



THE DATASHEET OF BAT46WJ-QX





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 $V_R \leq 100$ 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; $t_p \leq 300$ μ s; $\delta \leq 0.02$; pulsed; $T_{amb} = 25$ °C | - | 710 | 850 | mV |
| I_R | reverse current | $V_R = 75$ V; $t_p \leq 300$ μ s; $\delta \leq 0.02$; pulsed; $T_{amb} = 25$ °C | - | 1 | 4 | μ A |

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; $T_{j(\text{init})} = 25$ °C | | - | 2.5 | A |
| P_{tot} | total power dissipation | $T_{\text{amb}} \leq 25$ °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 cm².

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 cm².
- [4] Soldering point of cathode tab.

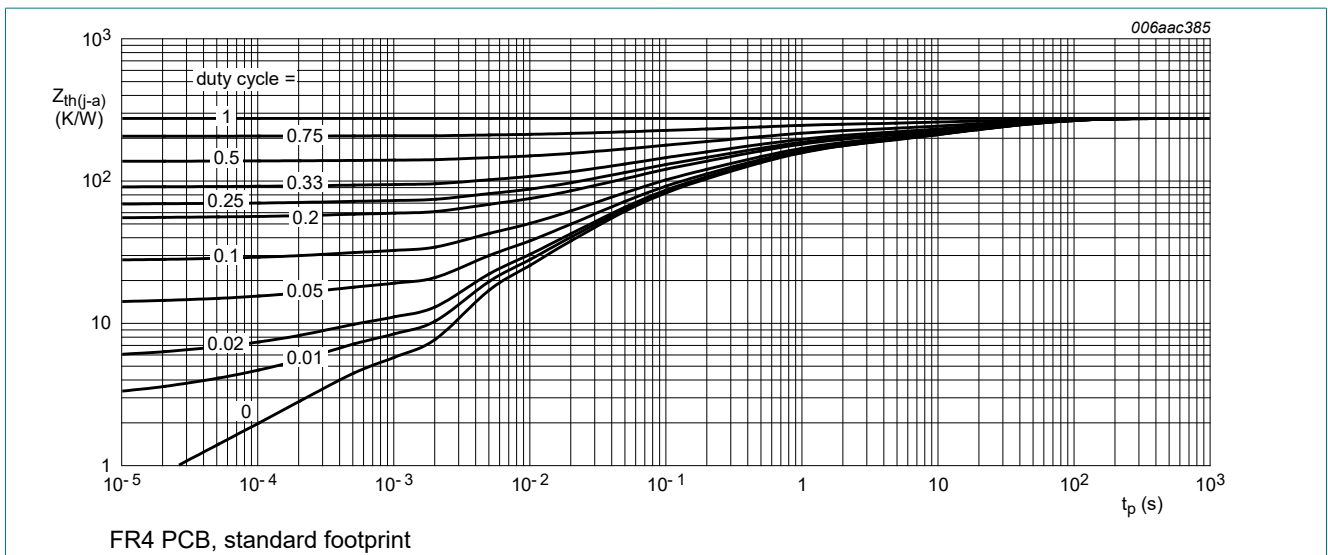


Fig. 1. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

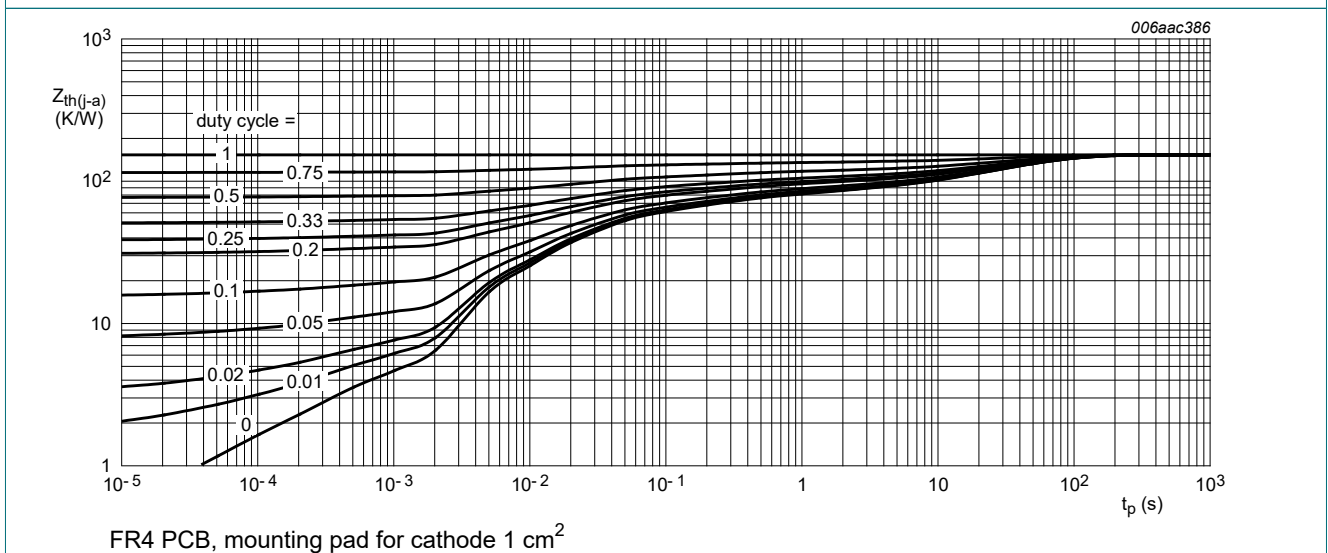
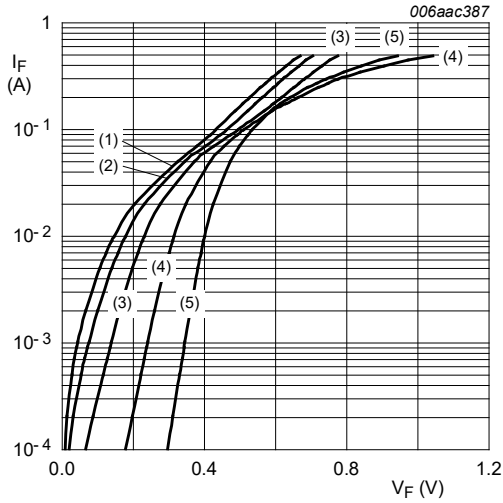


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

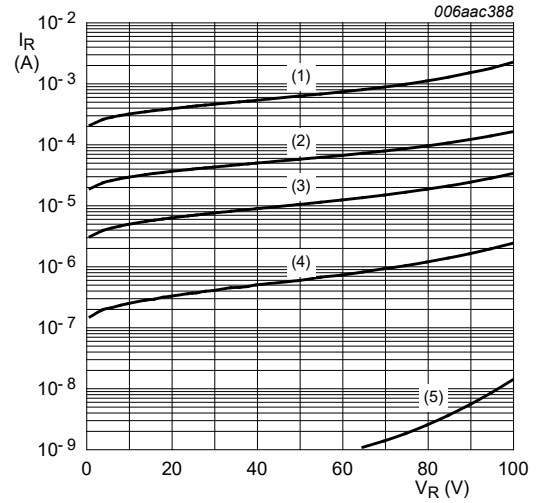
Table 7. Characteristics

| 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 |



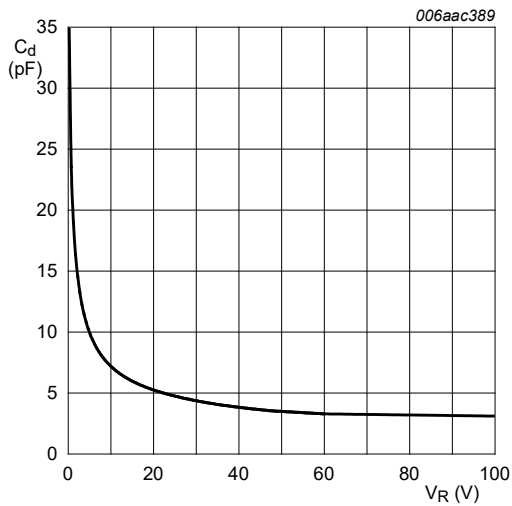
- (1) $T_{amb} = 150\text{ °C}$
- (2) $T_{amb} = 125\text{ °C}$
- (3) $T_{amb} = 85\text{ °C}$
- (4) $T_{amb} = 25\text{ °C}$
- (5) $T_{amb} = -40\text{ °C}$

