



# BAT46WJ

Single Schottky barrier diode

Rev. 2 — 8 November 2011

Product data sheet

## 1. Product profile

### 1.1 General description

Single planar Schottky barrier diode with an integrated guard ring for stress protection, encapsulated in a very small and flat lead SOD323F (SC-90) Surface-Mounted Device (SMD) plastic package.

### 1.2 Features and benefits

- Low forward voltage
- Reverse voltage  $V_R \leq 100$  V
- Very small and flat lead SMD plastic package
- Low capacitance
- AEC-Q101 qualified

### 1.3 Applications

- High-speed switching
- Line termination
- Voltage clamping
- Reverse polarity protection

### 1.4 Quick reference data




Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_R$	reverse voltage		-	-	100	V
$V_F$	forward voltage	$I_F = 250$ mA	[1]	-	850	mV
$I_R$	reverse current	$V_R = 75$ V	[1]	-	4	$\mu$ A

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

## 2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	cathode	[1]	1  2
2	anode		 sym001

[1] The marking bar indicates the cathode.



### 3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BAT46WJ	SC-90	plastic surface-mounted package; 2 leads	SOD323F

### 4. Marking

Table 4. Marking codes

Type number	Marking code
BAT46WJ	JK

### 5. Limiting values

Table 5. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
$V_R$	reverse voltage		-	100	V
$I_F$	forward current		-	250	mA
$I_{FSM}$	non-repetitive peak forward current	square wave; $t_p < 10$ ms	[1] -	2.5	A
$P_{tot}$	total power dissipation	$T_{amb} \leq 25$ °C	[2][4] -	400	mW
			[3][4] -	715	mW
$T_j$	junction temperature		-	150	°C
$T_{amb}$	ambient temperature		-55	+150	°C
$T_{stg}$	storage temperature		-65	+150	°C

[1]  $T_j = 25$  °C before surge.

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

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

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

### 6. Thermal characteristics

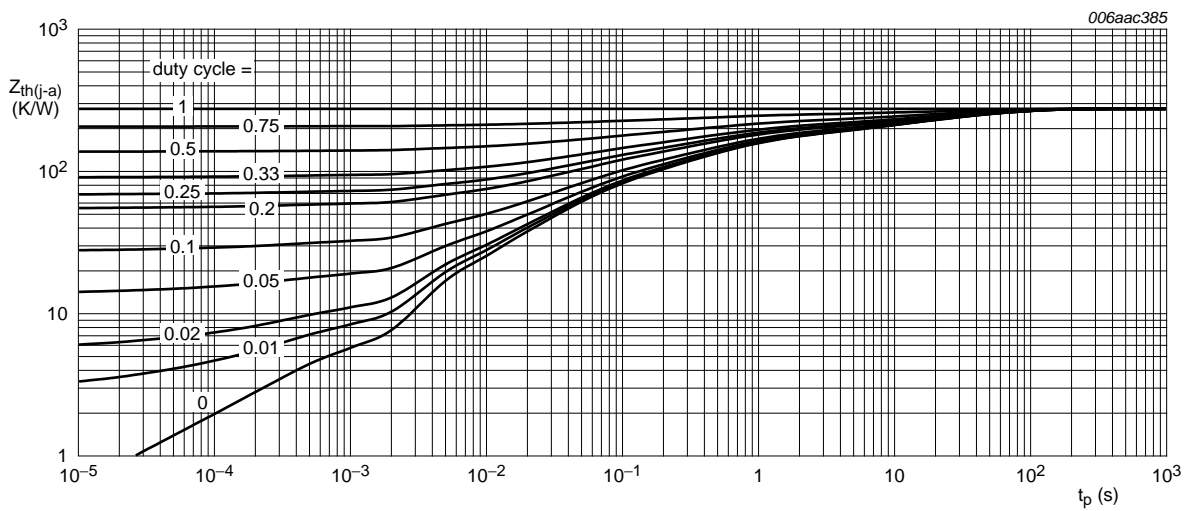
Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1][3] -	-	310	K/W
			[2][3] -	-	175	K/W

