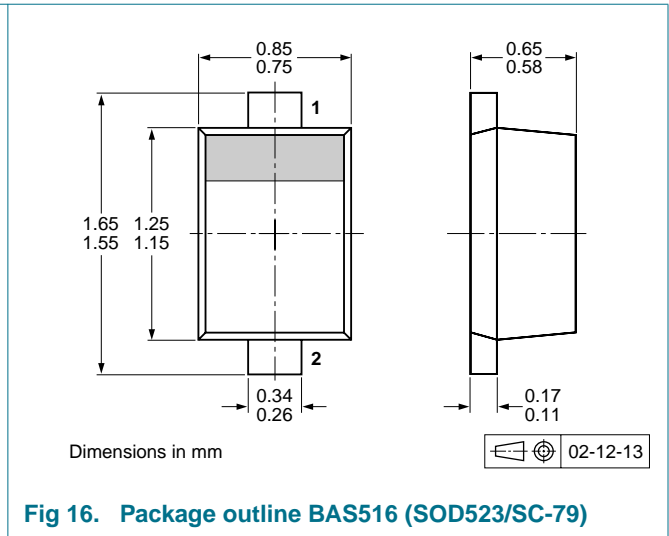


Fig 16. Package outline BAS516 (SOD523/SC-79)

## 10. Packing information

**Table 9. Packing methods**

The indicated -xxx are the last three digits of the 12NC ordering code.<sup>[1]</sup>

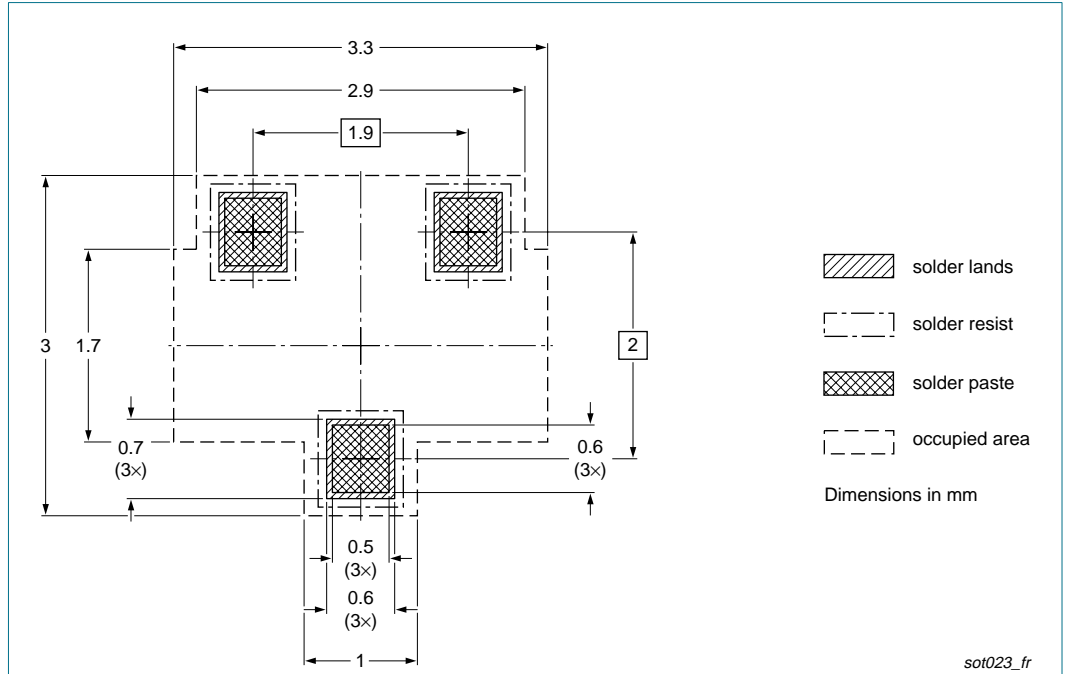
Type number	Package	Description	Packing quantity			
			3000	4000	8000	10000
BAS16	SOT23	4 mm pitch, 8 mm tape and reel	-215	-	-	-235
BAS16H	SOD123F	4 mm pitch, 8 mm tape and reel	-115	-	-	-135
BAS16J	SOD323F	4 mm pitch, 8 mm tape and reel	-115	-	-	-135
BAS16L	SOD882	2 mm pitch, 8 mm tape and reel	-	-	-	-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	<sup>[2]</sup> -115	-	-	-135
		4 mm pitch, 8 mm tape and reel; T2	<sup>[3]</sup> -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](#).

