

# BAT54 series

## Schottky barrier diodes

Rev. 5 — 5 October 2012 Product data sheet

## 1. Product profile

### 1.1 General description

Planar Schottky barrier diodes with an integrated guard ring for stress protection, encapsulated in a small SOT23 (TO-236AB) Surface-Mounted Device (SMD) plastic package.

### 1.2 Features and benefits

- Low forward voltage
- Low capacitance
- AEC-Q101 qualified

### 1.3 Applications

- Ultra high-speed switching
- Line termination
- Voltage clamping
- Reverse polarity protection

### 1.4 Quick reference data

**Table 1. Quick reference data**

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

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| **Per diode** | | | | | | | |
| $V_R$ | reverse voltage | | | - | - | 30 | V |
| $V_F$ | forward voltage | $I_F$ = 100 mA | [1] | - | - | 800 | mV |
| $I_R$ | reverse current | $V_R$ = 25 V | [1] | - | - | 2 | µA |

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

## 2. Pinning information

**Table 2. Pinning**

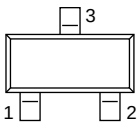
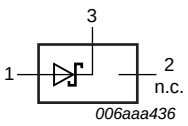
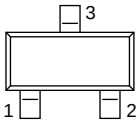
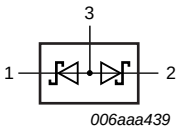
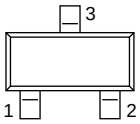
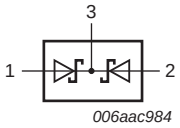
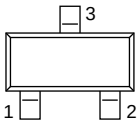
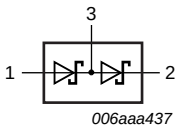
| Pin | Description | Simplified outline | Graphic symbol |
|---|---|---|---|
| **BAT54** | | | |
| 1 | anode |  |  |
| 2 | not connected | | |
| 3 | cathode | | |

**Table 2. Pinning** *...continued*

| Pin | Description | Simplified outline | Graphic symbol |
|---|---|---|---|
| **BAT54A** | | | |
| 1 | cathode (diode 1) |  |  |
| 2 | cathode (diode 2) | | |
| 3 | common anode | | |
| **BAT54C** | | | |
| 1 | anode (diode 1) |  |  |
| 2 | anode (diode 2) | | |
| 3 | common cathode | | |
| **BAT54S** | | | |
| 1 | anode (diode 1) |  |  |
| 2 | cathode (diode 2) | | |
| 3 | cathode (diode 1), anode (diode 2) | | |

## 3. Ordering information

**Table 3. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| BAT54 series | - | plastic surface-mounted package; 3 leads | SOT23 |

## 4. Marking

**Table 4. Marking codes**

| Type number | Marking code[1] |
|---|---|
| BAT54 | L4* |
| BAT54A | *V3 |
| BAT54C | *W1 |
| BAT54S | *V4 |

[1] * = placeholder for manufacturing site code.


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## 5. Limiting values

**Table 5. Limiting values**

*In accordance with the Absolute Maximum Rating System (IEC 60134).*

| Symbol | Parameter | Conditions | | Min | Max | Unit |
|---|---|---|---|---|---|---|
| **Per diode** | | | | | | |
| $V_R$ | reverse voltage | | | - | 30 | V |
| $I_F$ | forward current | $T_{amb}$ = 25 °C | | - | 200 | mA |
| $I_{FRM}$ | repetitive peak forward current | $t_p \leq 1$ s; $\delta \leq 0.5$; $T_{amb}$ = 25 °C | | - | 300 | mA |
| $I_{FSM}$ | non-repetitive peak forward current | square wave; $t_p$ < 10 ms | [1] | - | 600 | mA |
| **Per device; one diode loaded** | | | | | | |
| $P_{tot}$ | total power dissipation | $T_{amb} \leq 25$ °C | [2] | - | 250 | 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.

## 6. Thermal characteristics

**Table 6. Thermal characteristics**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| **Per device; one diode loaded** | | | | | | | |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | [1][2] | - | - | 500 | K/W |

[1] For Schottky barrier diodes thermal runaway has to be considered, as in some applications the reverse power losses $P_R$ are a significant part of the total power losses.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.


