



**THE DATASHEET OF
BAT46WH,115**





BAT46WH

Single Schottky barrier diode

Rev. 2 — 28 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 small and flat lead SOD123F Surface-Mounted Device (SMD) plastic package.

1.2 Features and benefits

- Low forward voltage
- Reverse voltage $V_R \leq 100$ V
- 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 | μ A |

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

2. Pinning information

Table 2. Pinning

| Pin | Description | Simplified outline | Graphic symbol |
|-----|-------------|--------------------|-------------------|
| 1 | cathode | [1] | <i>sym001</i> |
| 2 | anode | | |

[1] The marking bar indicates the cathode.

3. Ordering information

Table 3. Ordering information

| Type number | Package | | Version |
|-------------|---------|--|---------|
| | Name | Description | |
| BAT46WH | - | plastic surface-mounted package; 2 leads | SOD123F |

4. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| BAT46WH | DB |

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] - | 440 | mW |
| | | | [3][4] - | 780 | 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 cm².

[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] - | - | 285 | K/W |
| | | | [2][3] - | - | 160 | 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] | - | 25 | 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 cm².
- [3] Reflow soldering is the only recommended soldering method.
- [4] Soldering point of cathode tab.

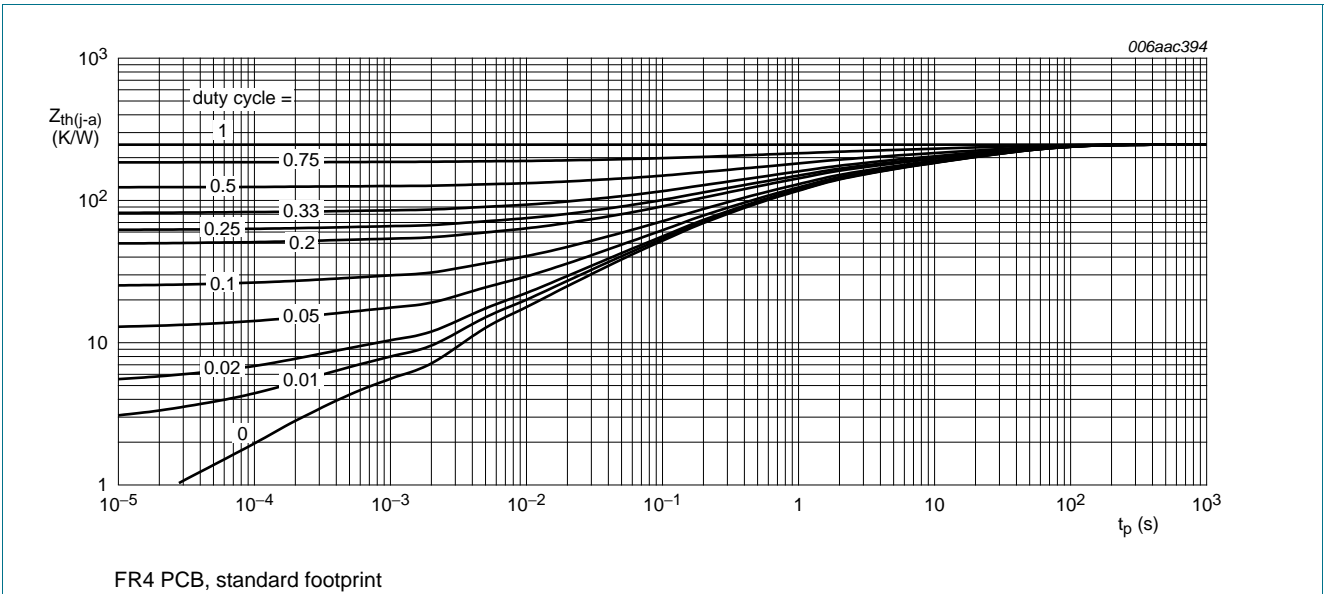


Fig 1. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

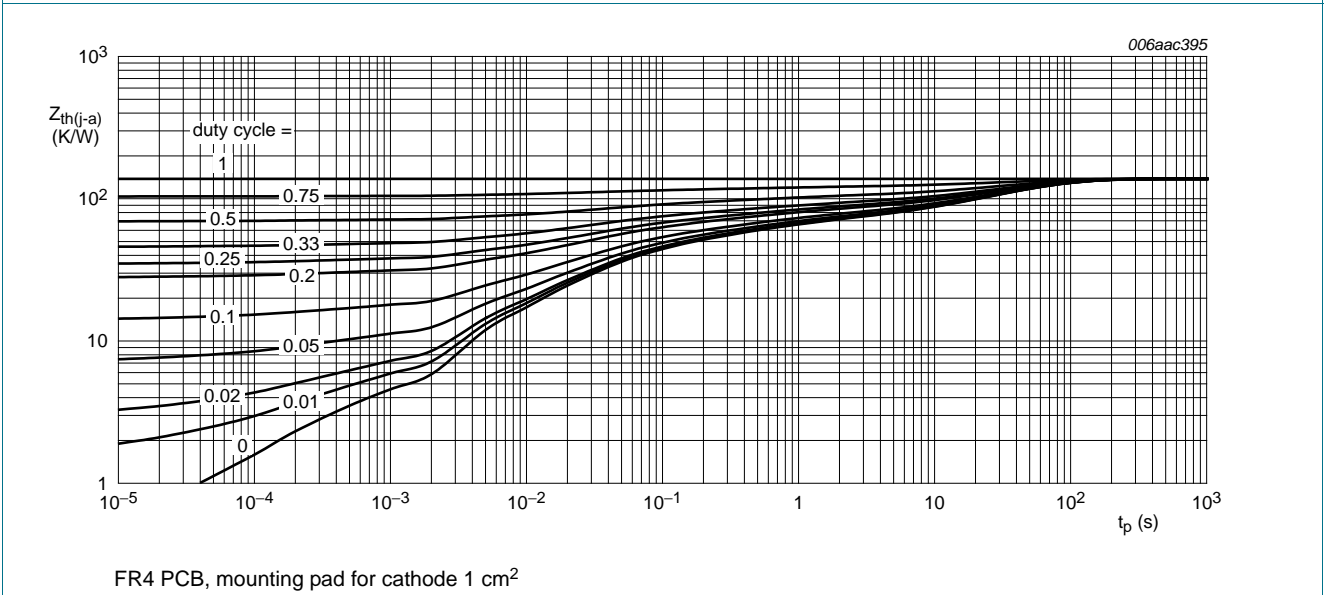


Fig 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

7. Characteristics

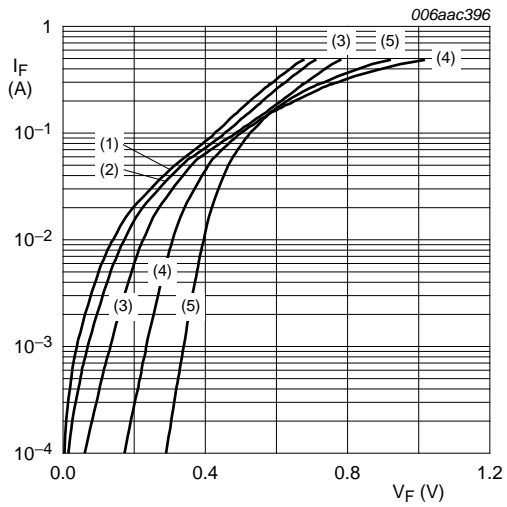
Table 7. Characteristics

$T_{amb} = 25\text{ °C}$ 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 | μA |
| | | $V_R = 1.5\text{ V}; T_j = 60\text{ °C}$ | - | - | 12 | μA |
| | | $V_R = 10\text{ V}$ | - | 0.3 | 0.8 | μA |
| | | $V_R = 10\text{ V}; T_j = 60\text{ °C}$ | - | - | 20 | μA |
| | | $V_R = 50\text{ V}$ | - | 0.7 | 2 | μA |