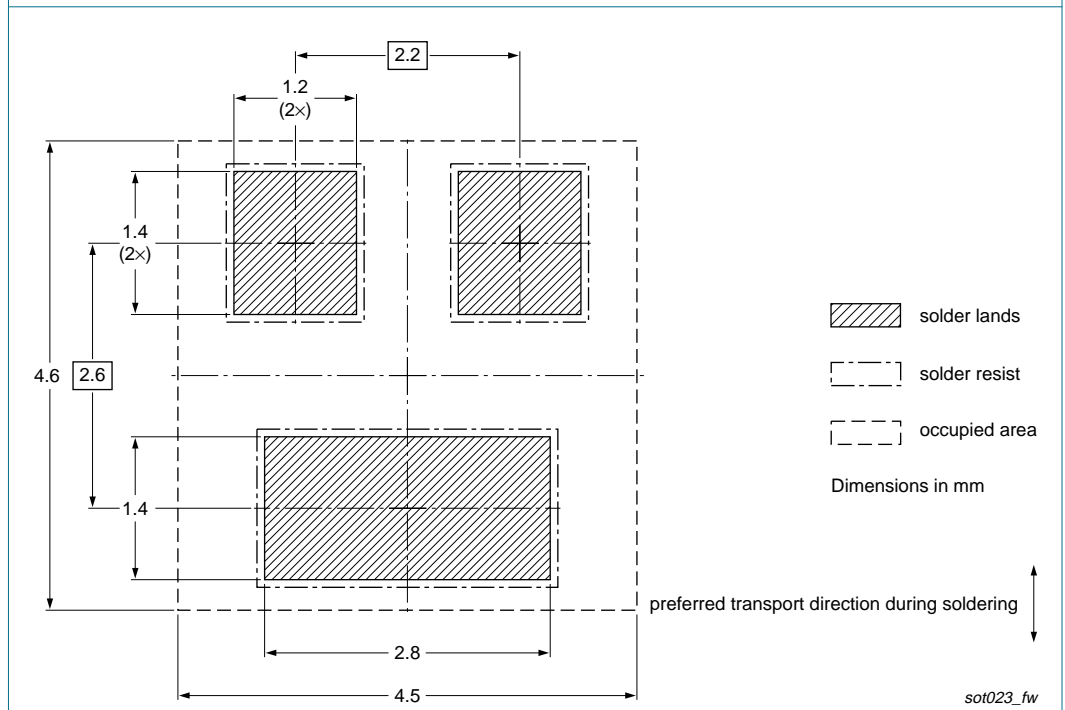
[2] T1: normal taping

[3] T2: reverse taping

