



# 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**

$T_{amb} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

| Symbol           | Parameter       | Conditions            | Min | Typ | Max | Unit          |
|------------------|-----------------|-----------------------|-----|-----|-----|---------------|
| <b>Per diode</b> |                 |                       |     |     |     |               |
| $V_R$            | reverse voltage |                       | -   | -   | 30  | V             |
| $V_F$            | forward voltage | $I_F = 100\text{ mA}$ | [1] | -   | 800 | mV            |
| $I_R$            | reverse current | $V_R = 25\text{ V}$   | [1] | -   | 2   | $\mu\text{A}$ |

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

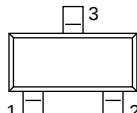
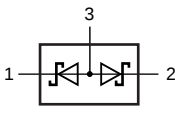
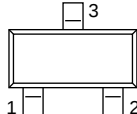
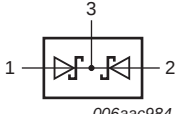
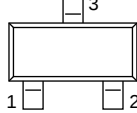
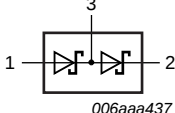
## 2. Pinning information

**Table 2. Pinning**

| Pin          | Description   | Simplified outline | Graphic symbol |
|--------------|---------------|--------------------|----------------|
| <b>BAT54</b> |               |                    |                |
| 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),<br>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 <sup>[1]</sup> |
|-------------|-----------------------------|
| BAT54       | L4*                         |
| BAT54A      | *V3                         |
| BAT54C      | *W1                         |
| BAT54S      | *V4                         |

[1] \* = placeholder for manufacturing site code.

## 5. Limiting values

**Table 5. Limiting values**

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

| Symbol                              | Parameter                           | Conditions                                                          | Min   | Max  | Unit |
|-------------------------------------|-------------------------------------|---------------------------------------------------------------------|-------|------|------|
| <b>Per diode</b>                    |                                     |                                                                     |       |      |      |
| $V_R$                               | reverse voltage                     |                                                                     | -     | 30   | V    |
| $I_F$                               | forward current                     | $T_{amb} = 25\text{ °C}$                                            | -     | 200  | mA   |
| $I_{FRM}$                           | repetitive peak forward current     | $t_p \leq 1\text{ s}; \delta \leq 0.5;$<br>$T_{amb} = 25\text{ °C}$ | -     | 300  | mA   |
| $I_{FSM}$                           | non-repetitive peak forward current | square wave;<br>$t_p < 10\text{ ms}$                                | [1] - | 600  | mA   |
| <b>Per device; one diode loaded</b> |                                     |                                                                     |       |      |      |
| $P_{tot}$                           | total power dissipation             | $T_{amb} \leq 25\text{ °C}$                                         | [2] - | 250  | mW   |
| $T_j$                               | junction temperature                |                                                                     | -     | 150  | °C   |
| $T_{amb}$                           | ambient temperature                 |                                                                     | -55   | +150 | °C   |
| $T_{stg}$                           | storage temperature                 |                                                                     | -65   | +150 | °C   |

[1]  $T_j = 25\text{ °C}$  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 |
|-------------------------------------|---------------------------------------------|-------------|----------|-----|-----|------|
| <b>Per device; one diode loaded</b> |                                             |             |          |     |     |      |
| $R_{th(j-a)}$                       | 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.

7. Characteristics

Table 7. Characteristics  
*T<sub>amb</sub> = 25 °C unless otherwise specified.*

| Symbol          | Parameter             | Conditions                      | Min | Typ | Max | Unit |
|-----------------|-----------------------|---------------------------------|-----|-----|-----|------|
| Per diode       |                       |                                 |     |     |     |      |
| V <sub>F</sub>  | forward voltage       |                                 | [1] |     |     |      |
|                 |                       | I <sub>F</sub> = 0.1 mA         | -   | -   | 240 | mV   |
|                 |                       | I <sub>F</sub> = 1 mA           | -   | -   | 320 | mV   |
|                 |                       | I <sub>F</sub> = 10 mA          | -   | -   | 400 | mV   |
|                 |                       | I <sub>F</sub> = 30 mA          | -   | -   | 500 | mV   |
|                 |                       | I <sub>F</sub> = 100 mA         | -   | -   | 800 | mV   |
| I <sub>R</sub>  | reverse current       | V <sub>R</sub> = 25 V           | [1] | -   | 2   | μA   |
| C <sub>d</sub>  | diode capacitance     | f = 1 MHz; V <sub>R</sub> = 1 V | -   | -   | 10  | pF   |
| t <sub>rr</sub> | reverse recovery time |                                 | [2] | -   | 5   | ns   |