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# 7. Characteristics

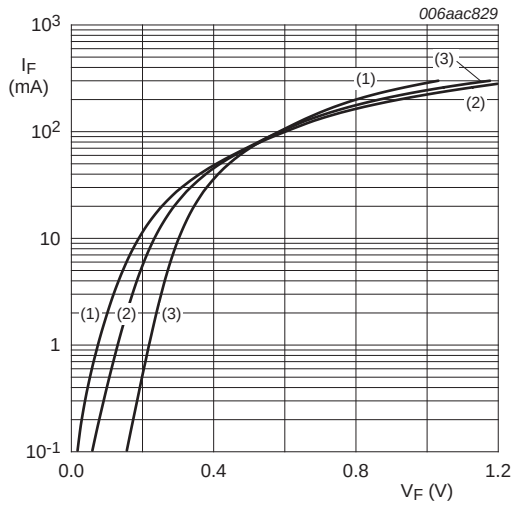
**Table 7. Characteristics**

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

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| **Per diode** | | | | | | | |
| $V_F$ | forward voltage | | [1] | | | | |
| | | $I_F$ = 0.1 mA | | - | - | 240 | mV |
| | | $I_F$ = 1 mA | | - | - | 320 | mV |
| | | $I_F$ = 10 mA | | - | - | 400 | mV |
| | | $I_F$ = 30 mA | | - | - | 500 | mV |
| | | $I_F$ = 100 mA | | - | - | 800 | mV |
| $I_R$ | reverse current | $V_R$ = 25 V | [1] | - | - | 2 | µA |
| $C_d$ | diode capacitance | f = 1 MHz; $V_R$ = 1 V | | - | - | 10 | pF |
| $t_{rr}$ | reverse recovery time | | [2] | - | - | 5 | 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.