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



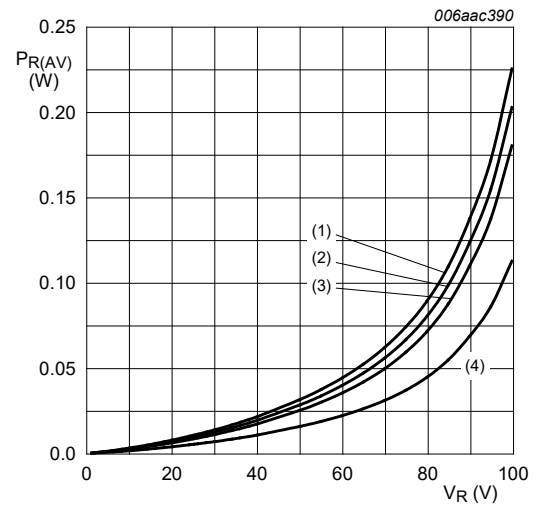
- (1) $T_{amb} = 125\text{ °C}$
- (2) $T_{amb} = 85\text{ °C}$
- (3) $T_{amb} = 60\text{ °C}$
- (4) $T_{amb} = 25\text{ °C}$
- (5) $T_{amb} = -40\text{ °C}$

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



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

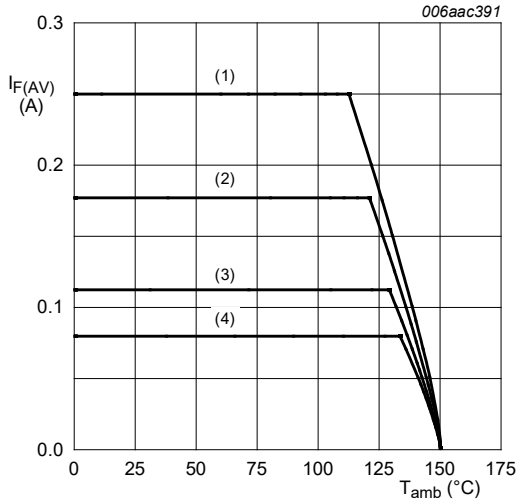
Fig. 5. Diode capacitance as a function of reverse voltage; typical values



$T_j = 125\text{ °C}$

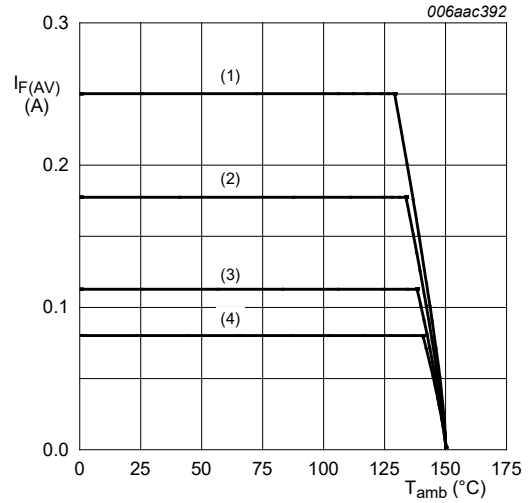
- (1) $\delta = 1$
- (2) $\delta = 0.9$
- (3) $\delta = 0.8$
- (4) $\delta = 0.5$

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



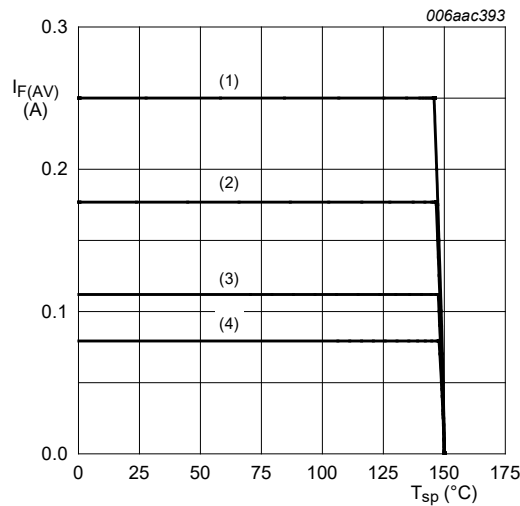
FR4 PCB, standard footprint
 $T_j = 150\text{ °C}$
 (1) $\delta = 1$; DC
 (2) $\delta = 0.5$; $f = 20\text{ kHz}$
 (3) $\delta = 0.2$; $f = 20\text{ kHz}$
 (4) $\delta = 0.1$; $f = 20\text{ kHz}$