[1] Pulse test: t<sub>p</sub> ≤ 300 μs; δ ≤ 0.02.  
[2] When switched from I<sub>F</sub> = 10 mA to I<sub>R</sub> = 10 mA; R<sub>L</sub> = 100 Ω; measured at I<sub>R</sub> = 1 mA.

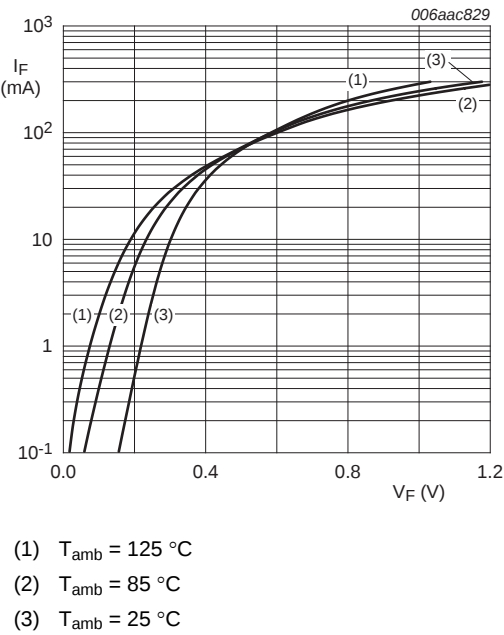


Fig 1. Forward current as a function of forward voltage; typical values

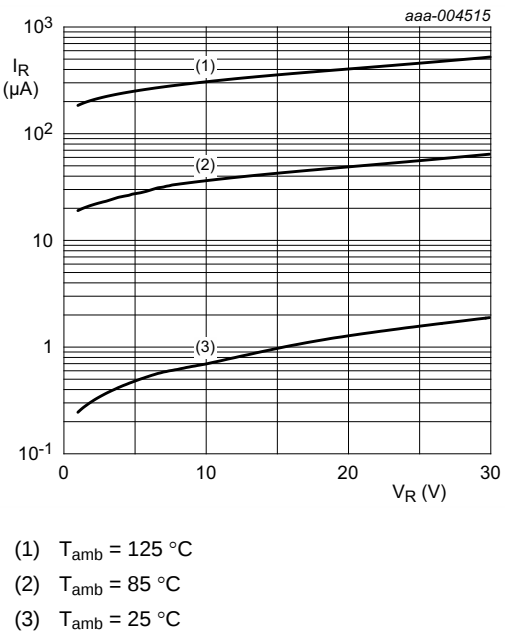
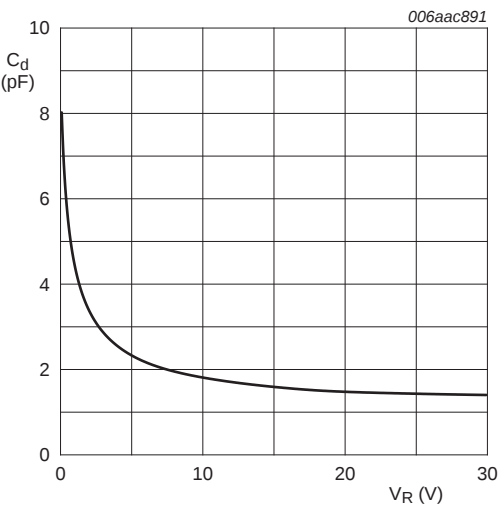


