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

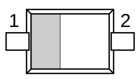
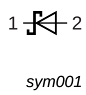
Table 1. Quick reference data

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	μA

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

2. Pinning information

Table 2. Pinning

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

[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^2.

[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*

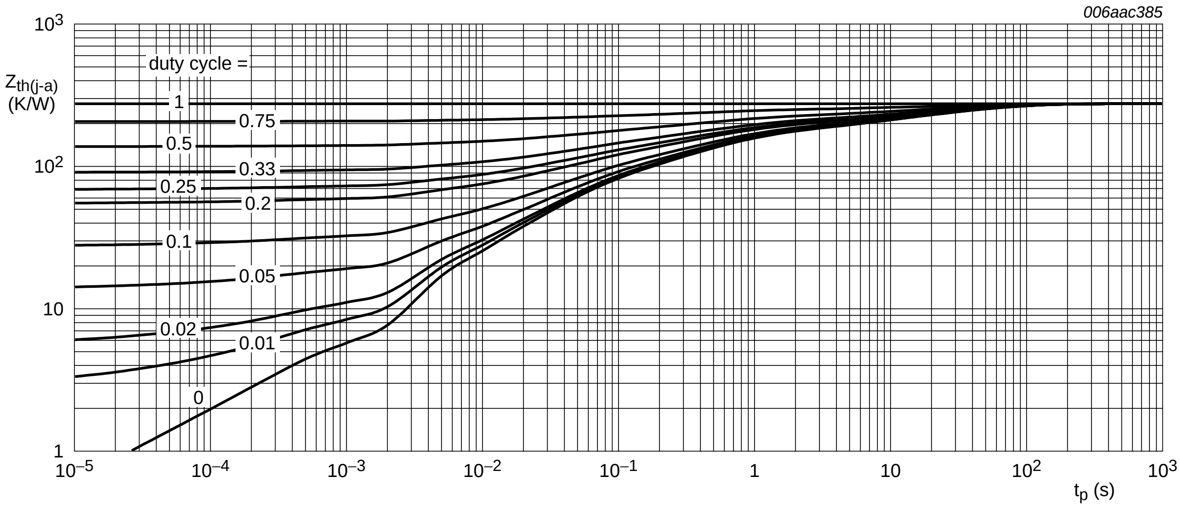
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-sp)}$	thermal resistance from junction to solder point		[4]	-	-	35	K/W

[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^2.

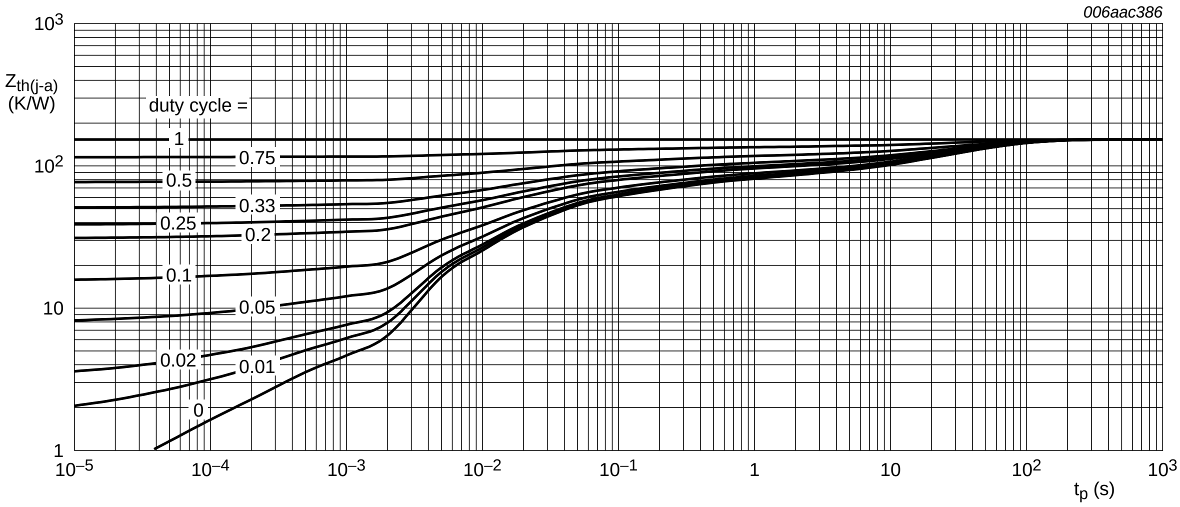
[3] Reflow soldering is the only recommended soldering method.

