BAT46WJ

Schottky barrier diode

1 October 2022 — Product data sheet

1. General description

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.

2. Features and benefits

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

3. Applications

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

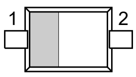
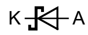
4. Quick reference data

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; $t_p \leq$ 300 µs; $\delta \leq$ 0.02; pulsed; T_{amb} = 25 °C		-	710	850	mV
I_R	reverse current	V_R = 75 V; $t_p \leq$ 300 µs; $\delta \leq$ 0.02; pulsed; T_{amb} = 25 °C		-	1	4	µA

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode[1]	 SC-90 (SOD323F)	 aaa-003679
2	A	anode		

[1] The marking bar indicates the cathode.

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6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BAT46WJ	SC-90	plastic, surface-mounted package; 2 leads; 1.7 mm x 1.25 mm x 0.7 mm body	SOD323F

7. Marking

Table 4. Marking codes

Type number	Marking code
BAT46WJ	JK

8. 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	t_p < 10 ms; square wave; $T_{j(init)}$ = 25 °C		-	2.5	A
P_{tot}	total power dissipation	$T_{amb} \leq$ 25 °C	[1] [2]	-	400	mW
			[3] [2]	-	715	mW
T_j	junction temperature			-	150	°C
T_{amb}	ambient temperature			-55	150	°C
T_{stg}	storage temperature			-65	150	°C

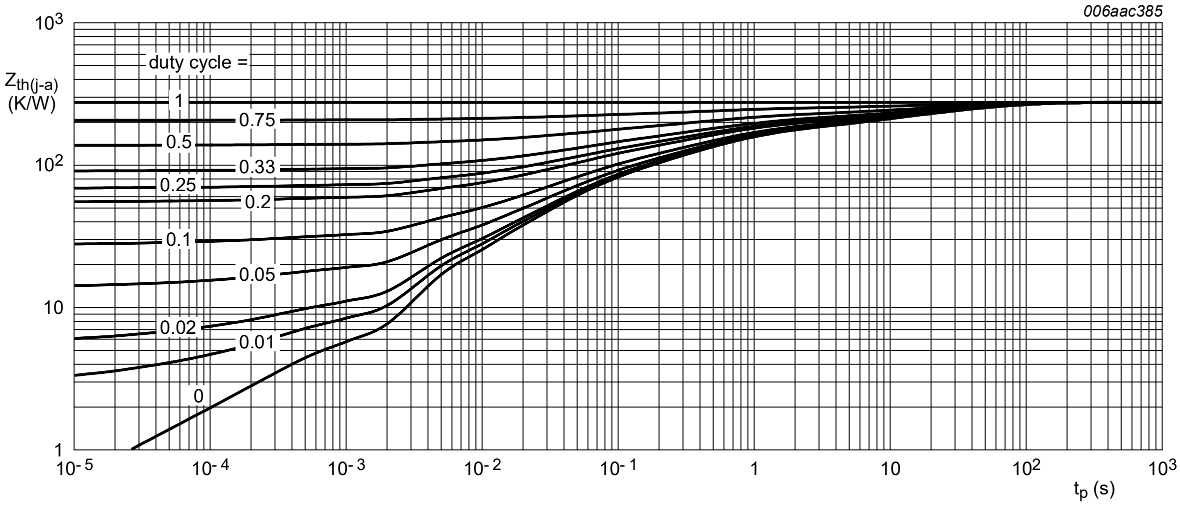
[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.
[2] Reflow soldering is the only recommended soldering method.
[3] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for cathode 1 cm^2.