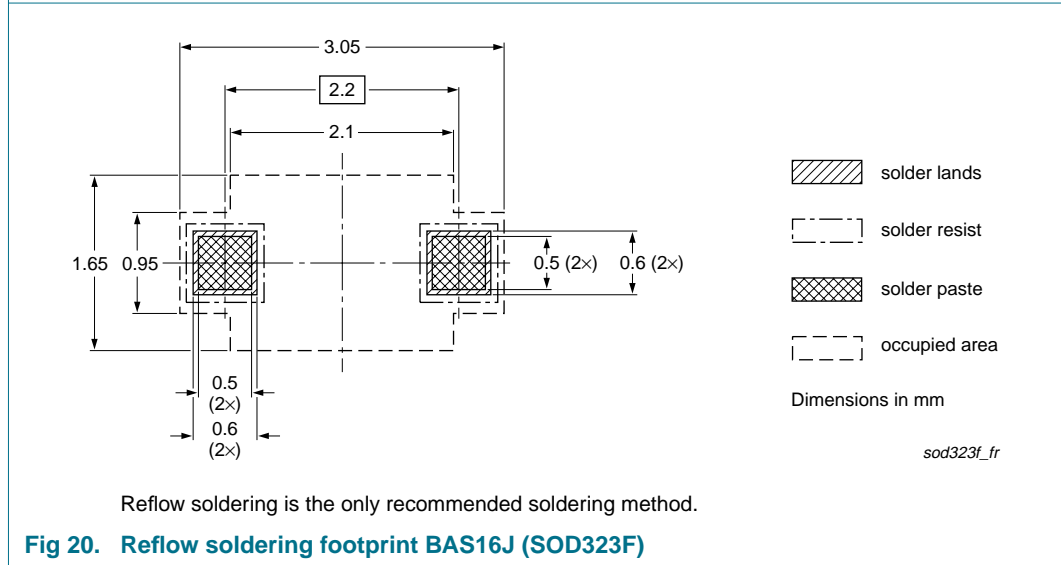
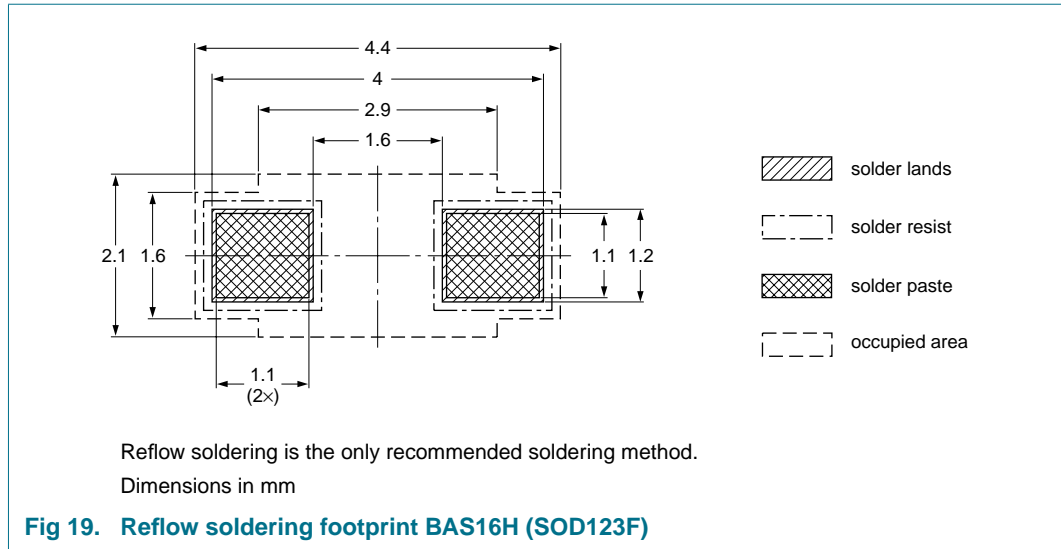
**11. Soldering**

