BAT46WJ-Q

Schottky barrier diode

23 August 2021 **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 ≤ 100 V
- Very small and flat lead SMD plastic package
- Low capacitance
- Qualified according to AEC-Q101 and recommended for use in automotive applications

3. Applications

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

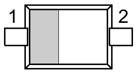
4. Quick reference data

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 ≤ 300 µs; δ ≤ 0.02; pulsed; T_{amb} = 25 °C		-	710	850	mV
I_R	reverse current	V_R = 75 V; t_p ≤ 300 µs; δ ≤ 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.

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BAT46WJ-Q	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-Q	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} ≤ 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

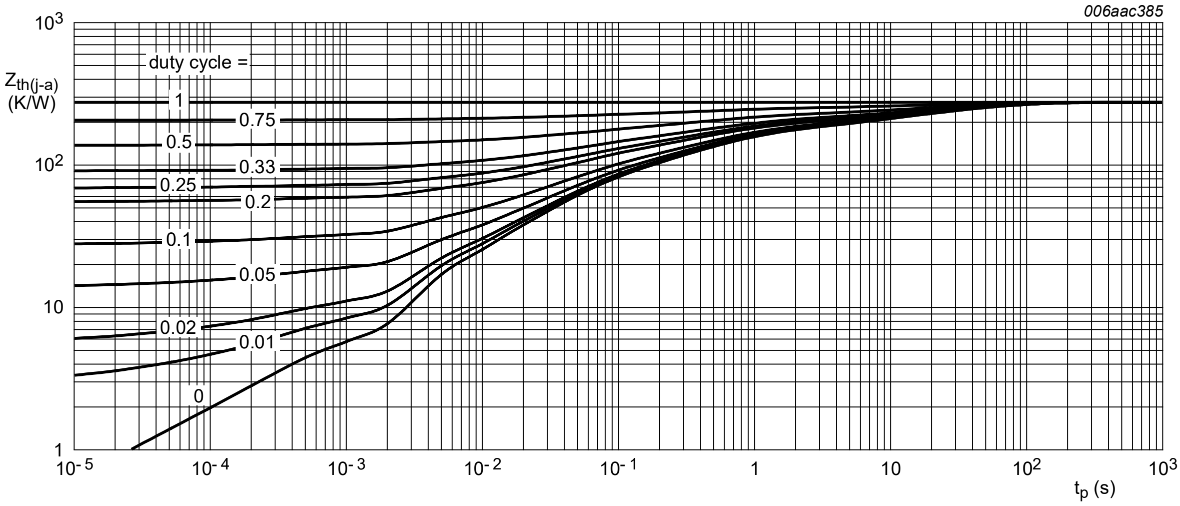
[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.
[2] Reflow soldering is the only recommended soldering method.
[3] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for cathode 1 cm^2.

9. Thermal characteristics

Table 6. Thermal characteristics

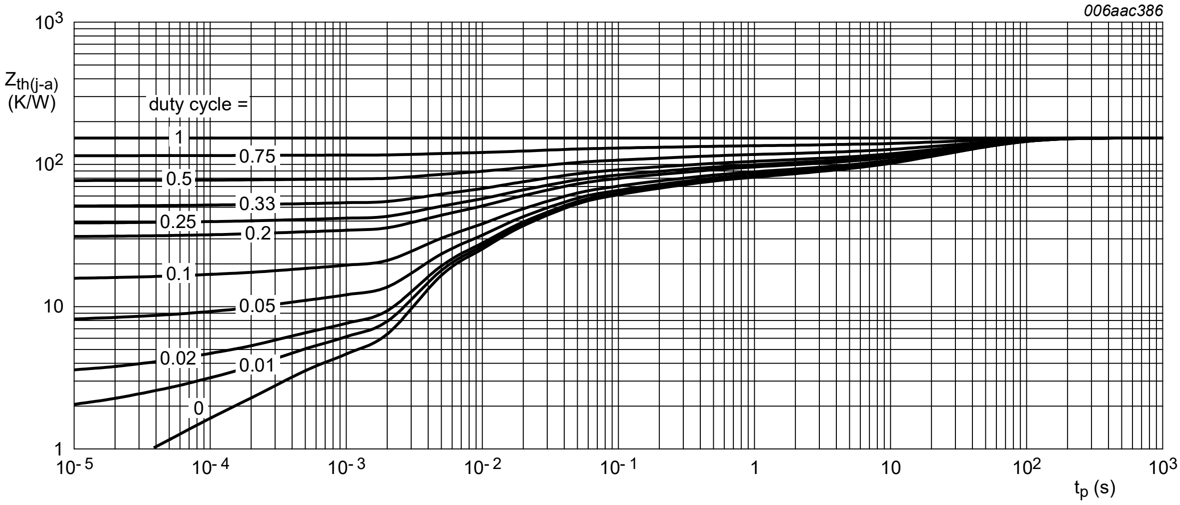
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1] [2]	-	-	310	K/W
			[3] [2]	-	-	175	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		[4]	-	-	35	K/W