9. Thermal characteristics

Table 6. Thermal characteristics

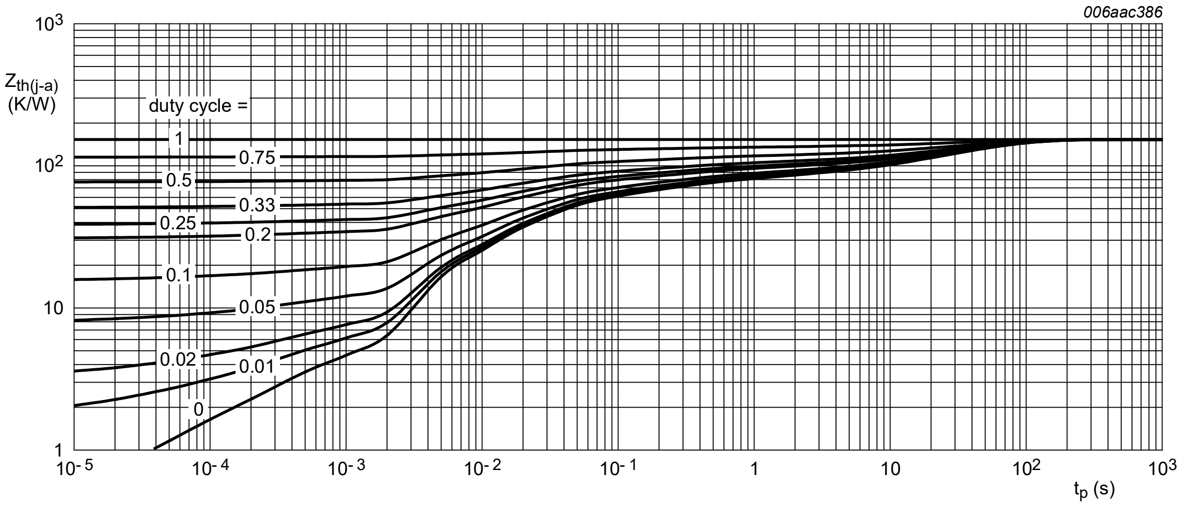
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1] [2]	-	-	310	K/W
			[3] [2]	-	-	175	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		[4]	-	-	35	K/W

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.
[2] Reflow soldering is the only recommended soldering method.
[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 cm^2.
[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



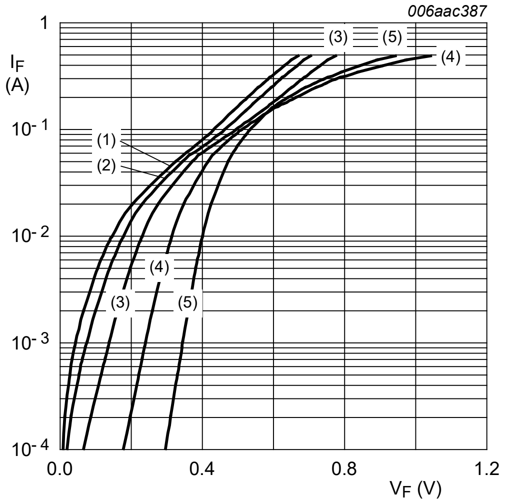
FR4 PCB, mounting pad for cathode 1 cm^2