| | | $V_R = 50\text{ V}; T_j = 60\text{ °C}$ | - | - | 44 | μA |
| | | $V_R = 75\text{ V}$ | - | 1 | 4 | μA |
| | | $V_R = 75\text{ V}; T_j = 60\text{ °C}$ | - | - | 80 | μA |
| | | $V_R = 100\text{ V}$ | - | 2 | 9 | μA |
| | | $V_R = 100\text{ V}; T_j = 60\text{ °C}$ | - | - | 120 | μA |
| | | $V_R = 100\text{ V}; T_j = 85\text{ °C}$ | - | - | 600 | μA |
| 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 |

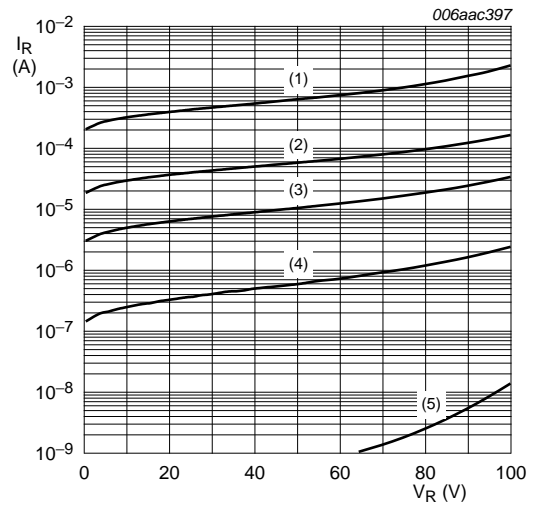
[1] Pulse test: $t_p \leq 300\text{ }\mu\text{s}$; $\delta \leq 0.02$.

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



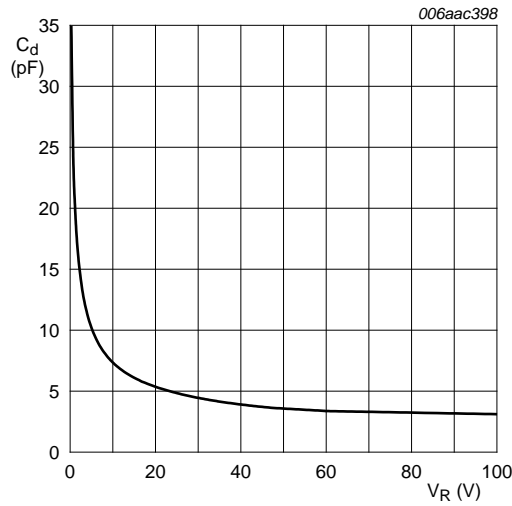
- (1) $T_{amb} = 150\text{ °C}$
- (2) $T_{amb} = 125\text{ °C}$
- (3) $T_{amb} = 85\text{ °C}$
- (4) $T_{amb} = 25\text{ °C}$
- (5) $T_{amb} = -40\text{ °C}$

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



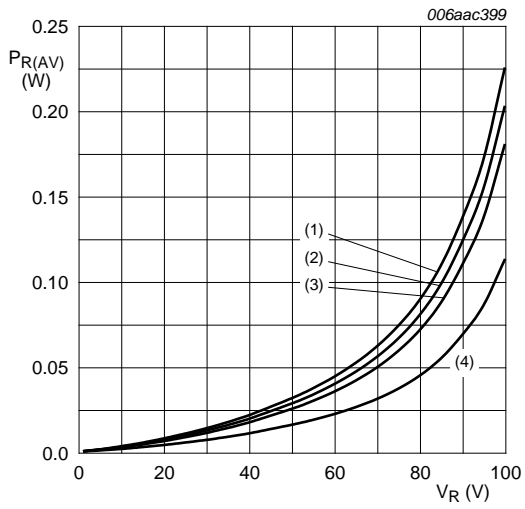
- (1) $T_{amb} = 125\text{ °C}$
- (2) $T_{amb} = 85\text{ °C}$
- (3) $T_{amb} = 60\text{ °C}$
- (4) $T_{amb} = 25\text{ °C}$
- (5) $T_{amb} = -40\text{ °C}$

