

# BAS16 series

## High-speed switching diodes

Rev. 6 — 24 September 2014

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
	Nexperia	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 and benefits

- High switching speed:  $t_{rr} \leq 4$  ns
- Low leakage current
- Repetitive peak reverse voltage:  $V_{RRM} \leq 100$  V
- AEC-Q101 qualified
- 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**

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

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	$I_F = 10\text{ mA}$ ; $I_R = 10\text{ mA}$ ; $R_L = 100\ \Omega$ ; $I_{R(meas)} = 1\text{ mA}$	-	-	4	ns

**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			
<b>BAS16L</b>				
1	cathode	[1]	 <p>Transparent top view</p>	 <p>006aab040</p>
2	anode			
<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	TO-236AB	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	DFN1006-2	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] \* = 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
<b>Per diode</b>					
$V_{RRM}$	repetitive peak reverse voltage		-	100	V
$V_R$	reverse voltage		-	100	V

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

Symbol	Parameter	Conditions		Min	Max	Unit	
$I_F$	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	$t_p \leq 0.5$ ms; $\delta \leq 0.25$		-	500	mA	
$I_{FSM}$	non-repetitive peak forward current	square wave; $T_{j(\text{init})} = 25$ °C					
		$t_p = 1$ $\mu$ s		-	4	A	
		$t_p = 1$ ms		-	1	A	
		$t_p = 1$ s		-	0.5	A	
$P_{\text{tot}}$	total power dissipation						
		BAS16	$T_{\text{amb}} \leq 25$ °C	[1]	-	250	mW
		BAS16H	$T_{\text{amb}} \leq 25$ °C	[2]	-	380	mW
				[5]	-	830	mW
		BAS16J	$T_{\text{amb}} \leq 25$ °C	[5]	-	550	mW
		BAS16L	$T_{\text{amb}} \leq 25$ °C	[2]	-	250	mW
		BAS16T	$T_{\text{sp}} \leq 90$ °C	[1][4]	-	170	mW
		BAS16VV	$T_{\text{amb}} \leq 25$ °C	[1][3]	-	180	mW
		BAS16VY	$T_{\text{sp}} \leq 85$ °C	[1][3][6]	-	250	mW
		BAS16W	$T_{\text{amb}} \leq 25$ °C	[1]	-	200	mW
		BAS316	$T_{\text{sp}} \leq 90$ °C	[1][4]	-	400	mW
BAS516	$T_{\text{sp}} \leq 90$ °C	[1][4]	-	500	mW		
<b>Per device</b>							
$T_j$	junction temperature			-	150	°C	
$T_{\text{amb}}$	ambient temperature			-65	+150	°C	
$T_{\text{stg}}$	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  $\mu$ m copper strip line.

[3] Single diode loaded.

[4] Soldering point of cathode tab.

[5] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 cm<sup>2</sup>.

[6] 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]	-	-	330 K/W
			[3]	-	-	150 K/W
	BAS16J		[3]	-	-	230 K/W
	BAS16L		[2]	-	-	500 K/W
	BAS16VV		[2][4]	-	-	700 K/W
			[3][4]	-	-	410 K/W
BAS16W		[1]	-	-	625 K/W	
$R_{th(j-sp)}$	thermal resistance from junction to solder point					
	BAS16		-	-	330 K/W	
	BAS16H		[5]	-	-	70 K/W
	BAS16J		[5]	-	-	55 K/W
	BAS16T		-	-	350 K/W	
	BAS16VY		[4][6]	-	-	260 K/W
	BAS16W		-	-	300 K/W	
	BAS316		[5]	-	-	150 K/W
	BAS516		[5]	-	-	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  $\mu\text{m}$  copper strip line.

[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1  $\text{cm}^2$ .

[4] Single diode loaded.

[5] Soldering point of cathode tab.