[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^2

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

7. Characteristics

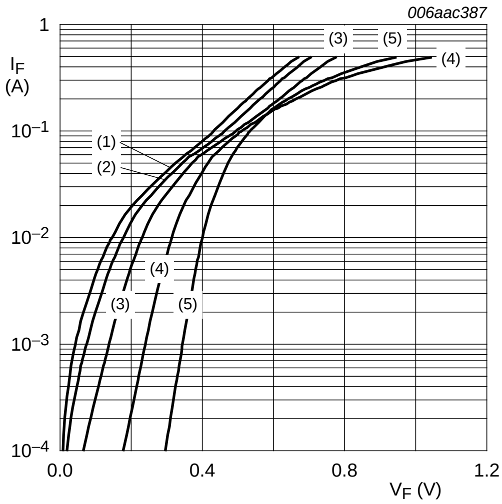
Table 7. Characteristics

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

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

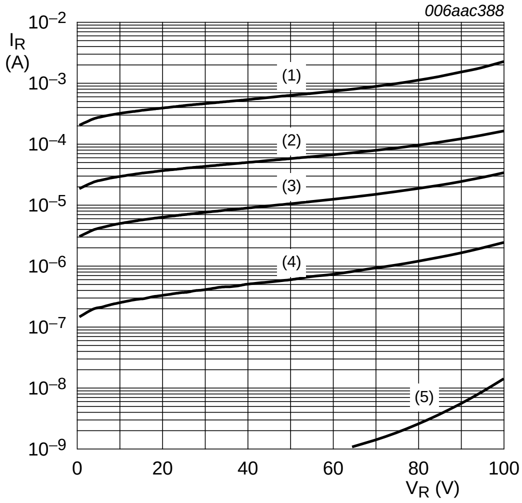
[1] Pulse test: $t_p \leq 300$ μs; $\delta \leq 0.02$.

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



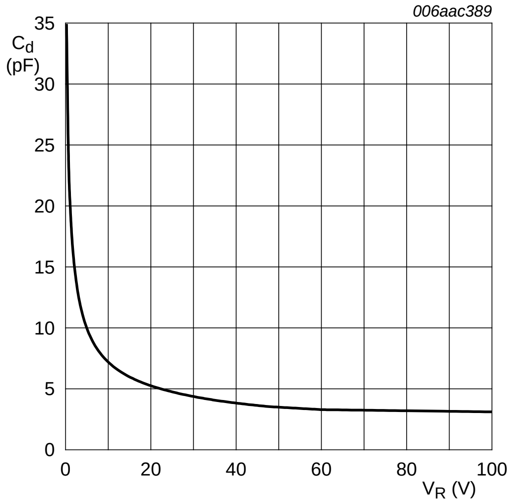
(1) T_{amb} = 150 °C
(2) T_{amb} = 125 °C
(3) T_{amb} = 85 °C
(4) T_{amb} = 25 °C
(5) T_{amb} = −40 °C

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



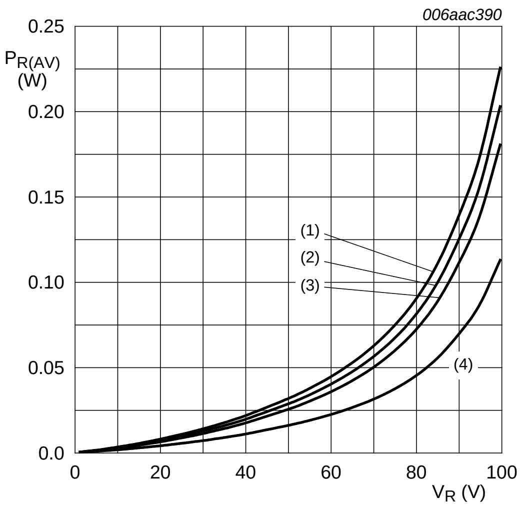
(1) T_{amb} = 125 °C
(2) T_{amb} = 85 °C
(3) T_{amb} = 60 °C
(4) T_{amb} = 25 °C
(5) T_{amb} = −40 °C