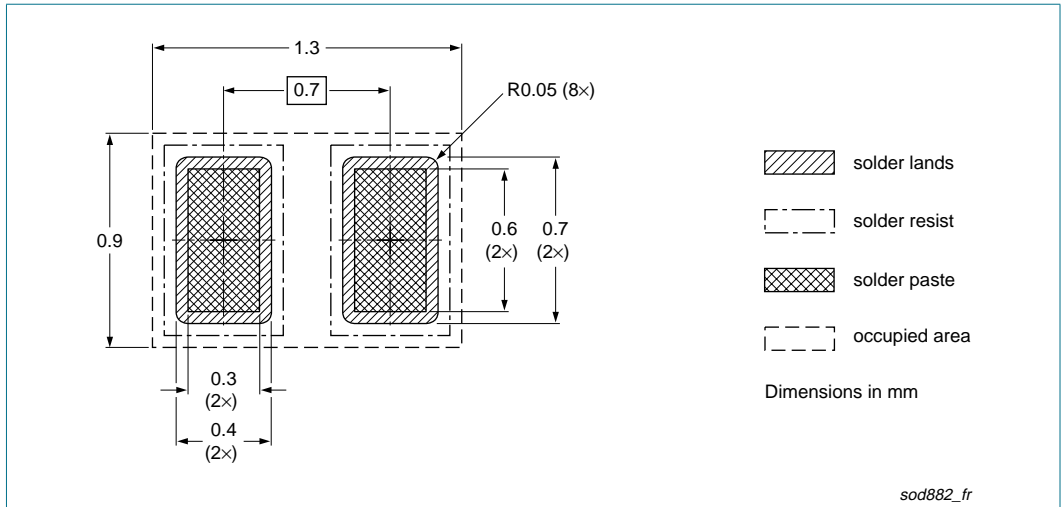


**Fig 17. Reflow soldering footprint BAS16 (SOT23/TO-236AB)**



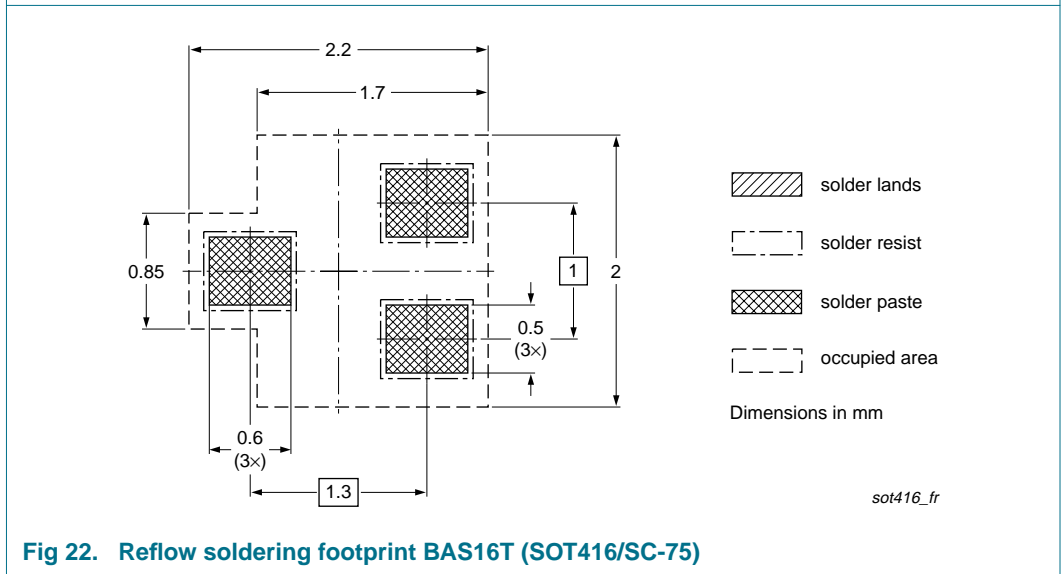
**Fig 18. Wave soldering footprint BAS16 (SOT23/TO-236AB)**



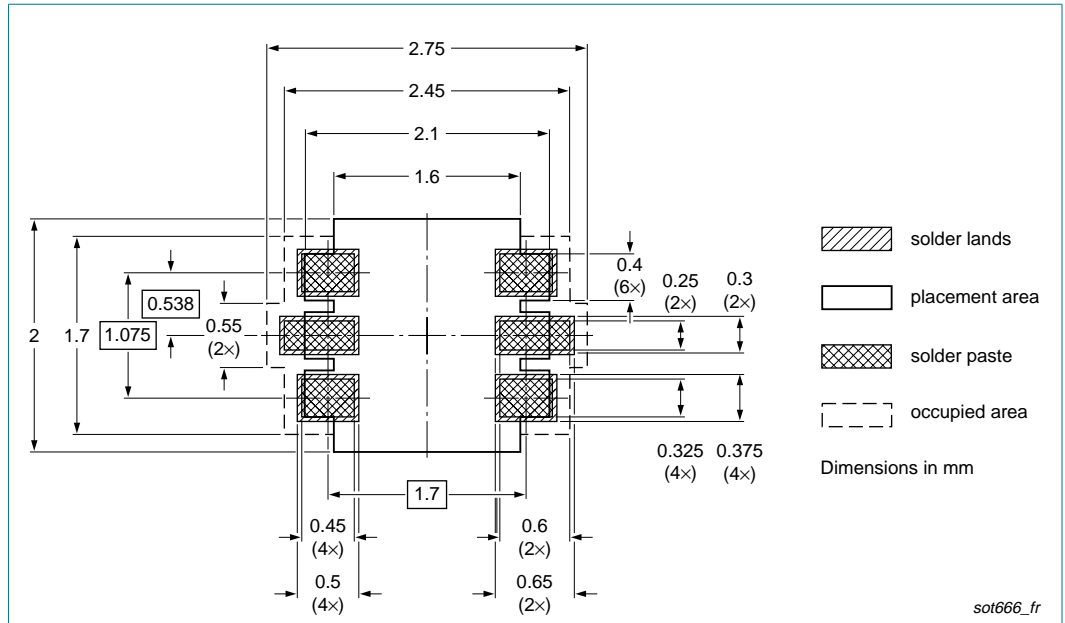


Reflow soldering is the only recommended soldering method.