[6] 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
$I_R$	reverse current	$V_R = 25\text{ V}$	-	-	30	nA
		$V_R = 80\text{ V}$	-	-	0.5	$\mu\text{A}$
		$V_R = 25\text{ V}; T_j = 150\text{ °C}$	-	-	30	$\mu\text{A}$
		$V_R = 80\text{ V}; T_j = 150\text{ °C}$	-	-	50	$\mu\text{A}$
$C_d$	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	$I_F = 10\text{ mA}; I_R = 10\text{ mA};$ $R_L = 100\ \Omega;$ $I_{R(\text{meas})} = 1\text{ mA}$	-	-	4	ns
$V_{FR}$	forward recovery voltage	$I_F = 10\text{ mA}; t_r = 20\text{ ns}$	-	-	1.75	V

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



- (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.  
 $T_{j(init)} = 25\text{ °C}$

**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**



(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**





Dimensions in mm



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



Dimensions in mm



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



Dimensions in mm



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

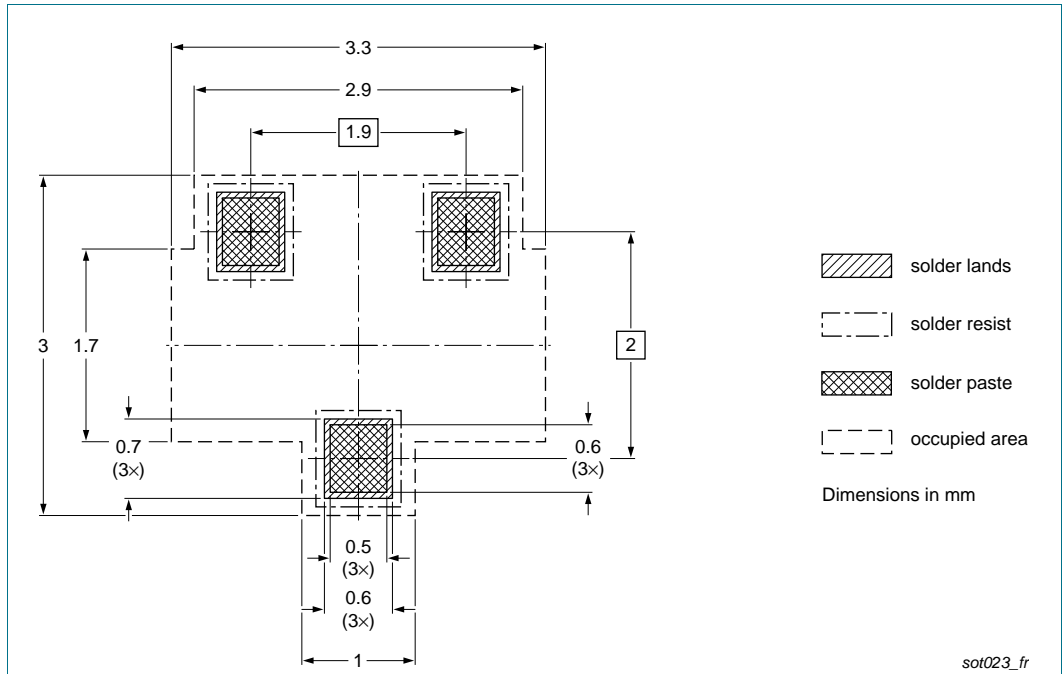


Dimensions in mm

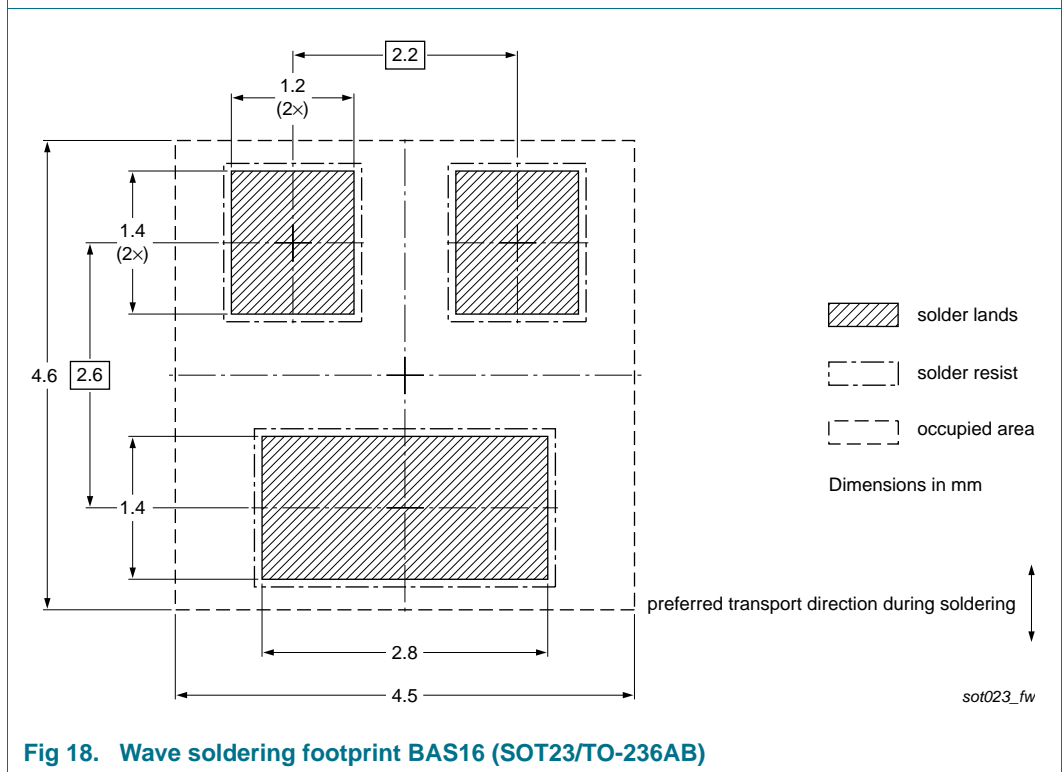


**Fig 16. Package outline BAS516 (SOD523/SC-79)**

**10. Soldering**



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



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





**Fig 21. Reflow soldering footprint BAS16L (SOD882/DFN1006-2)**



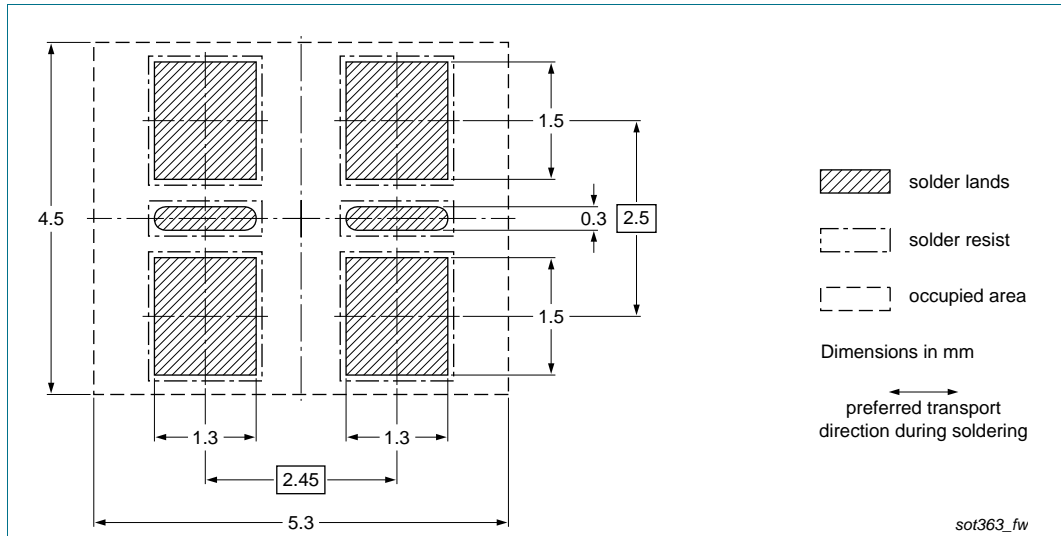
**Fig 22. Reflow soldering footprint BAS16T (SOT416/SC-75)**