[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



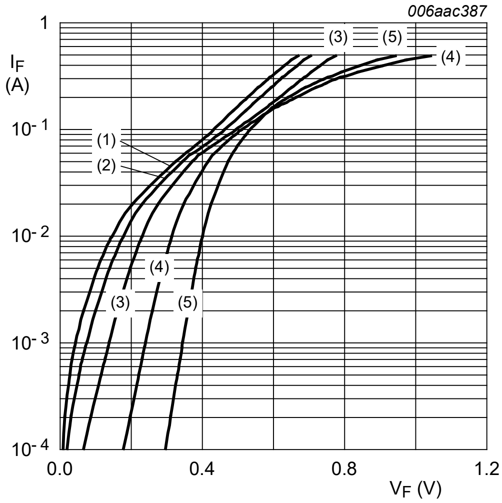
FR4 PCB, mounting pad for cathode 1 cm^2

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

10. Characteristics

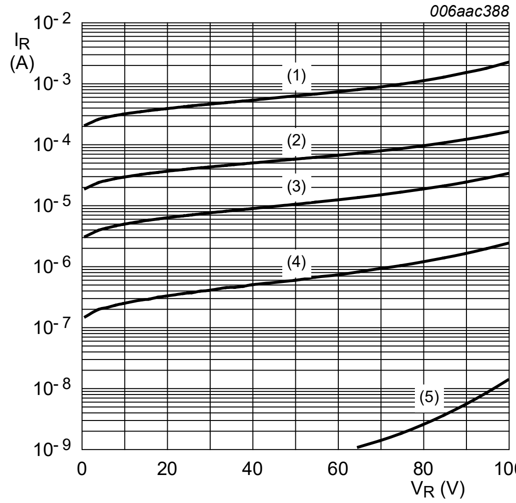
Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_F	forward voltage	I_F = 0.1 mA; $t_p \leq$ 300 µs; δ ≤ 0.02; pulsed; T_{amb} = 25 °C		-	175	200	mV
		I_F = 10 mA; $t_p \leq$ 300 µs; δ ≤ 0.02; pulsed; T_{amb} = 25 °C		-	315	350	mV
		I_F = 10 mA; $t_p \leq$ 300 µs; δ ≤ 0.02; pulsed; T_j = -40 °C		-	-	470	mV
		I_F = 50 mA; $t_p \leq$ 300 µs; δ ≤ 0.02; pulsed; T_{amb} = 25 °C		-	415	475	mV
		I_F = 50 mA; $t_p \leq$ 300 µs; δ ≤ 0.02; pulsed; T_j = -40 °C		-	-	560	mV
		I_F = 250 mA; $t_p \leq$ 300 µs; δ ≤ 0.02; pulsed; T_{amb} = 25 °C		-	710	850	mV
I_R	reverse current	V_R = 1.5 V; $t_p \leq$ 300 µs; δ ≤ 0.02; pulsed; T_{amb} = 25 °C		-	0.2	0.5	µA
		V_R = 1.5 V; $t_p \leq$ 300 µs; δ ≤ 0.02; pulsed; T_j = 60 °C		-	-	12	µA
		V_R = 10 V; $t_p \leq$ 300 µs; δ ≤ 0.02; pulsed; T_{amb} = 25 °C		-	0.3	0.8	µA
		V_R = 10 V; $t_p \leq$ 300 µs; δ ≤ 0.02; pulsed; T_j = 60 °C		-	-	20	µA
		V_R = 50 V; $t_p \leq$ 300 µs; δ ≤ 0.02; pulsed; T_{amb} = 25 °C		-	0.7	2	µA
		V_R = 50 V; $t_p \leq$ 300 µs; δ ≤ 0.02; pulsed; T_j = 60 °C		-	-	44	µA
		V_R = 75 V; $t_p \leq$ 300 µs; δ ≤ 0.02; pulsed; T_{amb} = 25 °C		-	1	4	µA
		V_R = 75 V; $t_p \leq$ 300 µs; δ ≤ 0.02; pulsed; T_j = 60 °C		-	-	80	µA
		V_R = 100 V; $t_p \leq$ 300 µs; δ ≤ 0.02; pulsed; T_{amb} = 25 °C		-	2	9	µA
		V_R = 100 V; $t_p \leq$ 300 µs; δ ≤ 0.02; pulsed; T_j = 60 °C		-	-	120	µA
		V_R = 100 V; $t_p \leq$ 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