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



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

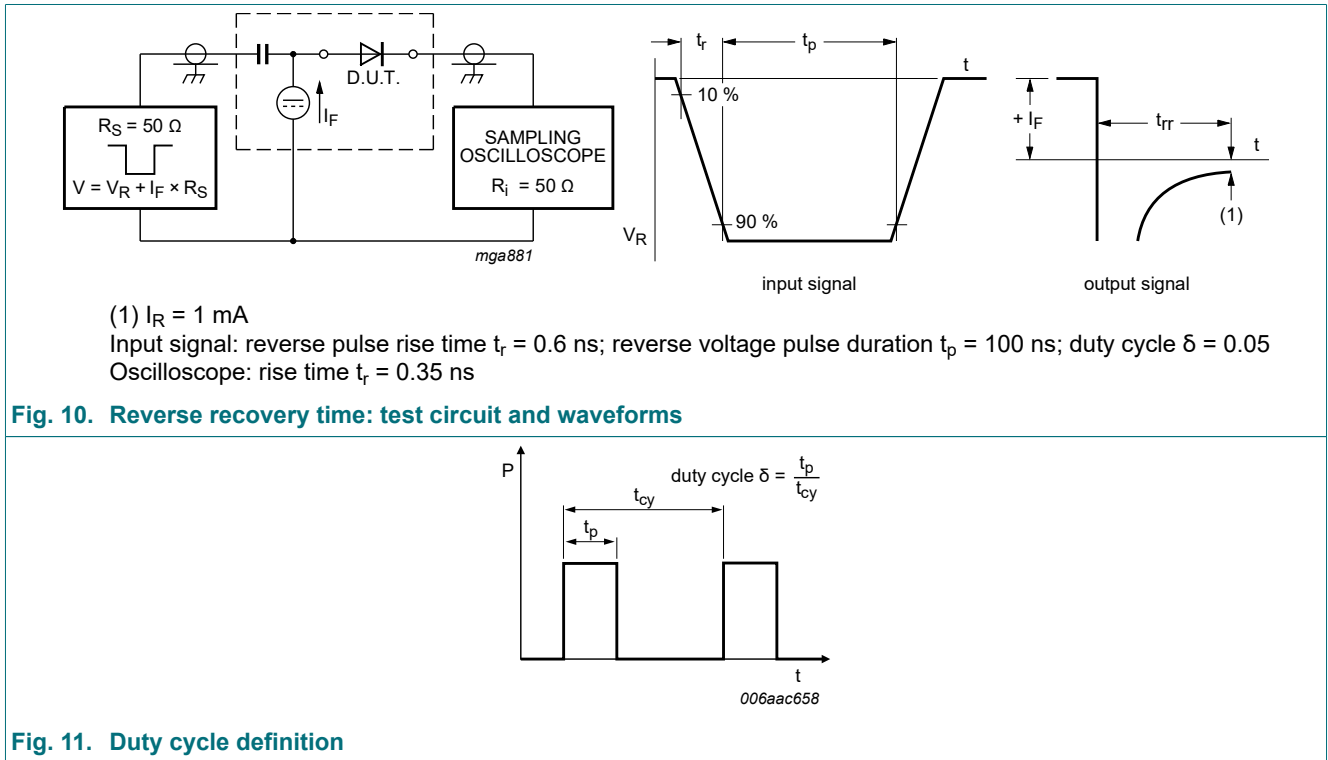
Fig. 8. Average forward current as a function of ambient temperature; typical values