**Fig 21. Reflow soldering footprint BAS16L (SOD882)**

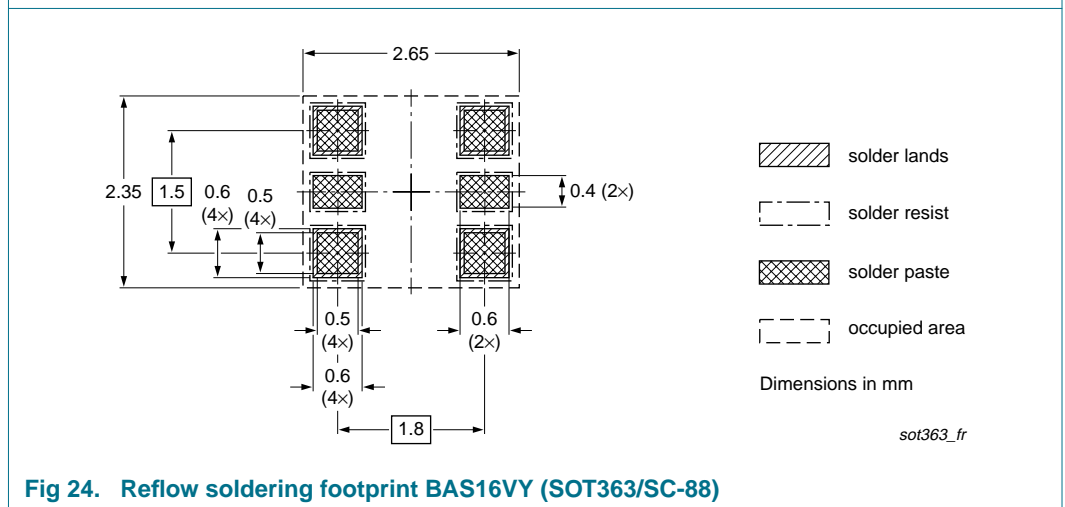


**Fig 22. Reflow soldering footprint BAS16T (SOT416/SC-75)**

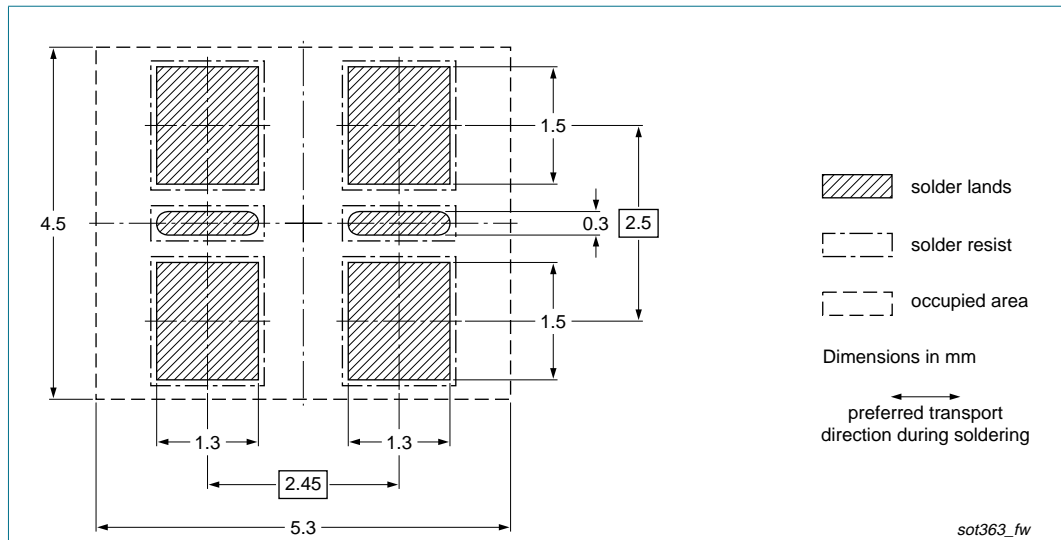


Reflow soldering is the only recommended soldering method.

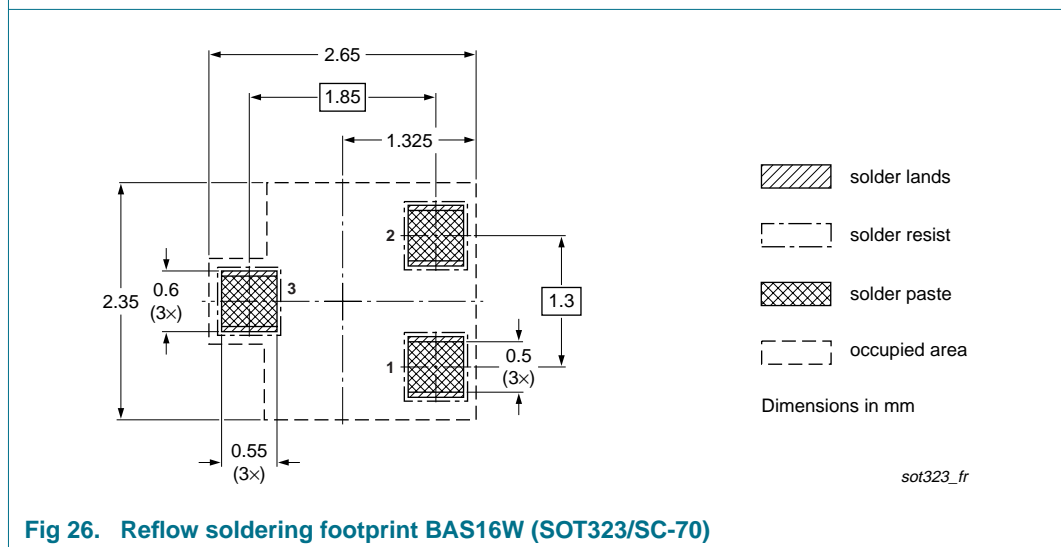
**Fig 23. Reflow soldering footprint BAS16VV (SOT666)**