**Table 6. Thermal characteristics ...continued**

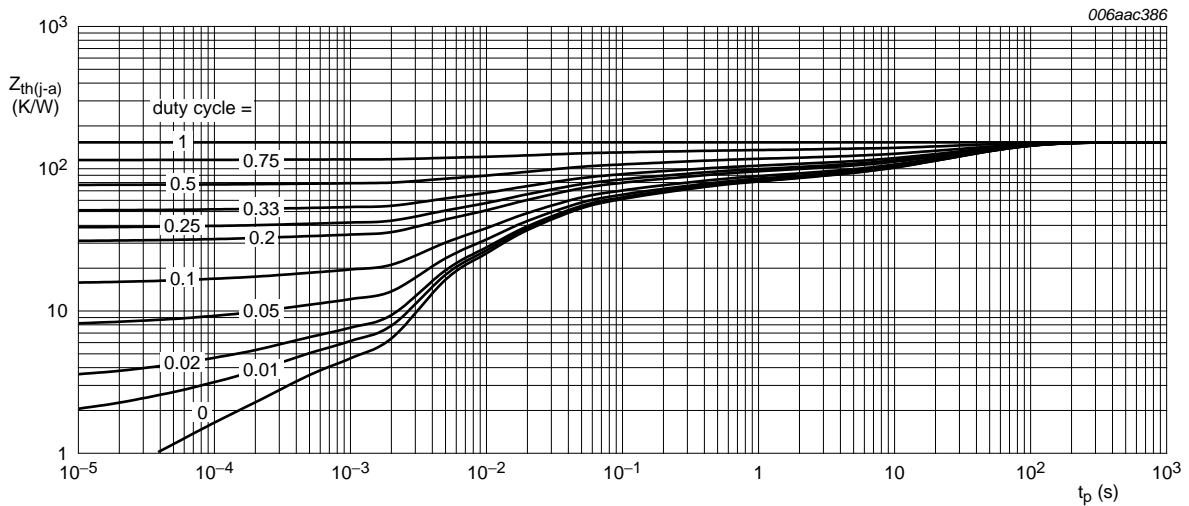
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-sp)}$	thermal resistance from junction to solder point	[4]	-	-	35	K/W

- [1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
- [2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 cm<sup>2</sup>.
- [3] Reflow soldering is the only recommended soldering method.
- [4] Soldering point of cathode tab.



FR4 PCB, standard footprint

**Fig 1. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values**



FR4 PCB, mounting pad for cathode 1 cm<sup>2</sup>

**Fig 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values**

## 7. Characteristics

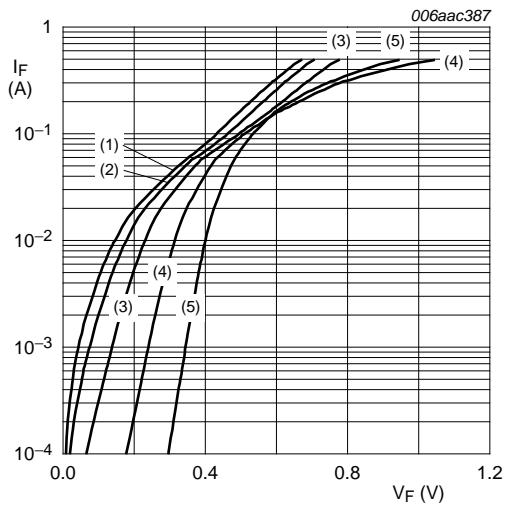
**Table 7. Characteristics**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$V_F$	forward voltage		[1]				
		$I_F = 0.1\text{ mA}$	-	175	200	mV	
		$I_F = 10\text{ mA}$	-	315	350	mV	
		$I_F = 10\text{ mA}; T_j = -40\text{ °C}$	-	-	470	mV	
		$I_F = 50\text{ mA}$	-	415	475	mV	
		$I_F = 50\text{ mA}; T_j = -40\text{ °C}$	-	-	560	mV	
		$I_F = 250\text{ mA}$	-	710	850	mV	
$I_R$	reverse current		[1]				
		$V_R = 1.5\text{ V}$	-	0.2	0.5	$\mu\text{A}$	
		$V_R = 1.5\text{ V}; T_j = 60\text{ °C}$	-	-	12	$\mu\text{A}$	
		$V_R = 10\text{ V}$	-	0.3	0.8	$\mu\text{A}$	
		$V_R = 10\text{ V}; T_j = 60\text{ °C}$	-	-	20	$\mu\text{A}$	
		$V_R = 50\text{ V}$	-	0.7	2	$\mu\text{A}$	
		$V_R = 50\text{ V}; T_j = 60\text{ °C}$	-	-	44	$\mu\text{A}$	
		$V_R = 75\text{ V}$	-	1	4	$\mu\text{A}$	
		$V_R = 75\text{ V}; T_j = 60\text{ °C}$	-	-	80	$\mu\text{A}$	
		$V_R = 100\text{ V}$	-	2	9	$\mu\text{A}$	
		$V_R = 100\text{ V}; T_j = 60\text{ °C}$	-	-	120	$\mu\text{A}$	
		$V_R = 100\text{ V}; T_j = 85\text{ °C}$	-	-	600	$\mu\text{A}$	
$C_d$	diode capacitance	$f = 1\text{ MHz}$					
		$V_R = 0\text{ V}$	-	-	39	pF	
		$V_R = 1\text{ V}$	-	-	21	pF	
$t_{rr}$	reverse recovery time		[2]	-	5.9	-	ns