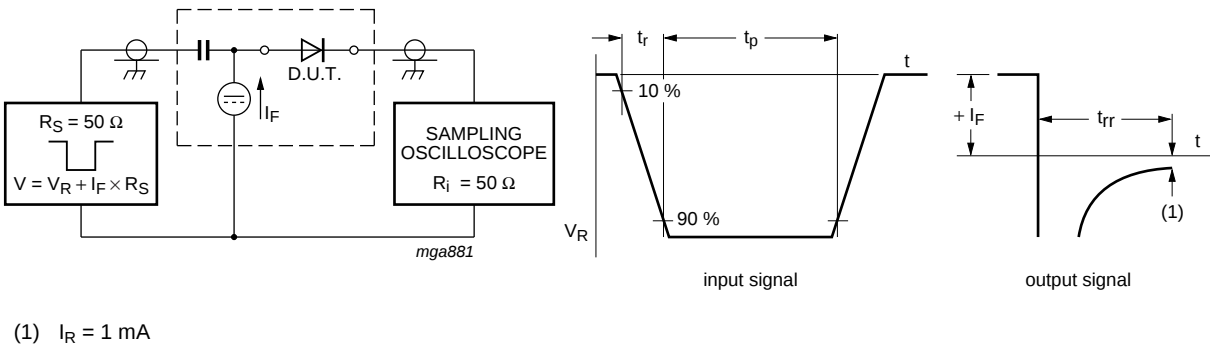
Fig 2. Reverse current as a function of reverse voltage; typical values



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

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

8. Test information



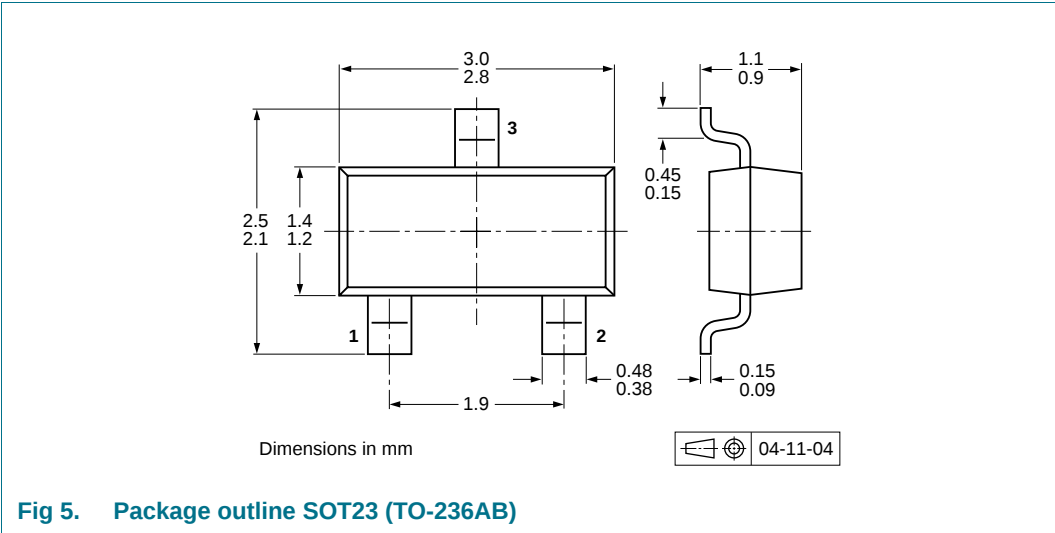
(1)  $I_R = 1\text{ mA}$

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.

9. Package outline



10. Packing information

Table 8. Packing methods

The indicated -xxx are the last three digits of the 12NC ordering code.<sup>[1]</sup>

| 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](#).