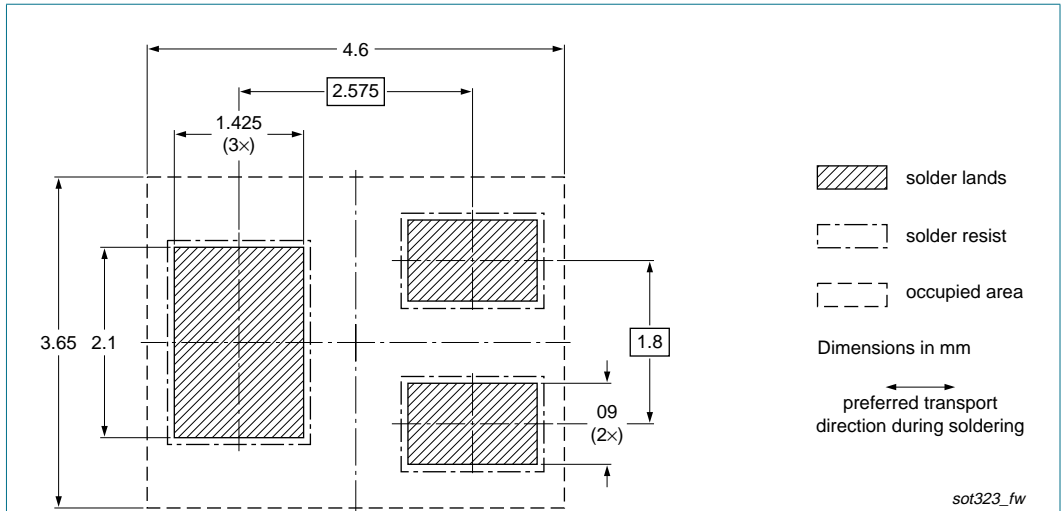
**Fig 24. Reflow soldering footprint BAS16VY (SOT363/SC-88)**



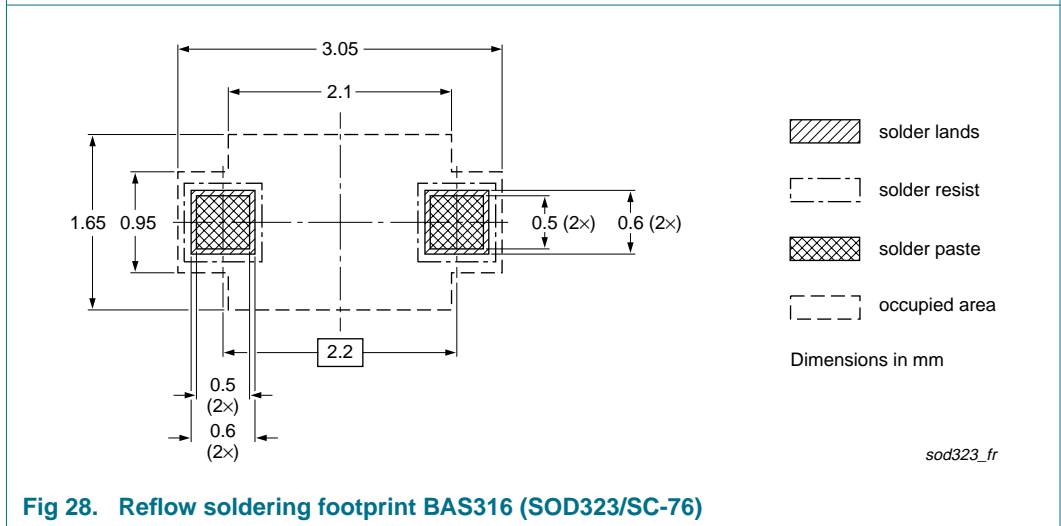
**Fig 25. Wave soldering footprint BAS16VY (SOT363/SC-88)**