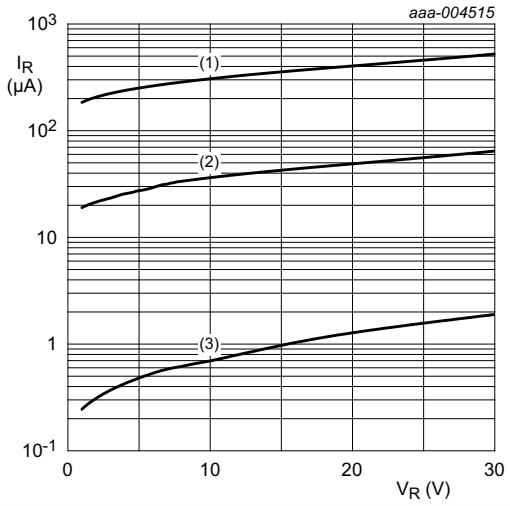



(1) $T_{amb}$ = 125 °C

(2) $T_{amb}$ = 85 °C

(3) $T_{amb}$ = 25 °C

**Fig 1. Forward current as a function of forward voltage; typical values**




(1) $T_{amb}$ = 125 °C

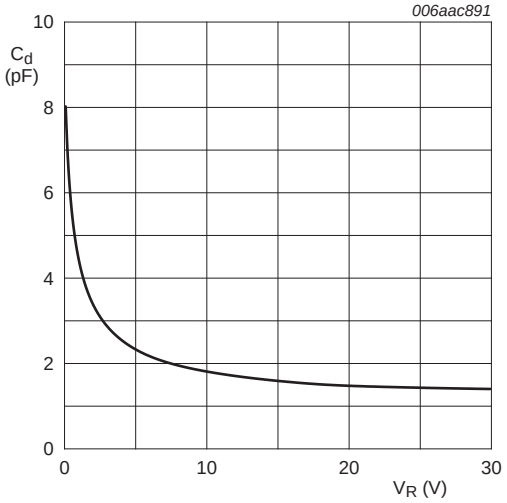
(2) $T_{amb}$ = 85 °C

(3) $T_{amb}$ = 25 °C

**Fig 2. Reverse current as a function of reverse voltage; typical values**


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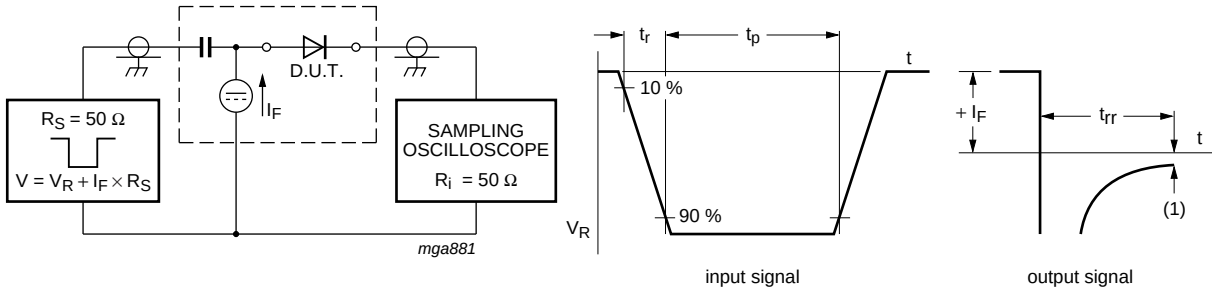
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f = 1 MHz; $T_{amb}$ = 25 °C

**Fig 3. Diode capacitance as a function of reverse voltage; typical values**

## 8. Test information




(1) $I_R$ = 1 mA

**Fig 4. Reverse recovery time test circuit and waveforms**

### 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.


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## 9. Package outline

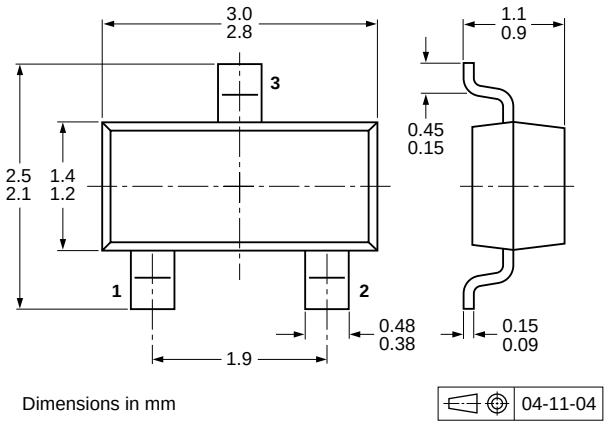



**Fig 5. Package outline SOT23 (TO-236AB)**

## 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 |
| BAT54 series | SOT23 | 4 mm pitch, 8 mm tape and reel | -215 | -235 |

[1] For further information and the availability of packing methods, see Section 14.