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



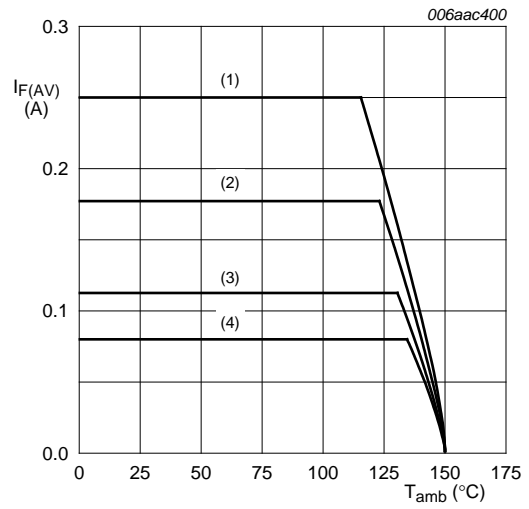
$f = 1\text{ MHz}; T_{amb} = 25\text{ °C}$

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



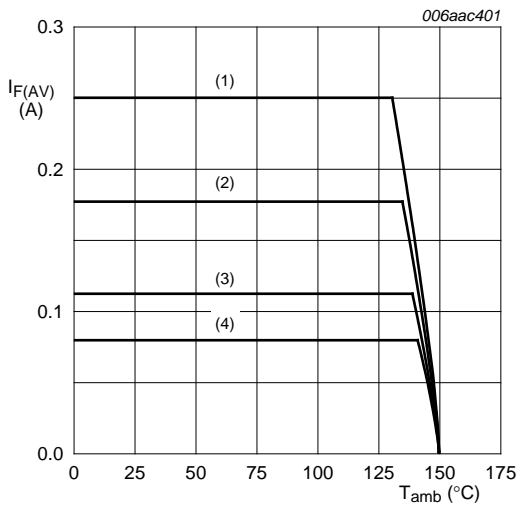
$T_j = 125\text{ °C}$
 (1) $\delta = 1$
 (2) $\delta = 0.9$
 (3) $\delta = 0.8$
 (4) $\delta = 0.5$

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



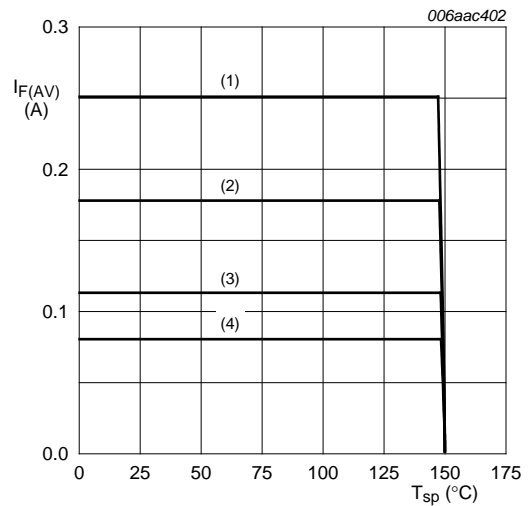
FR4 PCB, standard footprint
 $T_j = 150\text{ °C}$
 (1) $\delta = 1$; DC
 (2) $\delta = 0.5$; $f = 20\text{ kHz}$
 (3) $\delta = 0.2$; $f = 20\text{ kHz}$
 (4) $\delta = 0.1$; $f = 20\text{ kHz}$

