



# 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

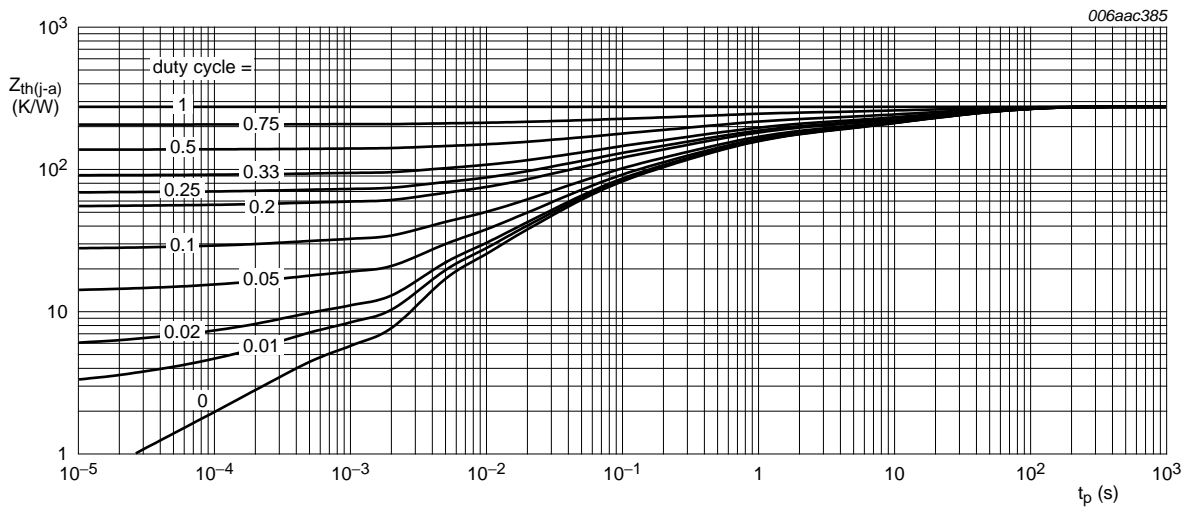
Table 6. Thermal characteristics

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**

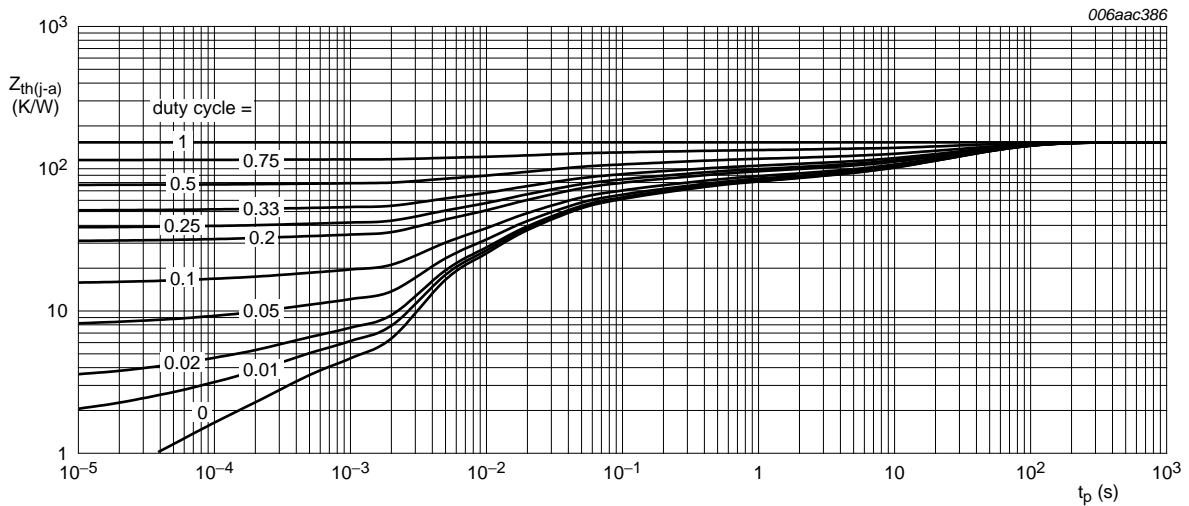
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-sp)}$	thermal resistance from junction to solder point	[4]	-	-	35	K/W