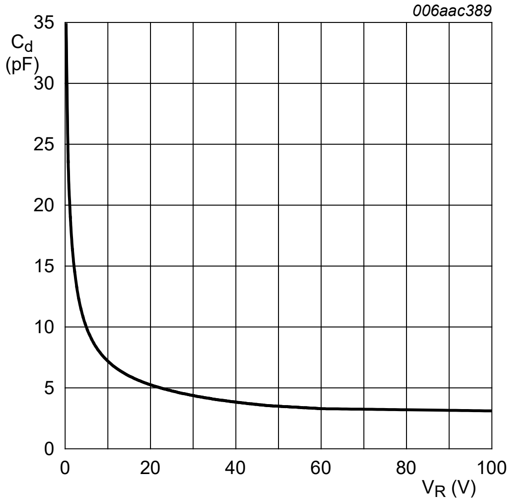
(1) T_{amb} = 150 °C
(2) T_{amb} = 125 °C
(3) T_{amb} = 85 °C
(4) T_{amb} = 25 °C
(5) T_{amb} = -40 °C

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



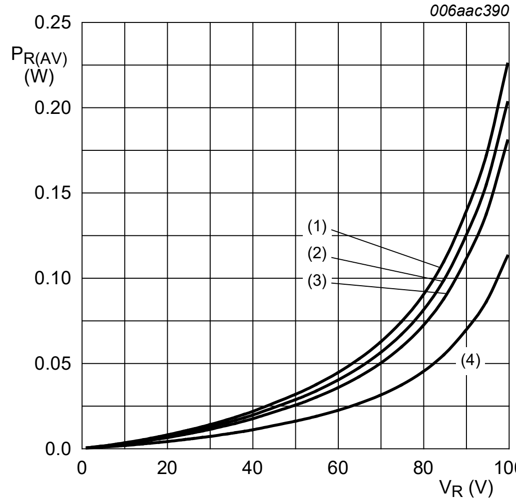
(1) T_{amb} = 125 °C
(2) T_{amb} = 85 °C
(3) T_{amb} = 60 °C
(4) T_{amb} = 25 °C
(5) T_{amb} = -40 °C

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



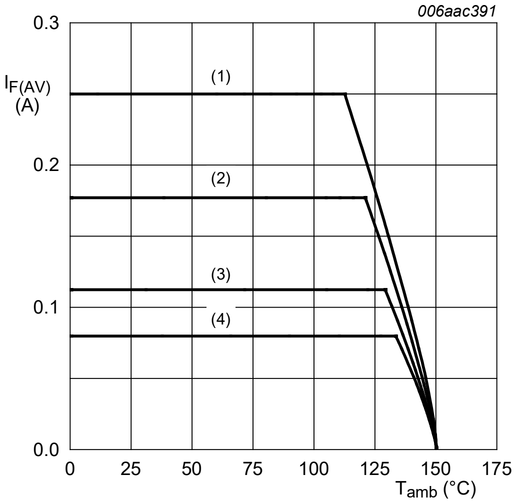
f = 1 MHz; T_{amb} = 25 °C

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



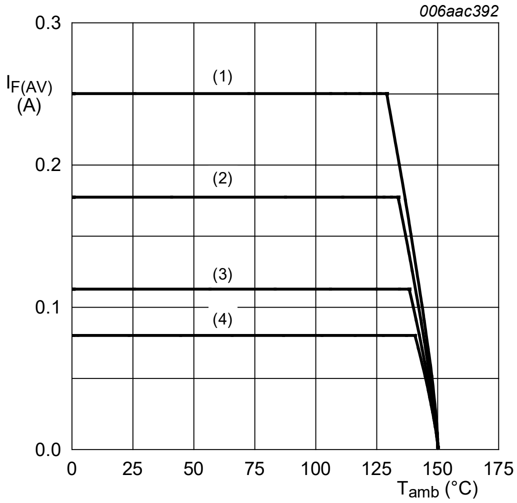
T_j = 125 °C
(1) δ = 1
(2) δ = 0.9
(3) δ = 0.8
(4) δ = 0.5

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



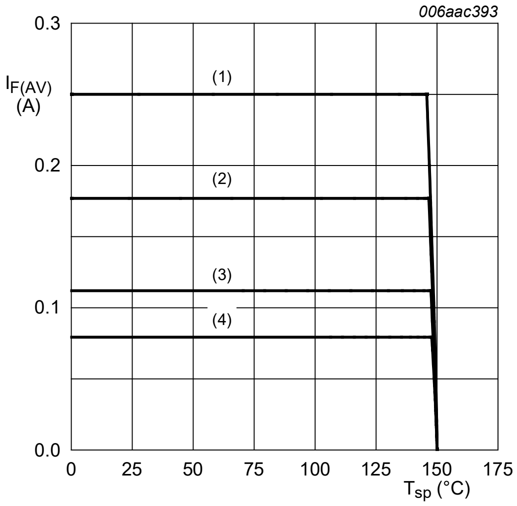
FR4 PCB, standard footprint
T_j = 150 °C
(1) δ = 1; DC
(2) δ = 0.5; f = 20 kHz
(3) δ = 0.2; f = 20 kHz
(4) δ = 0.1; f = 20 kHz