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

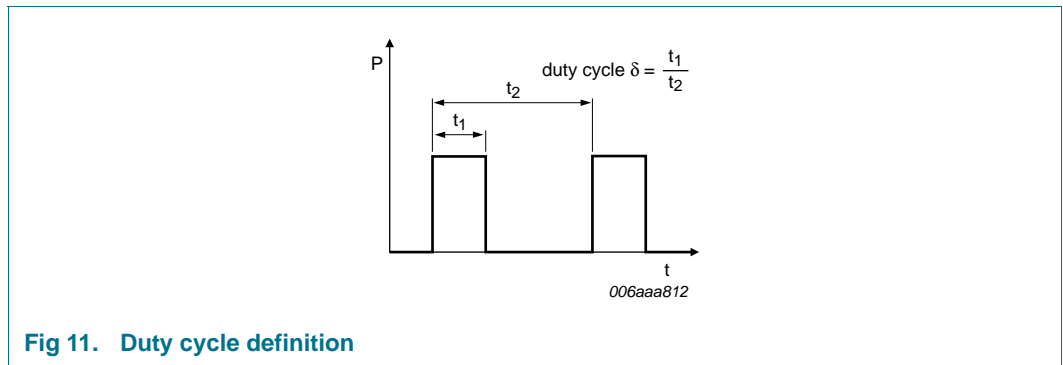
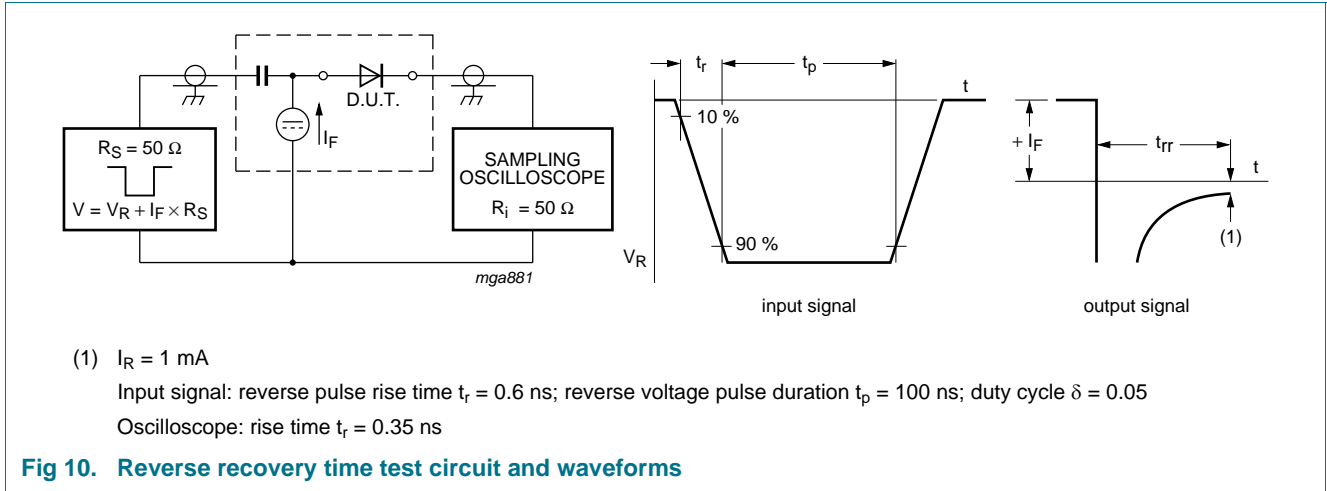
Fig 8. Average forward current as a function of ambient temperature; typical values