- [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

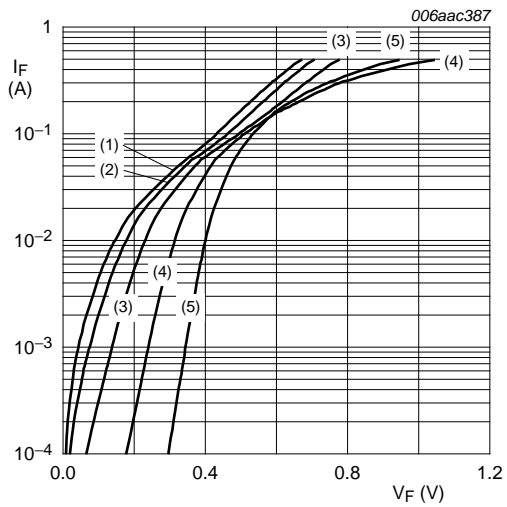
**Table 7. Characteristics**

$T_{amb} = 25\text{ °C}$  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

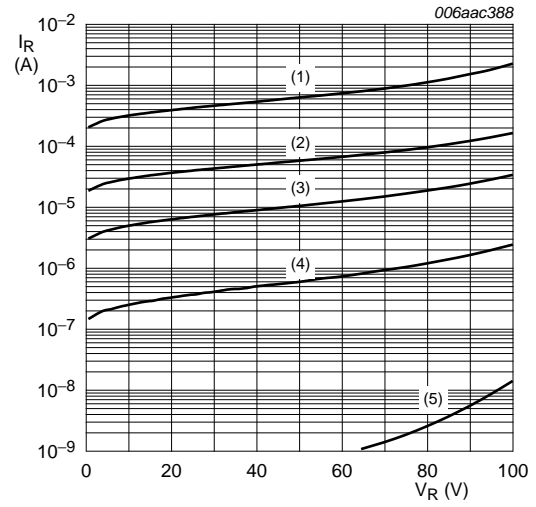
[1] Pulse test:  $t_p \leq 300\text{ }\mu\text{s}$ ;  $\delta \leq 0.02$ .

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



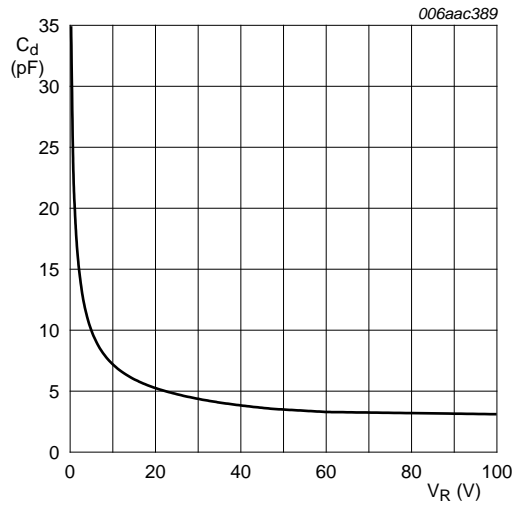
- (1)  $T_{amb} = 150\text{ }^{\circ}\text{C}$
- (2)  $T_{amb} = 125\text{ }^{\circ}\text{C}$
- (3)  $T_{amb} = 85\text{ }^{\circ}\text{C}$
- (4)  $T_{amb} = 25\text{ }^{\circ}\text{C}$
- (5)  $T_{amb} = -40\text{ }^{\circ}\text{C}$