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



f = 1 MHz; T_{amb} = 25 °C

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



T_j = 125 °C

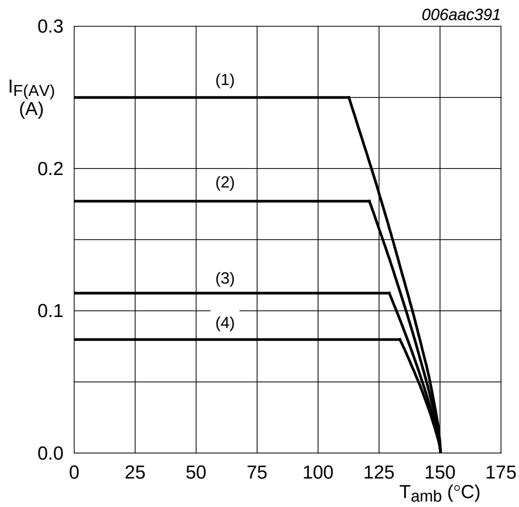
(1) δ = 1

(2) δ = 0.9

(3) δ = 0.8

(4) δ = 0.5

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



FR4 PCB, standard footprint

T_j = 150 °C

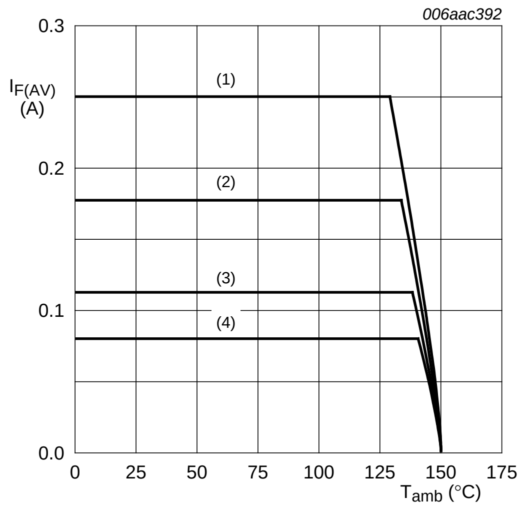
(1) δ = 1; DC

(2) δ = 0.5; f = 20 kHz

(3) δ = 0.2; f = 20 kHz

(4) δ = 0.1; f = 20 kHz

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



FR4 PCB, mounting pad for cathode 1 cm^2

T_j = 150 °C

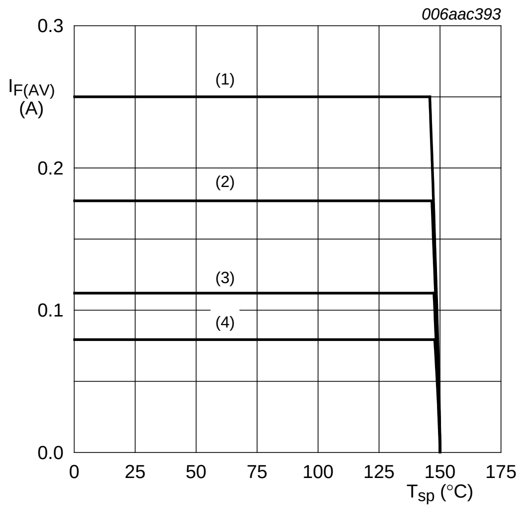
(1) δ = 1; DC

(2) δ = 0.5; f = 20 kHz

(3) δ = 0.2; f = 20 kHz

(4) δ = 0.1; f = 20 kHz

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



T_j = 150 °C

(1) δ = 1; DC

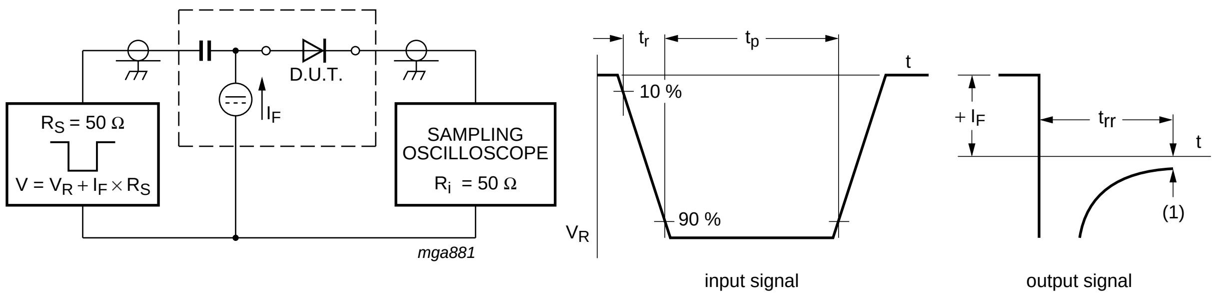
(2) δ = 0.5; f = 20 kHz

(3) δ = 0.2; f = 20 kHz

(4) δ = 0.1; f = 20 kHz

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