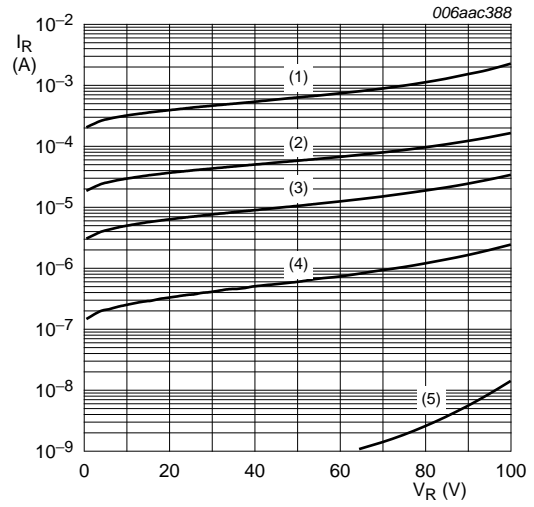
[1] Pulse test:  $t_p \leq 300\text{ }\mu\text{s}$ ;  $\delta \leq 0.02$ .

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



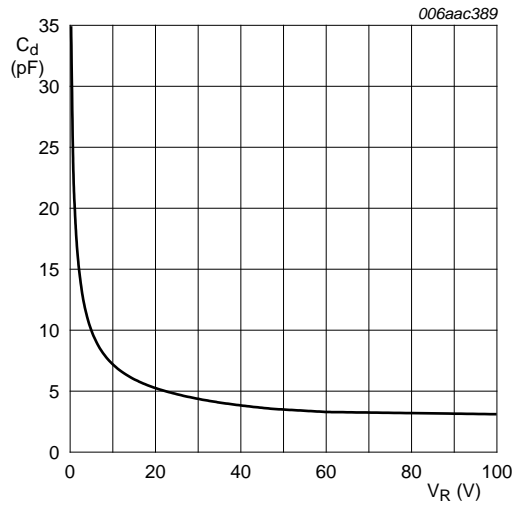
- (1)  $T_{amb} = 150\text{ }^{\circ}\text{C}$
- (2)  $T_{amb} = 125\text{ }^{\circ}\text{C}$
- (3)  $T_{amb} = 85\text{ }^{\circ}\text{C}$
- (4)  $T_{amb} = 25\text{ }^{\circ}\text{C}$
- (5)  $T_{amb} = -40\text{ }^{\circ}\text{C}$

**Fig 3. Forward current as a function of forward voltage; typical values**



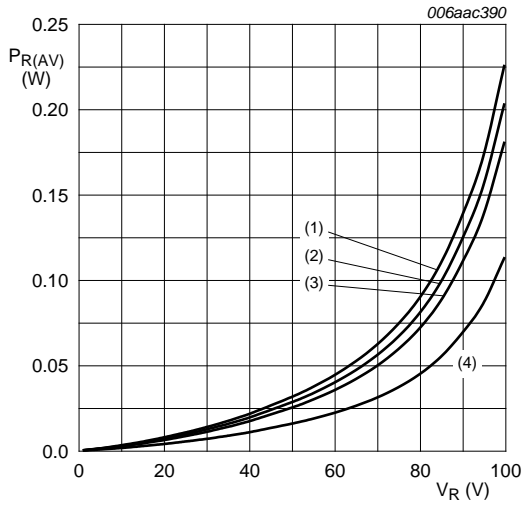
- (1)  $T_{amb} = 125\text{ }^{\circ}\text{C}$
- (2)  $T_{amb} = 85\text{ }^{\circ}\text{C}$
- (3)  $T_{amb} = 60\text{ }^{\circ}\text{C}$
- (4)  $T_{amb} = 25\text{ }^{\circ}\text{C}$
- (5)  $T_{amb} = -40\text{ }^{\circ}\text{C}$