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



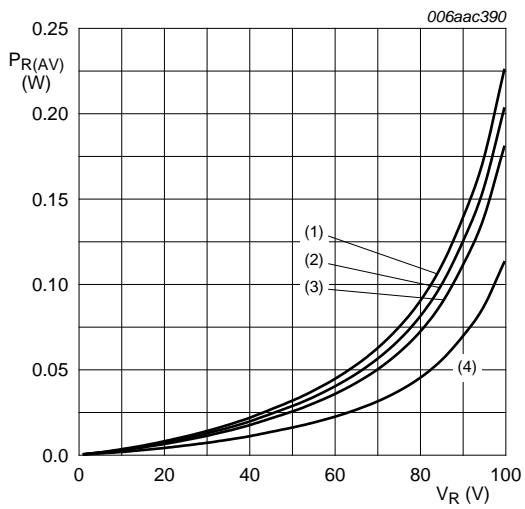
- (1)  $T_{amb} = 125\text{ }^{\circ}\text{C}$
- (2)  $T_{amb} = 85\text{ }^{\circ}\text{C}$
- (3)  $T_{amb} = 60\text{ }^{\circ}\text{C}$
- (4)  $T_{amb} = 25\text{ }^{\circ}\text{C}$
- (5)  $T_{amb} = -40\text{ }^{\circ}\text{C}$

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



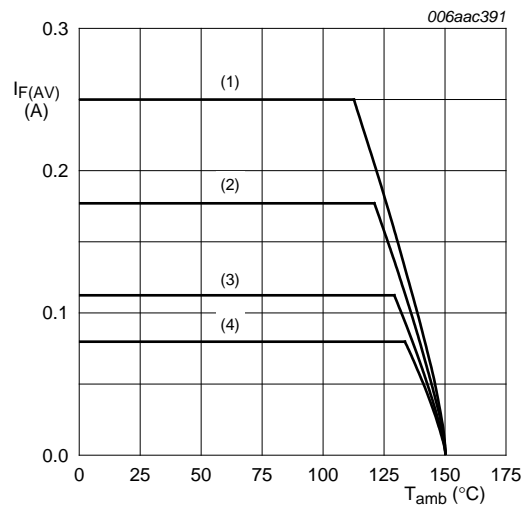
$f = 1\text{ MHz}; T_{amb} = 25\text{ }^{\circ}\text{C}$

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



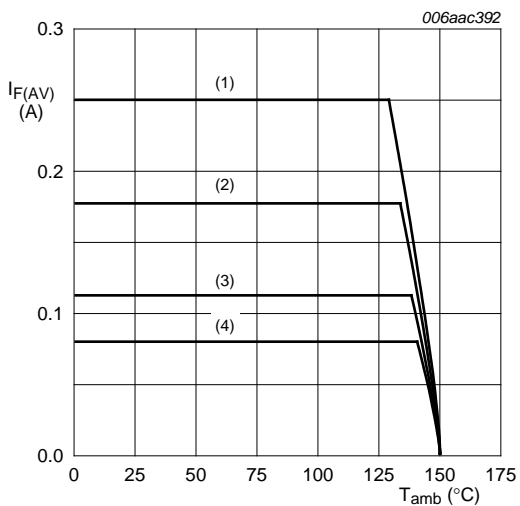
- $T_j = 125\text{ }^\circ\text{C}$
- (1)  $\delta = 1$
  - (2)  $\delta = 0.9$
  - (3)  $\delta = 0.8$
  - (4)  $\delta = 0.5$

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



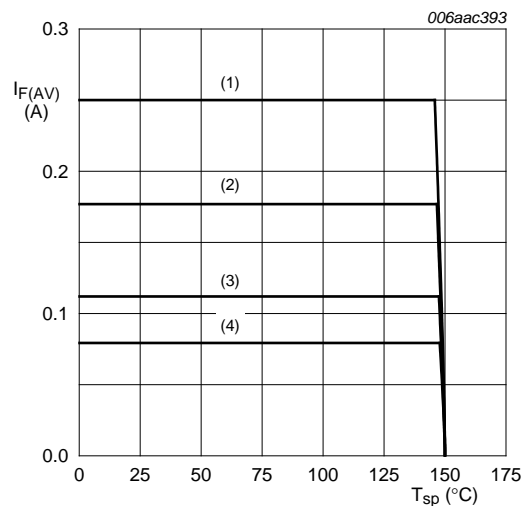
- FR4 PCB, standard footprint  
 $T_j = 150\text{ }^\circ\text{C}$
- (1)  $\delta = 1$ ; DC
  - (2)  $\delta = 0.5$ ;  $f = 20\text{ kHz}$
  - (3)  $\delta = 0.2$ ;  $f = 20\text{ kHz}$
  - (4)  $\delta = 0.1$ ;  $f = 20\text{ kHz}$