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

10. Characteristics

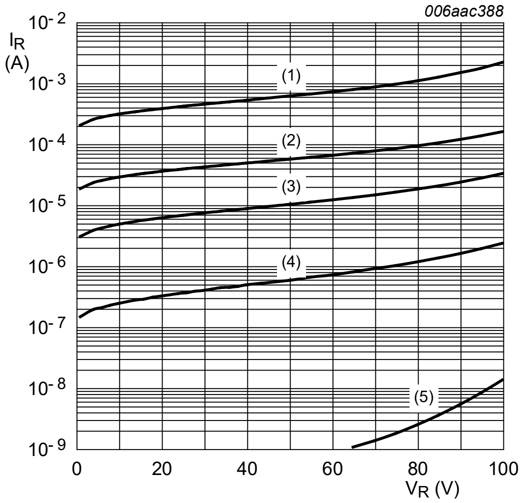
Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_F	forward voltage	I_F = 0.1 mA; t_p ≤ 300 µs; δ ≤ 0.02; pulsed; T_{amb} = 25 °C		-	175	200	mV
		I_F = 10 mA; t_p ≤ 300 µs; δ ≤ 0.02; pulsed; T_{amb} = 25 °C		-	315	350	mV
		I_F = 10 mA; t_p ≤ 300 µs; δ ≤ 0.02; pulsed; T_j = -40 °C		-	-	470	mV
		I_F = 50 mA; t_p ≤ 300 µs; δ ≤ 0.02; pulsed; T_{amb} = 25 °C		-	415	475	mV
		I_F = 50 mA; t_p ≤ 300 µs; δ ≤ 0.02; pulsed; T_j = -40 °C		-	-	560	mV
		I_F = 250 mA; t_p ≤ 300 µs; δ ≤ 0.02; pulsed; T_{amb} = 25 °C		-	710	850	mV
I_R	reverse current	V_R = 1.5 V; t_p ≤ 300 µs; δ ≤ 0.02; pulsed; T_{amb} = 25 °C		-	0.2	0.5	µA
		V_R = 1.5 V; t_p ≤ 300 µs; δ ≤ 0.02; pulsed; T_j = 60 °C		-	-	12	µA
		V_R = 10 V; t_p ≤ 300 µs; δ ≤ 0.02; pulsed; T_{amb} = 25 °C		-	0.3	0.8	µA
		V_R = 10 V; t_p ≤ 300 µs; δ ≤ 0.02; pulsed; T_j = 60 °C		-	-	20	µA
		V_R = 50 V; t_p ≤ 300 µs; δ ≤ 0.02; pulsed; T_{amb} = 25 °C		-	0.7	2	µA
		V_R = 50 V; t_p ≤ 300 µs; δ ≤ 0.02; pulsed; T_j = 60 °C		-	-	44	µA
		V_R = 75 V; t_p ≤ 300 µs; δ ≤ 0.02; pulsed; T_{amb} = 25 °C		-	1	4	µA
		V_R = 75 V; t_p ≤ 300 µs; δ ≤ 0.02; pulsed; T_j = 60 °C		-	-	80	µA
		V_R = 100 V; t_p ≤ 300 µs; δ ≤ 0.02; pulsed; T_{amb} = 25 °C		-	2	9	µA
		V_R = 100 V; t_p ≤ 300 µs; δ ≤ 0.02; pulsed; T_j = 60 °C		-	-	120	µA
		V_R = 100 V; t_p ≤ 300 µs; δ ≤ 0.02; pulsed; T_j = 85 °C		-	-	600	µA
C_d	diode capacitance	V_R = 0 V; f = 1 MHz; T_{amb} = 25 °C		-	-	39	pF
		V_R = 1 V; f = 1 MHz; T_{amb} = 25 °C		-	-	21	pF
t_{rr}	reverse recovery time	I_F = 10 mA; I_R = 10 mA; $I_{R(meas)}$ = 1 mA; R_L = 100 Ω; T_{amb} = 25 °C		-	5.9	-	ns



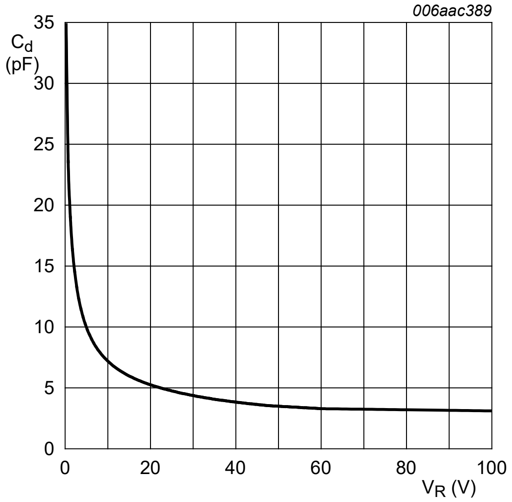
(1) T_{amb} = 150 °C
(2) T_{amb} = 125 °C
(3) T_{amb} = 85 °C
(4) T_{amb} = 25 °C
(5) T_{amb} = -40 °C