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

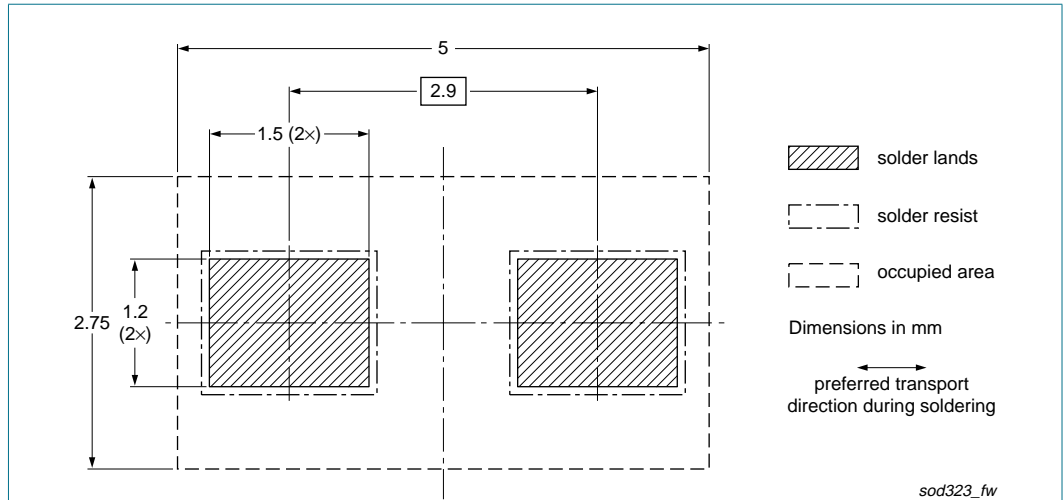


**Fig 27. Wave soldering footprint BAS16W (SOT323/SC-70)**

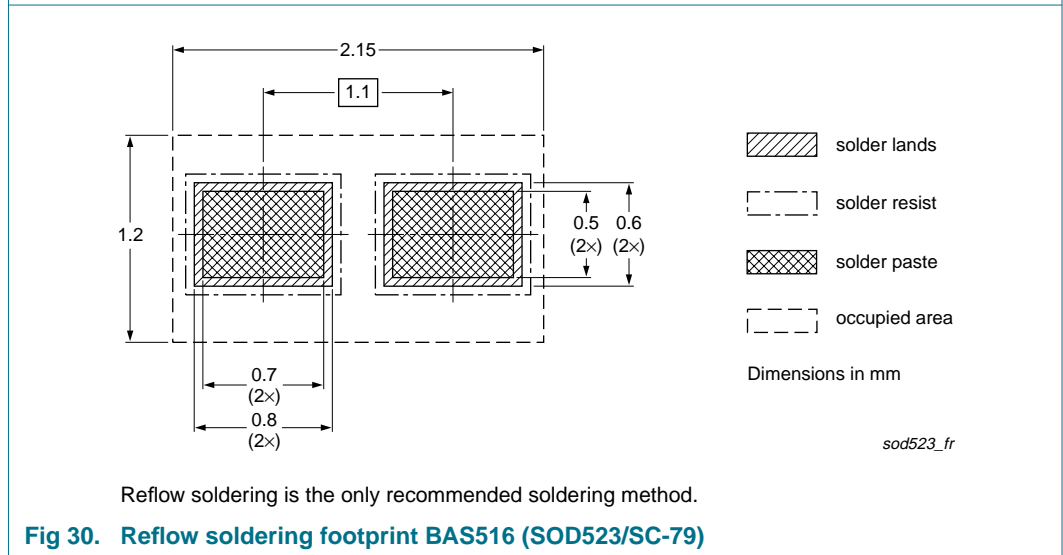


**Fig 28. Reflow soldering footprint BAS316 (SOD323/SC-76)**





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



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

## 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:				<ul style="list-style-type: none"> <li>• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li> <li>• Legal texts have been adapted to the new company name where appropriate.</li> <li>• <a href="#">Table 5 “Marking codes”</a>: marking code amended for BAS16W</li> <li>• <a href="#">Table 6 “Limiting values”</a>: for BAS16, BAS16T, BAS16W and BAS516 change of <math>V_{RRM}</math> maximum value from 85 V to 100 V</li> <li>• <a href="#">Table 6 “Limiting values”</a>: for BAS16, BAS16L, BAS16T, BAS16W and BAS516 change of <math>V_R</math> maximum value from 75 V to 100 V</li> <li>• <a href="#">Table 8 “Characteristics”</a>: change of <math>I_R</math> condition <math>V_R</math> from 75 V to 80 V for <math>T_j = 25\text{ °C}</math></li> <li>• <a href="#">Table 8 “Characteristics”</a>: change of <math>I_R</math> maximum value from 1.0 <math>\mu\text{A}</math> to 0.5 <math>\mu\text{A}</math> for <math>V_R = 80\text{ V}</math> and <math>T_j = 25\text{ °C}</math></li> <li>• <a href="#">Table 8 “Characteristics”</a>: change of <math>I_R</math> condition <math>V_R</math> from 75 V to 80 V for <math>T_j = 150\text{ °C}</math></li> <li>• <a href="#">Section 13 “Legal information”</a>: updated</li> </ul>
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	-	-

## 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".

[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

**Draft** — The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. NXP Semiconductors does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

**Short data sheet** — A short data sheet is an extract from a full data sheet with the same product type number(s) and title. A short data sheet is intended for quick reference only and should not be relied upon to contain detailed and full information. For detailed and full information see the relevant full data sheet, which is available on request via the local NXP Semiconductors sales office. In case of any inconsistency or conflict with the short data sheet, the full data sheet shall prevail.

### 13.3 Disclaimers

**General** — Information in this document is believed to be accurate and reliable. However, NXP Semiconductors does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information.

**Right to make changes** — NXP Semiconductors reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

**Suitability for use** — NXP Semiconductors products are not designed, authorized or warranted to be suitable for use in medical, military, aircraft, space or life support equipment, nor in applications where failure or malfunction of an NXP Semiconductors product can reasonably be expected to result in personal injury, death or severe property or environmental

damage. NXP Semiconductors accepts no liability for inclusion and/or use of NXP Semiconductors products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