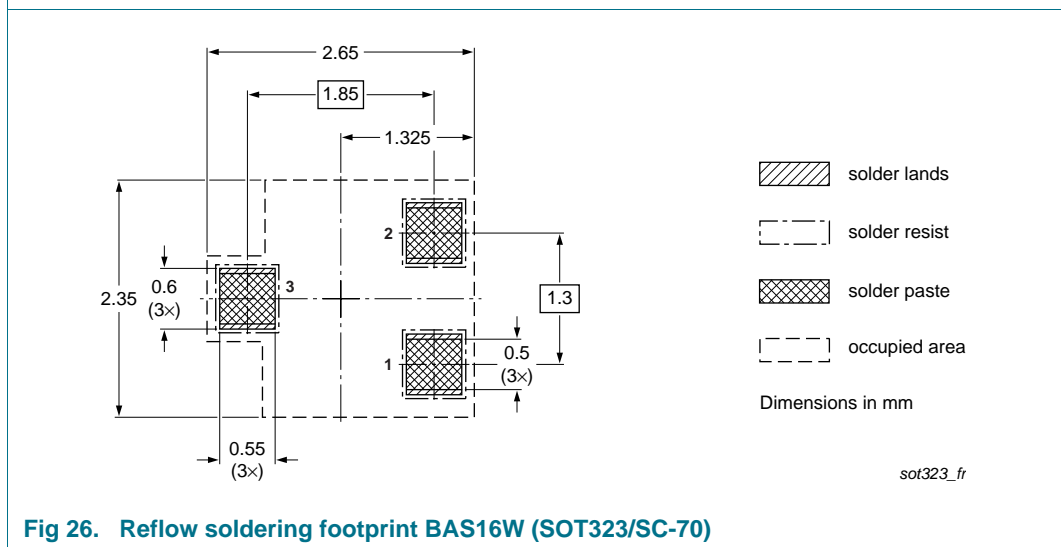
**Fig 23. Reflow soldering footprint BAS16VV (SOT666)**



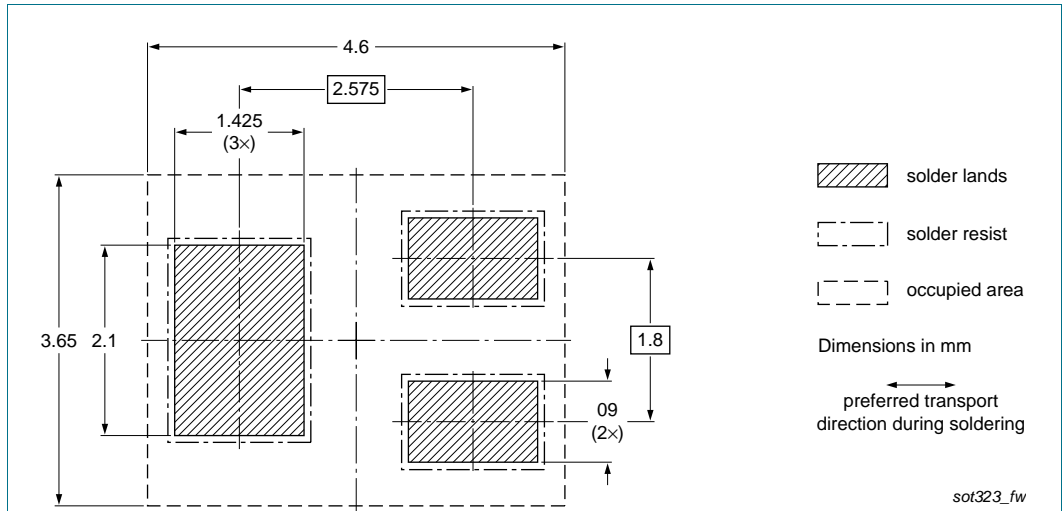
**Fig 24. Reflow soldering footprint BAS16VY (SOT363/SC-88)**