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



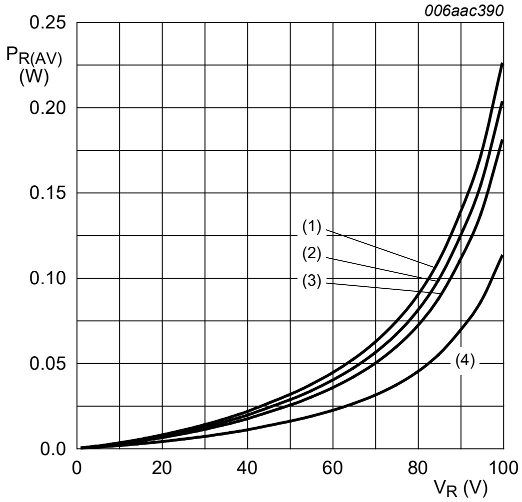
(1) T_{amb} = 125 °C
(2) T_{amb} = 85 °C
(3) T_{amb} = 60 °C
(4) T_{amb} = 25 °C
(5) T_{amb} = -40 °C

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



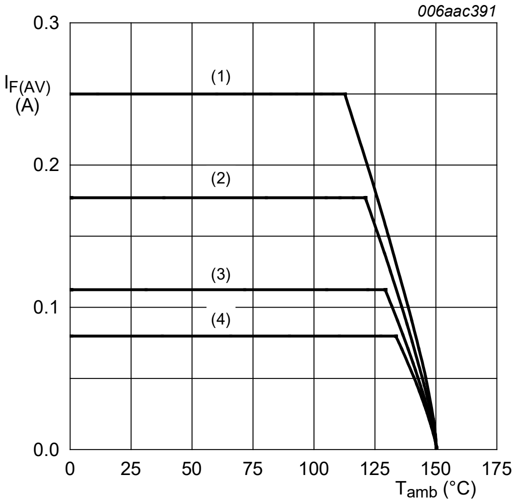
f = 1 MHz; T_{amb} = 25 °C

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



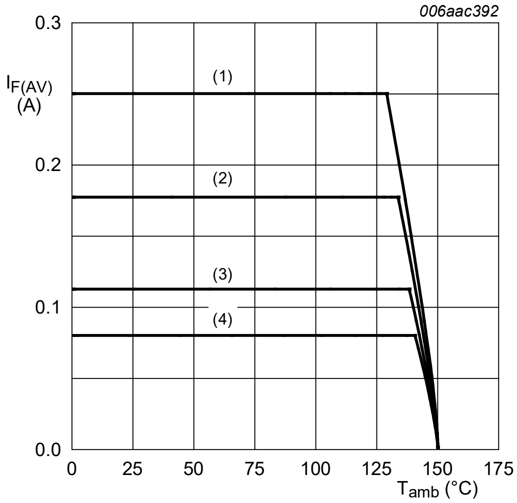
T_j = 125 °C
(1) δ = 1
(2) δ = 0.9
(3) δ = 0.8
(4) δ = 0.5

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



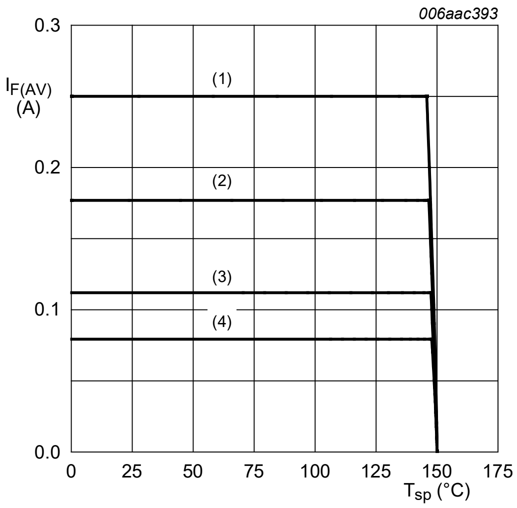
FR4 PCB, standard footprint
T_j = 150 °C
(1) δ = 1; DC
(2) δ = 0.5; f = 20 kHz
(3) δ = 0.2; f = 20 kHz
(4) δ = 0.1; f = 20 kHz