**Applications** — Applications that are described herein for any of these products are for illustrative purposes only. NXP Semiconductors makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

**Limiting values** — Stress above one or more limiting values (as defined in the Absolute Maximum Ratings System of IEC 60134) may cause permanent damage to the device. Limiting values are stress ratings only and operation of the device at these or any other conditions above those given in the Characteristics sections of this document is not implied. Exposure to limiting values for extended periods may affect device reliability.

**Terms and conditions of sale** — NXP Semiconductors products are sold subject to the general terms and conditions of commercial sale, as published at <http://www.nxp.com/profile/terms>, including those pertaining to warranty, intellectual property rights infringement and limitation of liability, unless explicitly otherwise agreed to in writing by NXP Semiconductors. In case of any inconsistency or conflict between information in this document and such terms and conditions, the latter will prevail.

**No offer to sell or license** — Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.

**Quick reference data** — The Quick reference data is an extract of the product data given in the Limiting values and Characteristics sections of this document, and as such is not complete, exhaustive or legally binding.

### 13.4 Trademarks

Notice: All referenced brands, product names, service names and trademarks are the property of their respective owners.

## 14. Contact information

For more information, please visit: <http://www.nxp.com>

For sales office addresses, please send an email to: [salesaddresses@nxp.com](mailto:salesaddresses@nxp.com)

**15. Contents**

**1 Product profile . . . . . 1**

1.1 General description . . . . . 1

1.2 Features . . . . . 1

1.3 Applications . . . . . 1

1.4 Quick reference data . . . . . 2

**2 Pinning information . . . . . 2**

**3 Ordering information . . . . . 3**

**4 Marking . . . . . 3**

**5 Limiting values . . . . . 4**

**6 Thermal characteristics . . . . . 5**

**7 Characteristics . . . . . 6**

**8 Test information . . . . . 8**

**9 Package outline . . . . . 8**

**10 Packing information . . . . . 10**

**11 Soldering . . . . . 11**

**12 Revision history . . . . . 18**

**13 Legal information . . . . . 19**

13.1 Data sheet status . . . . . 19

13.2 Definitions . . . . . 19

13.3 Disclaimers . . . . . 19

13.4 Trademarks . . . . . 19

**14 Contact information . . . . . 19**

**15 Contents . . . . . 20**

Please be aware that important notices concerning this document and the product(s) described herein, have been included in section 'Legal information'.



© NXP B.V. 2008.

All rights reserved.

For more information, please visit: <http://www.nxp.com>

For sales office addresses, please send an email to: [salesaddresses@nxp.com](mailto:salesaddresses@nxp.com)

Date of release: 25 August 2008

Document identifier: BAS16\_SER\_5