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## 11. Soldering

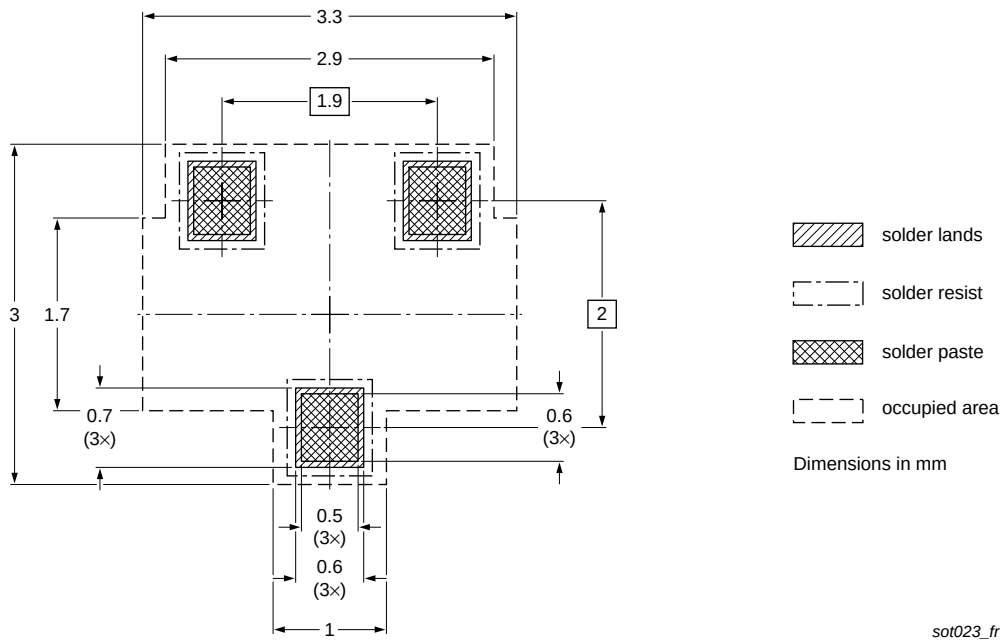



**Fig 6. Reflow soldering footprint SOT23 (TO-236AB)**

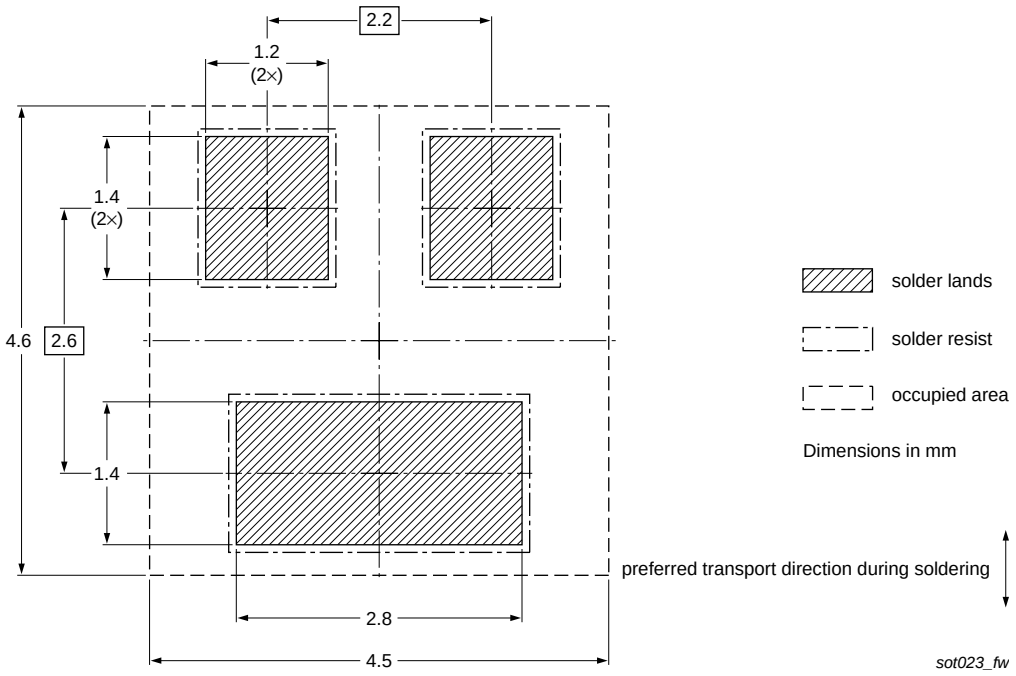



**Fig 7. Wave soldering footprint SOT23 (TO-236AB)**


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## 12. Revision history

**Table 9. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| BAT54_SER v.5 | 20121005 | Product data sheet | - | BAT54_SERIES v.4 |
| Modifications: | • The format of this document has been redesigned to comply with the new identity guidelines of NXP Semiconductors.<br>• Legal texts have been adapted to the new company name where appropriate.<br>• Section 1: updated<br>• Section 4: updated<br>• Table 5: added ambient temperature $T_{amb}$, updated total power dissipation $P_{tot}$; updated junction temperature $T_j$<br>• Figure 1 to 4: updated<br>• Section 8 “Test information”: added<br>• Figure 5: replaced by minimized package outline drawing<br>• Section 10 “Packing information”: added<br>• Section 11 “Soldering”: added<br>• Section 13 “Legal information”: updated | | | |
| BAT54_SERIES v.4 | 20020304 | Product data sheet | - | BAT54_SERIES v.3 |
| BAT54_SERIES v.3 | 20011012 | Product specification | - | BAT54 v.2 |
| BAT54 v.2 | 19990506 | Product specification | - | BAT54 v.1 |
| BAT54 v.1 | 19960319 | Product specification | - | - |


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# 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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