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

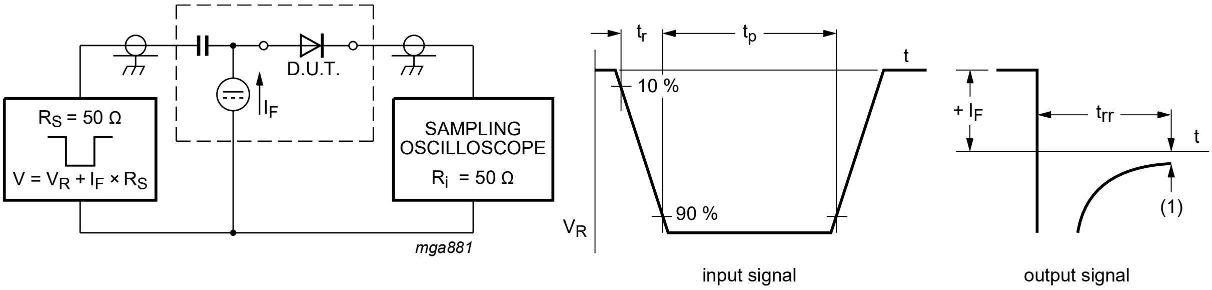
Fig. 8. Average forward current as a function of ambient temperature; typical values



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

11. 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

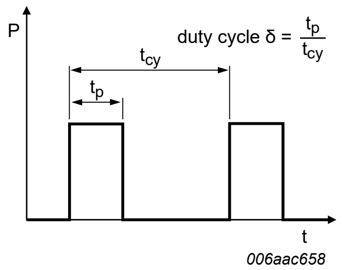


Fig. 11. Duty cycle definition

The current ratings for the typical waveforms 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.

12. Package outline

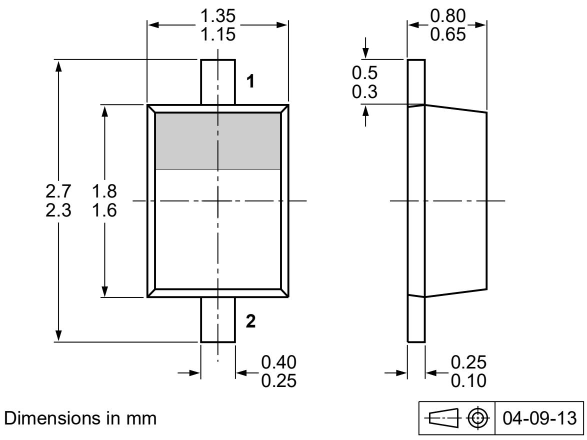


Fig. 12. Package outline SC-90 (SOD323F)

13. Soldering

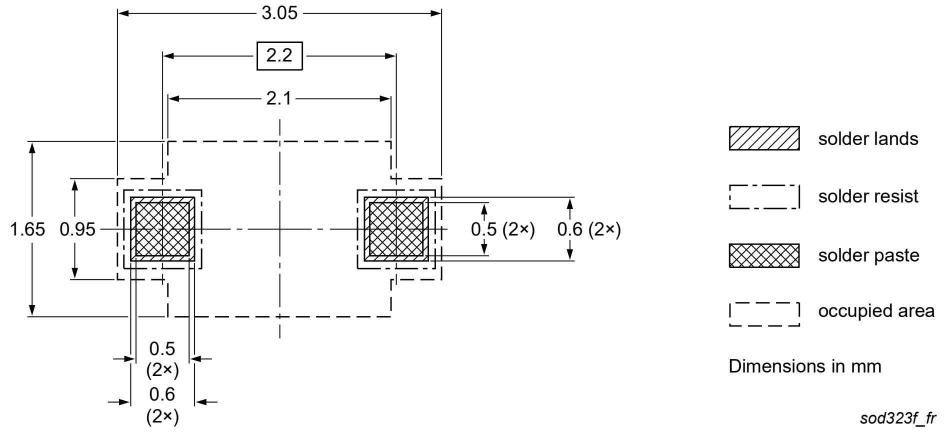


Fig. 13. Reflow soldering footprint for SC-90 (SOD323F)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
BAT46WJ v.3	20221001	Product data sheet	-	BAT46WJ v.2
Modifications:	• Product changed to non automotive. Please refer to the automotive product(s) with -Q. • Packing information removed.			
BAT46WJ v.2	20111108	Product data sheet	-	BAT46WJ v.1
BAT46WJ v.1	20100728	Product data sheet	-	-

15. Legal information

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".
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