**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)  $\delta = 0.1$ ;  $f = 20\text{ kHz}$

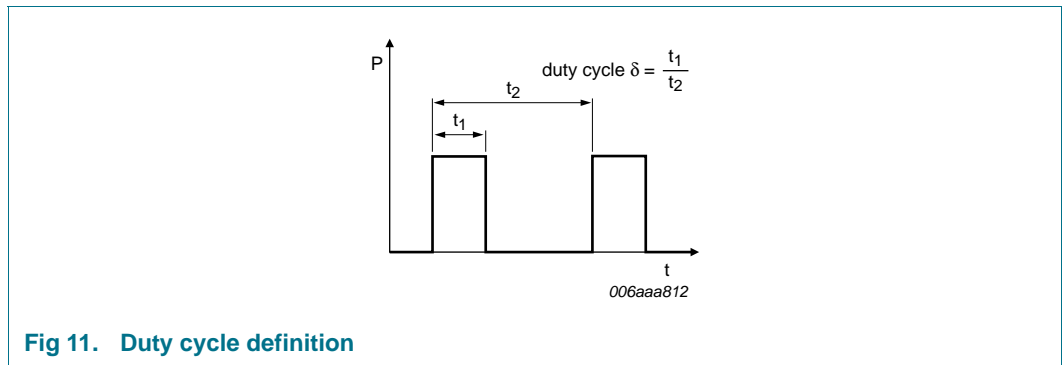
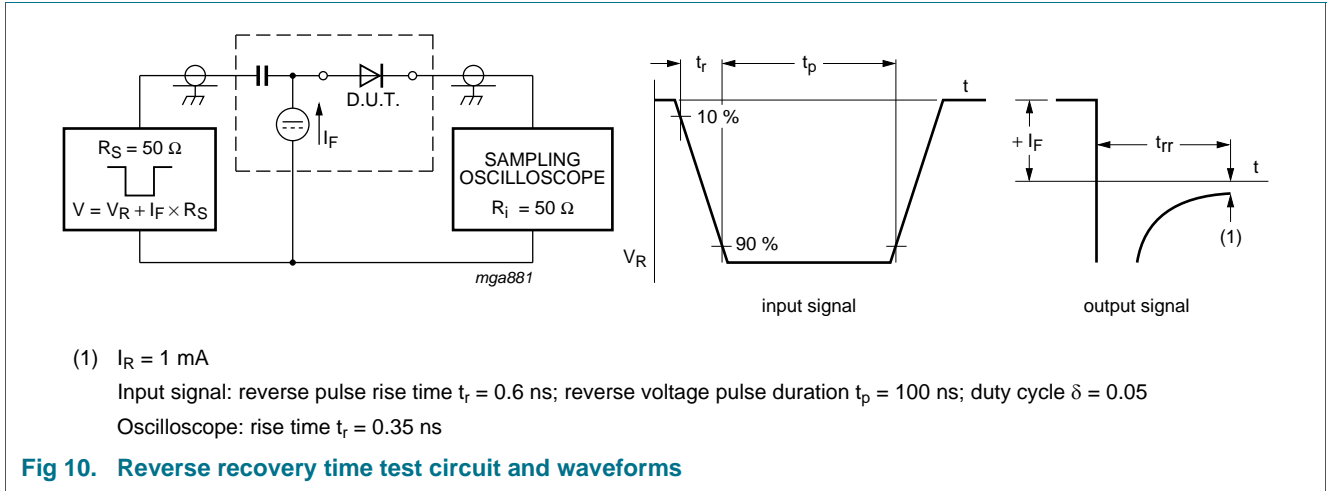
**Fig 8. Average forward current as a function of ambient temperature; typical values**



- $T_j = 150\text{ }^\circ\text{C}$
- (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