$T_j = 150\text{ °C}$
 (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

11. Test information



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

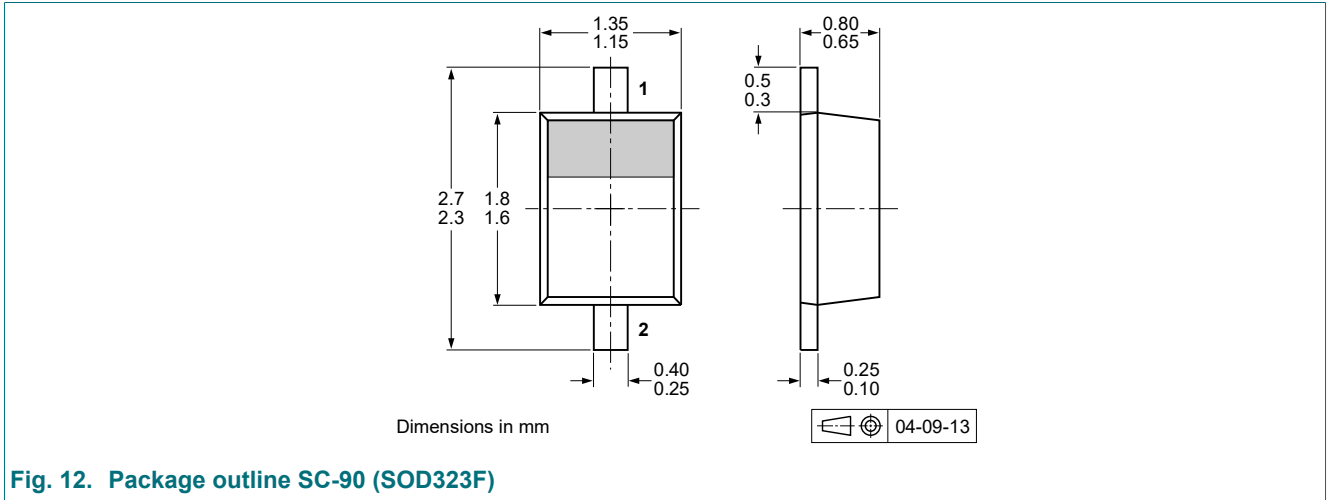


Fig. 12. Package outline SC-90 (SOD323F)

13. Soldering

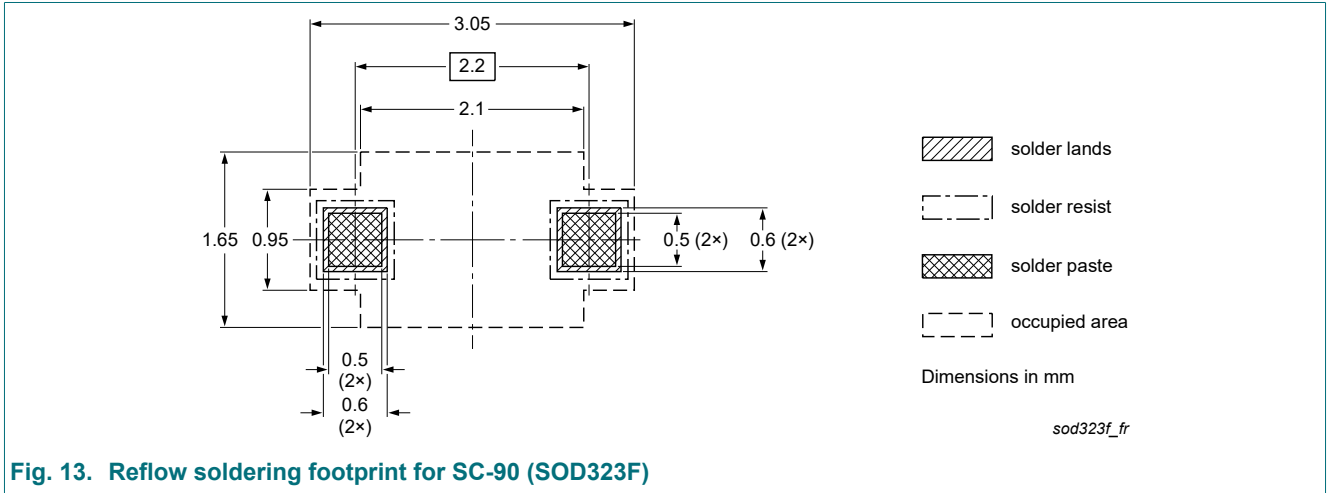


Fig. 13. Reflow soldering footprint for SC-90 (SOD323F)

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. |

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