**Fig 4. Reverse current as a function of reverse voltage; typical values**



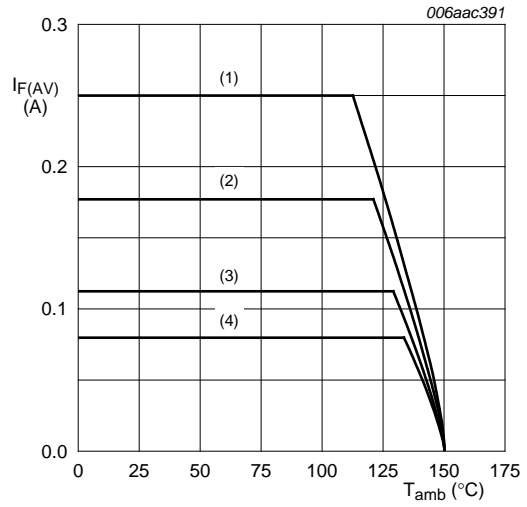
$f = 1\text{ MHz}; T_{amb} = 25\text{ }^{\circ}\text{C}$

**Fig 5. Diode capacitance as a function of reverse voltage; typical values**



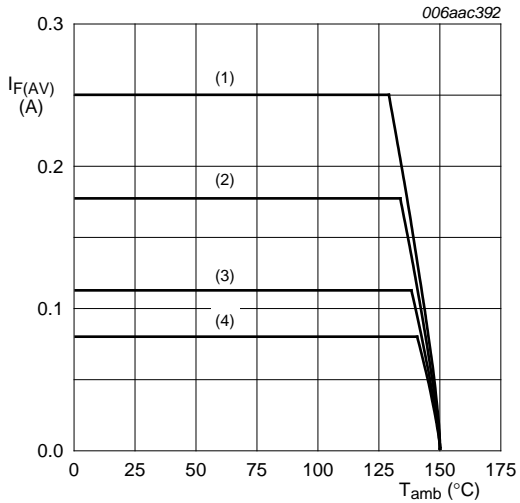
- $T_j = 125\text{ }^\circ\text{C}$
- (1)  $\delta = 1$
  - (2)  $\delta = 0.9$
  - (3)  $\delta = 0.8$
  - (4)  $\delta = 0.5$

**Fig 6. Average reverse power dissipation as a function of reverse voltage; typical values**



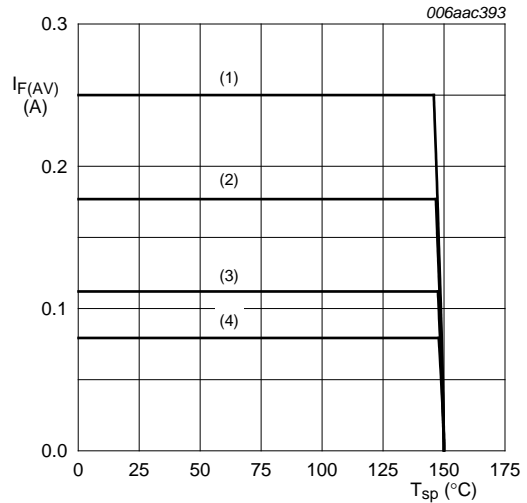
- FR4 PCB, standard footprint  
 $T_j = 150\text{ }^\circ\text{C}$
- (1)  $\delta = 1$ ; DC
  - (2)  $\delta = 0.5$ ;  $f = 20\text{ kHz}$
  - (3)  $\delta = 0.2$ ;  $f = 20\text{ kHz}$
  - (4)  $\delta = 0.1$ ;  $f = 20\text{ kHz}$

**Fig 7. Average forward current as a function of ambient temperature; typical values**



- FR4 PCB, mounting pad for cathode  $1\text{ cm}^2$   
 $T_j = 150\text{ }^\circ\text{C}$
- (1)  $\delta = 1$ ; DC
  - (2)  $\delta = 0.5$ ;  $f = 20\text{ kHz}$
  - (3)  $\delta = 0.2$ ;  $f = 20\text{ kHz}$
  - (4)  $\delta = 0.1$ ;  $f = 20\text{ kHz}$

**Fig 8. Average forward current as a function of ambient temperature; typical values**



- $T_j = 150\text{ }^\circ\text{C}$
- (1)  $\delta = 1$ ; DC
  - (2)  $\delta = 0.5$ ;  $f = 20\text{ kHz}$
  - (3)  $\delta = 0.2$ ;  $f = 20\text{ kHz}$
  - (4)  $\delta = 0.1$ ;  $f = 20\text{ kHz}$