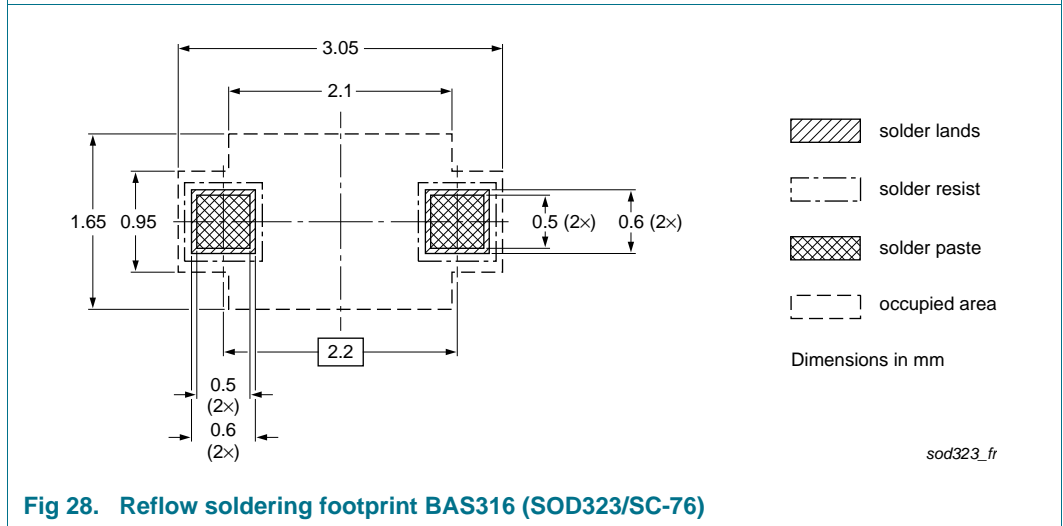
**Fig 25. Wave soldering footprint BAS16VY (SOT363/SC-88)**



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



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

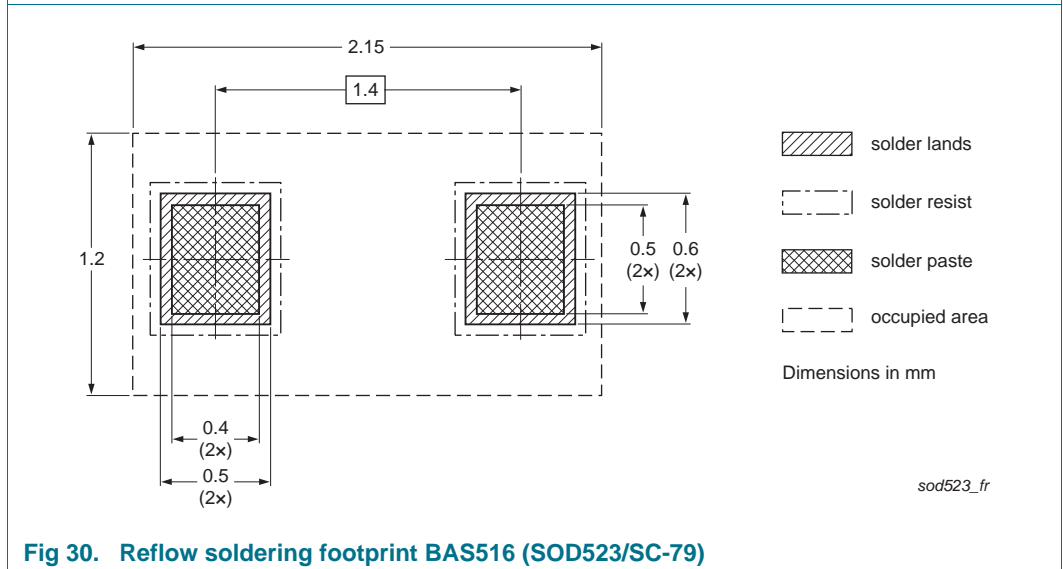


**Fig 28. Reflow soldering footprint BAS316 (SOD323/SC-76)**





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



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

## 11. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BAS16_SER_6	20140924	Product data sheet	-	BAS16_SER_5
Modifications:	<ul style="list-style-type: none"> <li>• <a href="#">Section 1.2 “Features and benefits”</a>: updated</li> <li>• <a href="#">Section 4 “Marking”</a>: updated</li> <li>• <a href="#">Table 6 “Limiting values”</a>: updated</li> <li>• <a href="#">Section 8 “Test information”</a>: updated</li> <li>• <a href="#">Section 12 “Legal information”</a>: updated</li> </ul>			
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
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	-	-

## 12. Legal information

### 12.1 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".

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