$T_j = 150\text{ °C}$
 (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

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

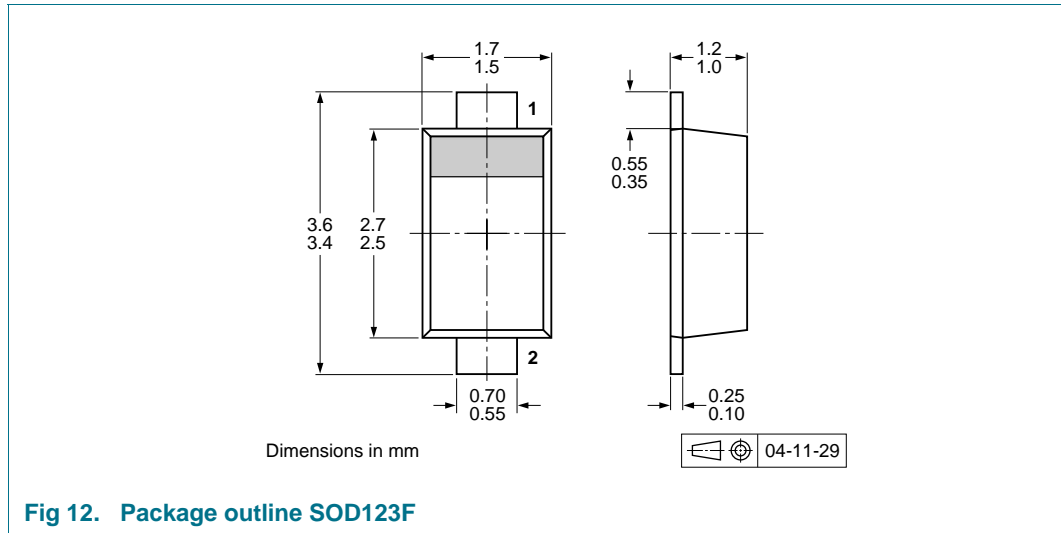


Fig 12. Package outline SOD123F

10. Packing information

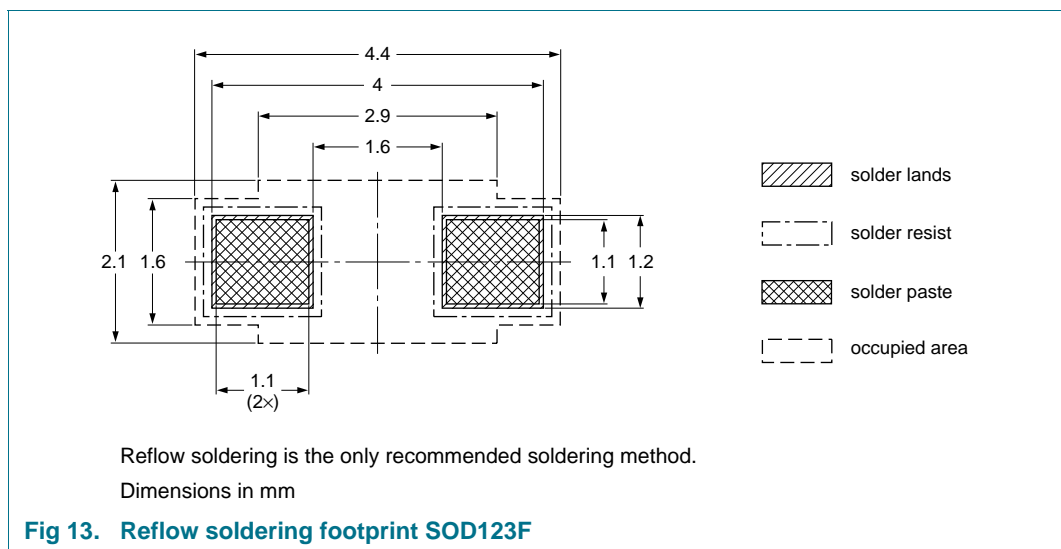
Table 8. Packing methods

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

| Type number | Package | Description | Packing quantity | |
|-------------|---------|--------------------------------|------------------|-------|
| | | | 3000 | 10000 |
| BAT46WH | SOD123F | 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



12. Revision history

Table 9. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|----------------|---|--------------------|---------------|-------------|
| BAT46WH v.2 | 20111128 | Product data sheet | - | BAT46WH v.1 |
| Modifications: | <ul style="list-style-type: none">• 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 | | | |
| BAT46WH v.1 | 20100727 | 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".

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