**Fig 9. Average forward current as a function of solder point temperature; typical values**

8. Test information

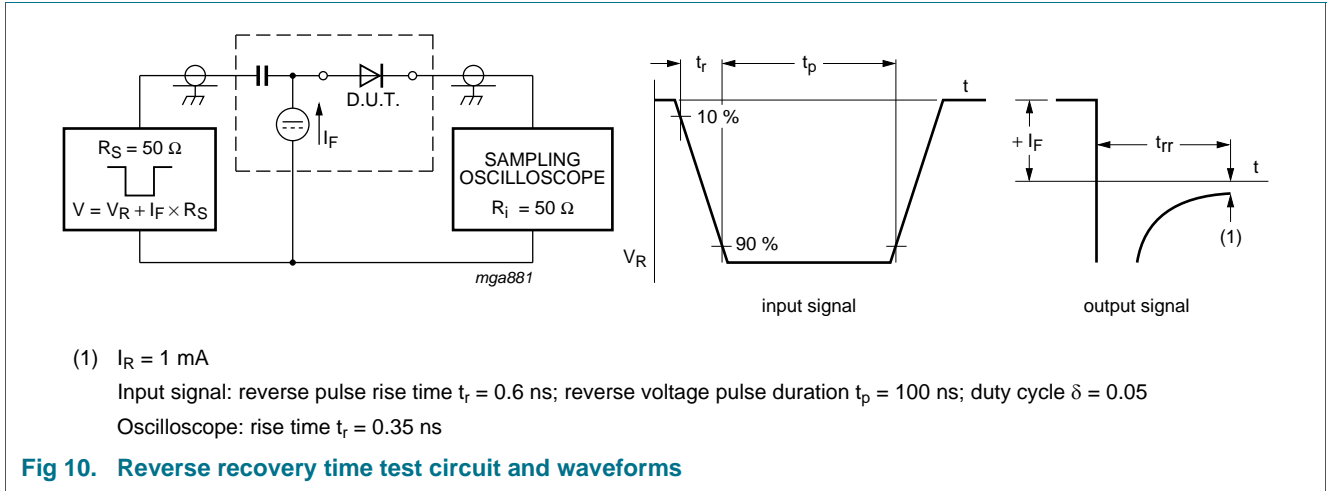


Fig 10. Reverse recovery time test circuit and waveforms

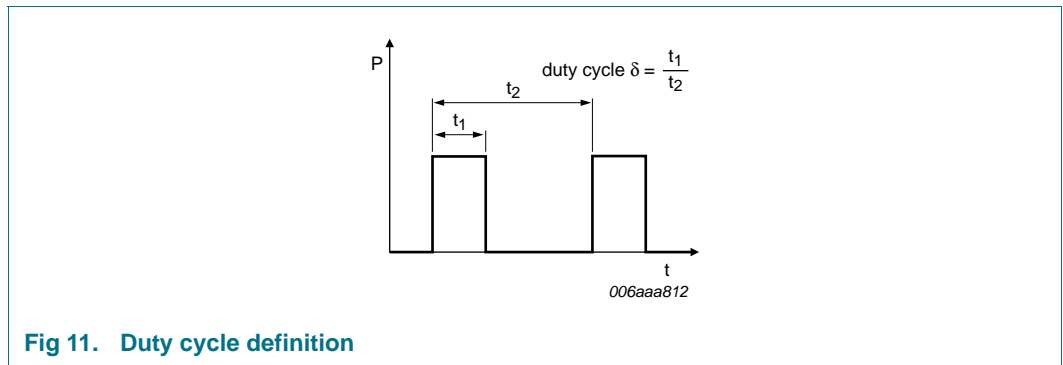


Fig 11. Duty cycle definition

The current ratings for the typical waveforms as shown in [Figure 7](#), [8](#) and [9](#) are calculated according to the equations:  $I_{F(AV)} = I_M \times \delta$  with  $I_M$  defined as peak current,  $I_{RMS} = I_{F(AV)}$  at DC, and  $I_{RMS} = I_M \times \sqrt{\delta}$  with  $I_{RMS}$  defined as RMS current.