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

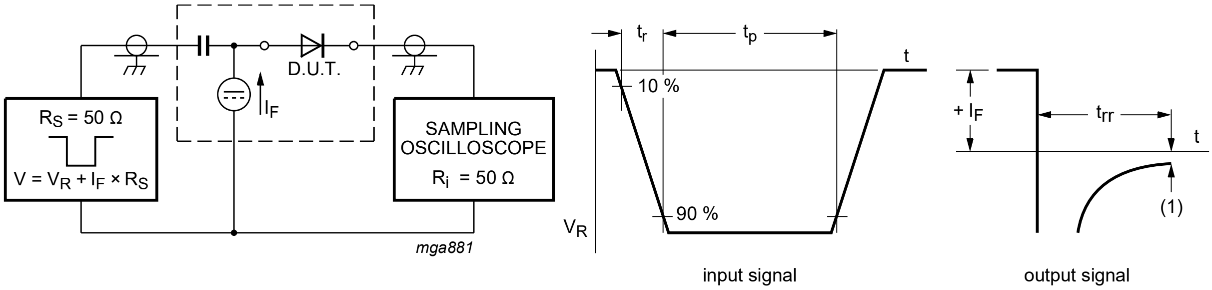
Fig. 8. Average forward current as a function of ambient temperature; typical values



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

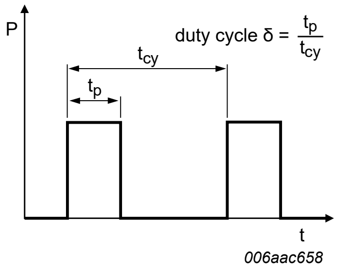


Fig. 11. Duty cycle definition

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.

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.

12. Package outline

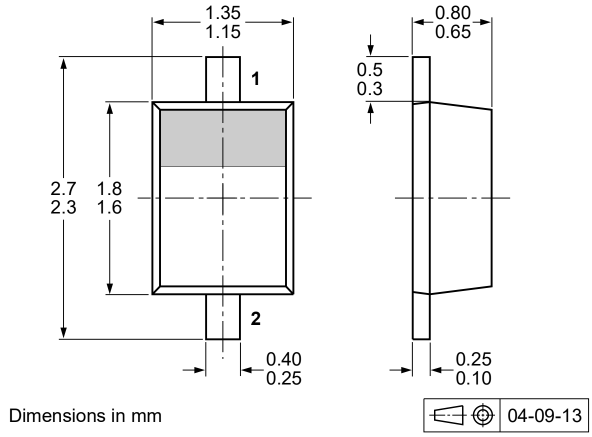


Fig. 12. Package outline SC-90 (SOD323F)

13. Soldering

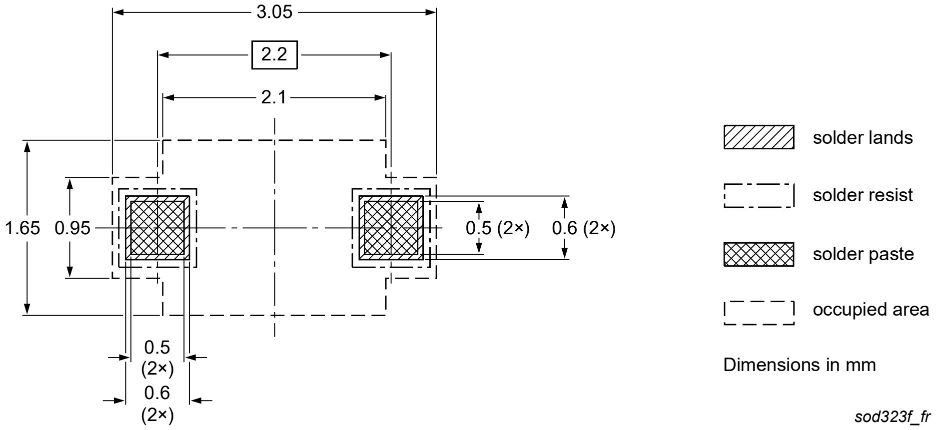


Fig. 13. Reflow soldering footprint for SC-90 (SOD323F)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
BAT46WJ-Q v.1	20210823	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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