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

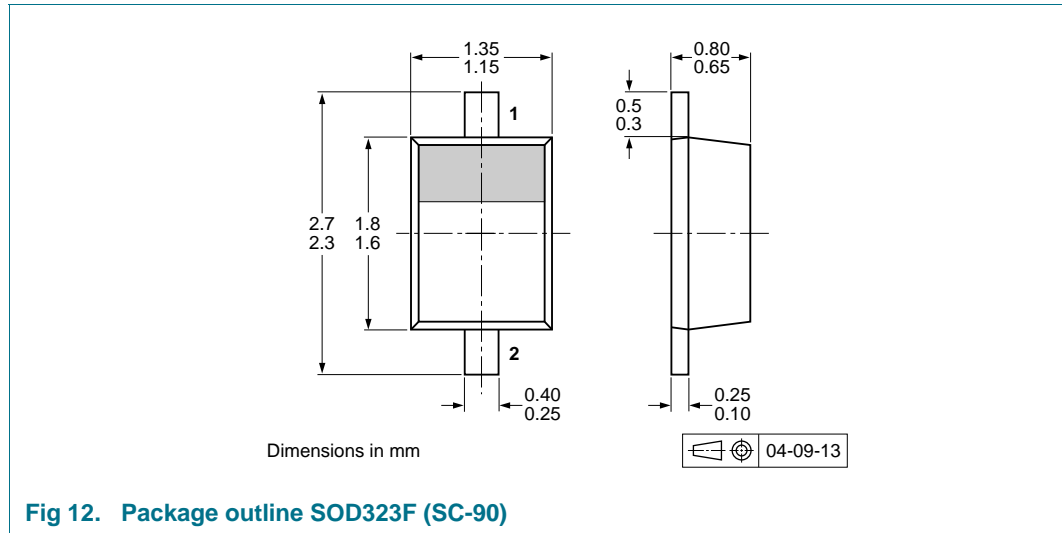


Fig 12. Package outline SOD323F (SC-90)

## 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

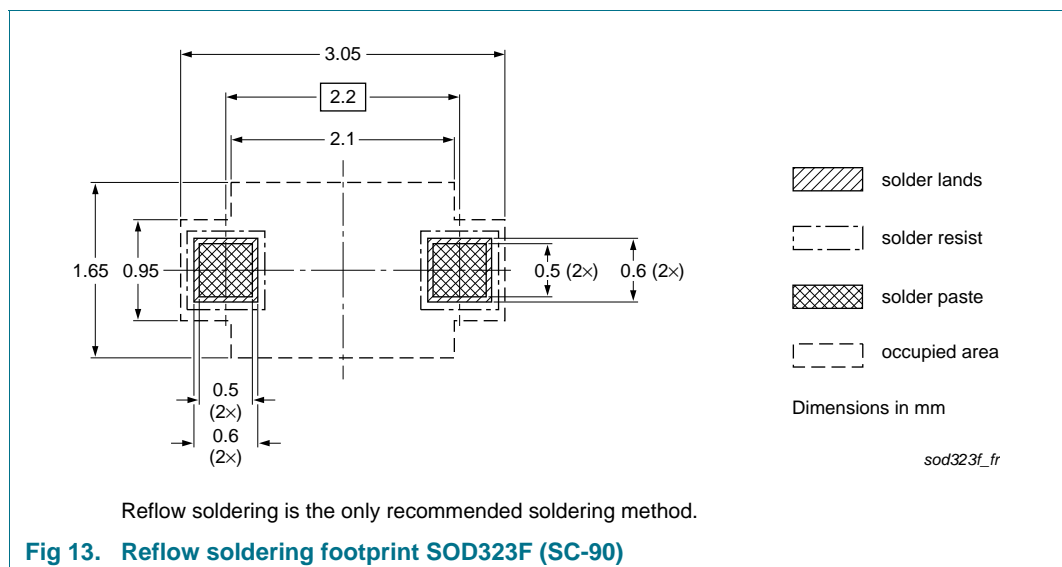


Fig 13. Reflow soldering footprint SOD323F (SC-90)



## 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".

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