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 10. Reverse recovery time test circuit and waveforms

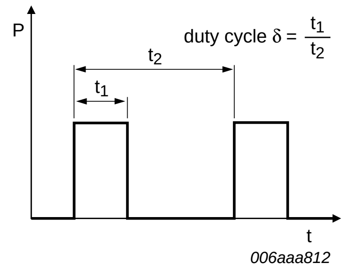


Fig 11. Duty cycle definition

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

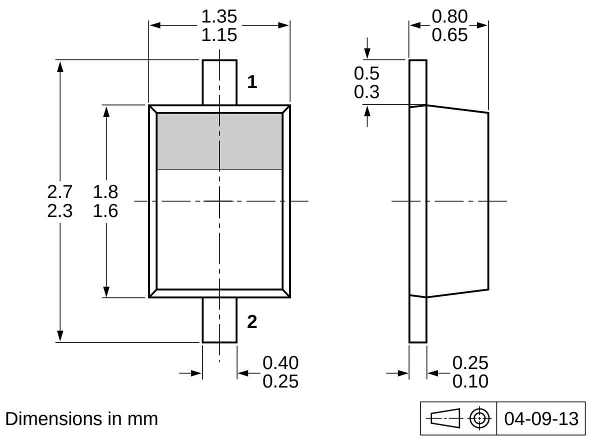


Fig 12. Package outline SOD323F (SC-90)

10. Packing information

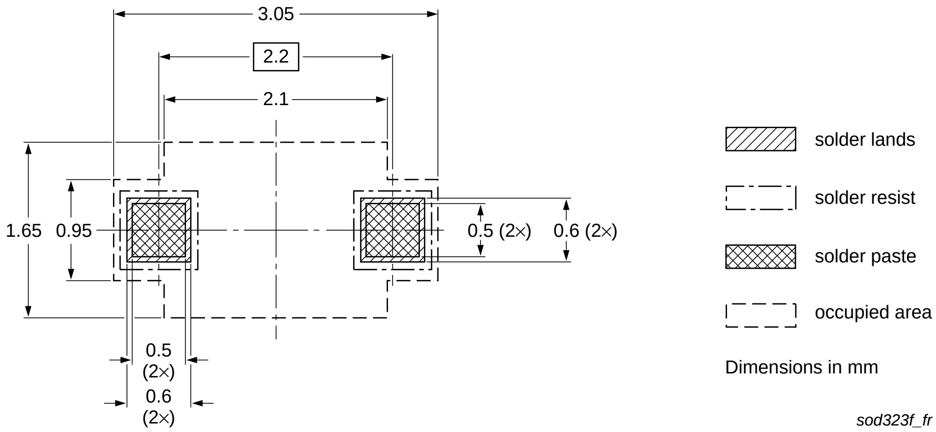
Table 8. Packing methods

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

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



Reflow soldering is the only recommended soldering method.

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:	• Table 7: unit for reverse current I_R at V_R = 50 V corrected to µA • Table 7: conditions of reverse voltage V_R corrected • Section 13 “Legal information”: updated			
BAT46WJ v.1	20100728	Product data sheet	-	-

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.nexperia.com.

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15. Contents

Date of release: 08 November 2011

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