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

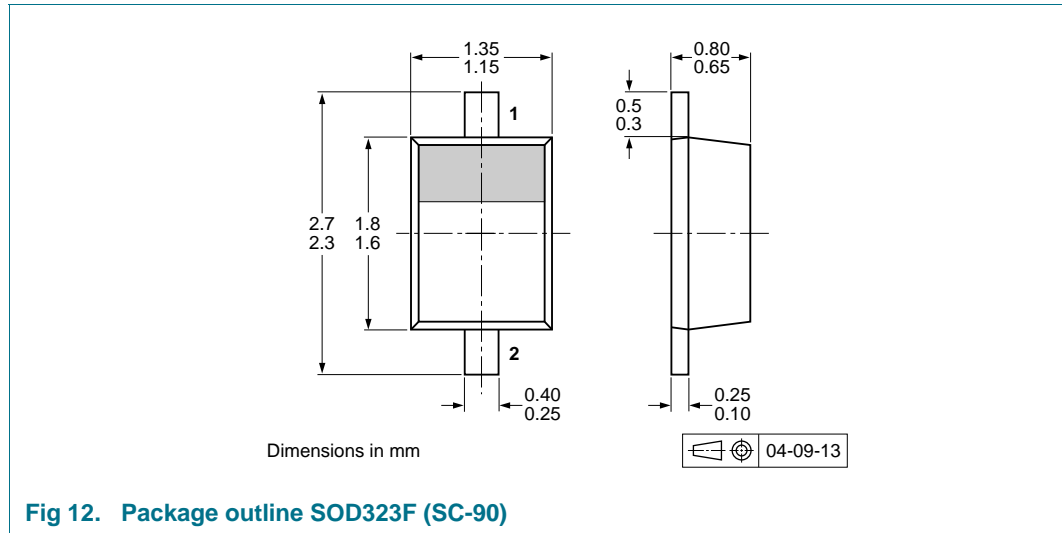


Fig 12. Package outline SOD323F (SC-90)

## 10. Packing information

**Table 8. 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	10000
BAT46WJ	SOD323F	4 mm pitch, 8 mm tape and reel	-115	-135

[1] For further information and the availability of packing methods, see [Section 14](#).

## 11. Soldering

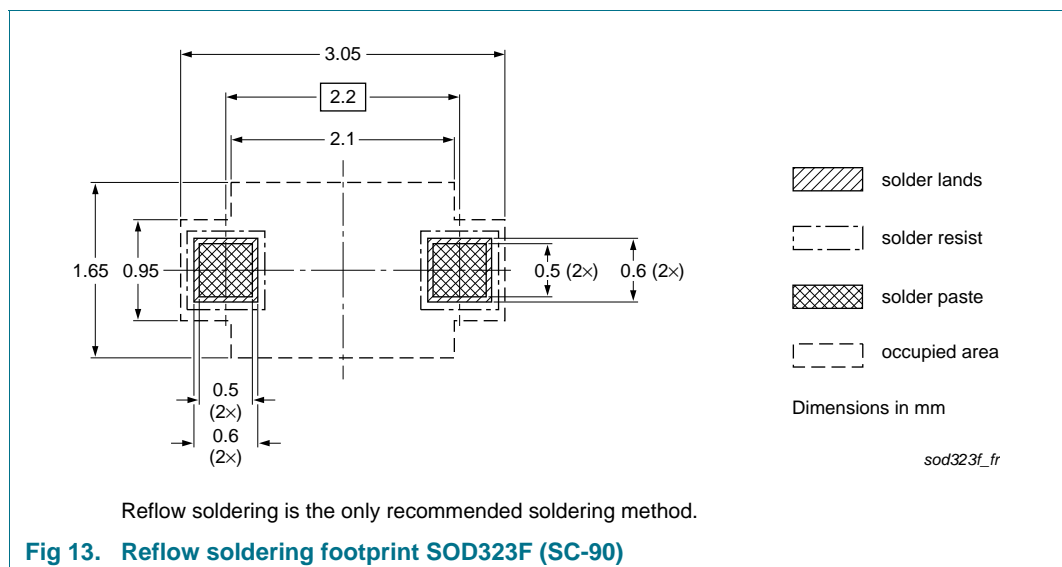


Fig 13. Reflow soldering footprint SOD323F (SC-90)



## 12. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BAT46WJ v.2	20111108	Product data sheet	-	BAT46WJ v.1
Modifications:		<ul style="list-style-type: none"><li>• <a href="#">Table 7</a>: unit for reverse current <math>I_R</math> at <math>V_R = 50</math> V corrected to <math>\mu\text{A}</math></li><li>• <a href="#">Table 7</a>: conditions of reverse voltage <math>V_R</math> corrected</li><li>• <a href="#">Section 13 "Legal information"</a>: updated</li></ul>		
BAT46WJ v.1	20100728	Product data sheet	-	-

## 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>.

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