11. Soldering

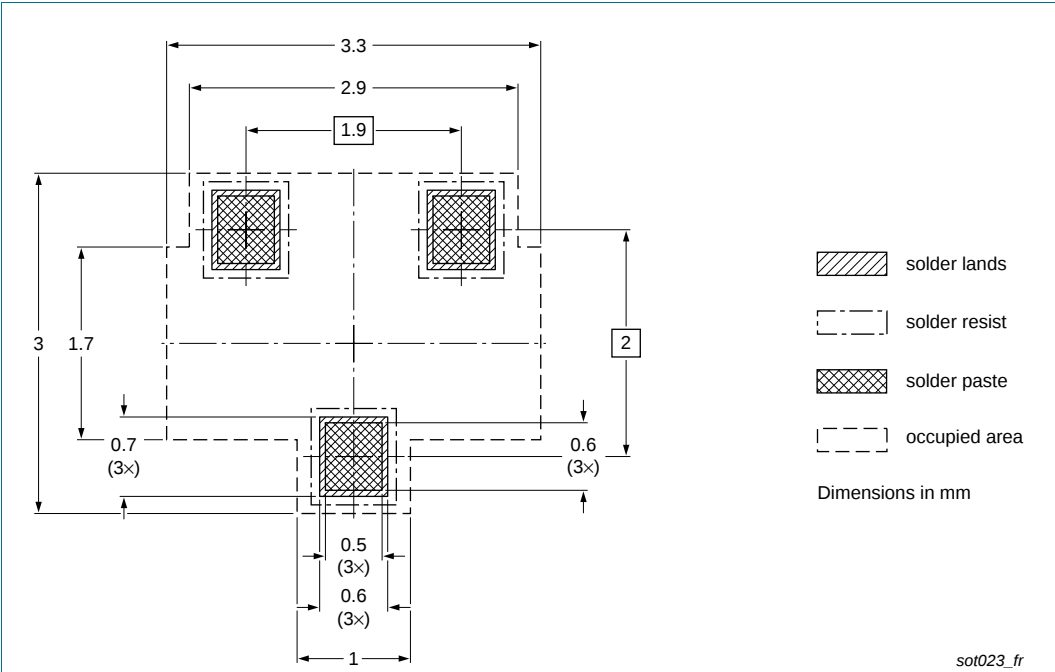


Fig 6. Reflow soldering footprint SOT23 (TO-236AB)

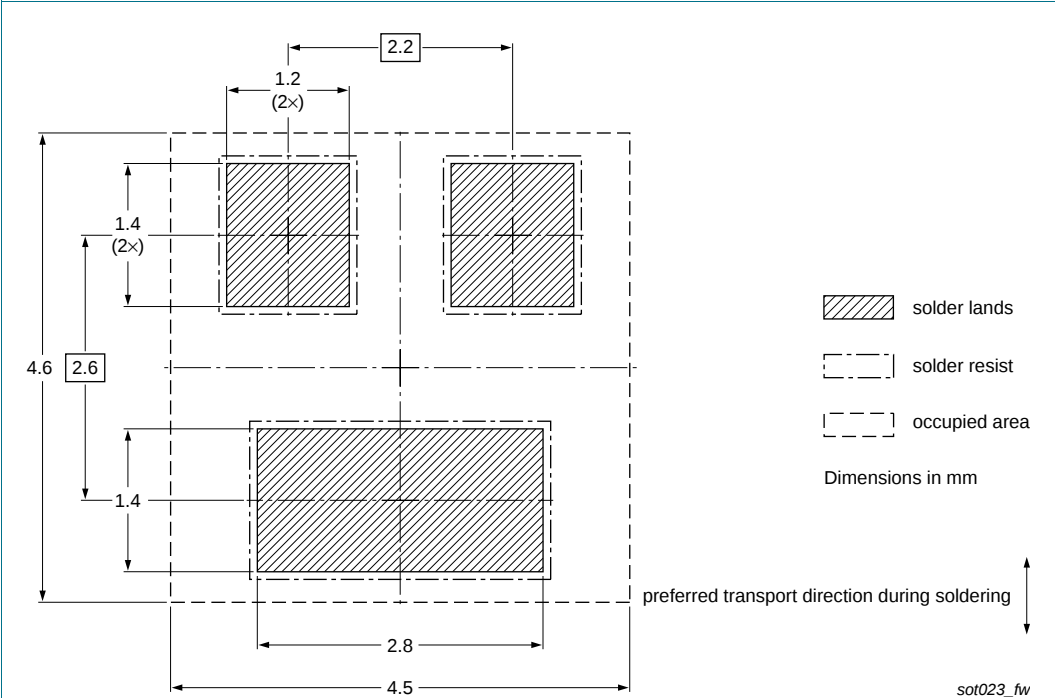


Fig 7. Wave soldering footprint SOT23 (TO-236AB)

## 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:   | <ul style="list-style-type: none"> <li>The format of this document has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> <li><a href="#">Section 1</a>: updated</li> <li><a href="#">Section 4</a>: updated</li> <li><a href="#">Table 5</a>: added ambient temperature <math>T_{amb}</math>, updated total power dissipation <math>P_{tot}</math>, updated junction temperature <math>T_j</math></li> <li><a href="#">Figure 1</a> to <a href="#">4</a>: updated</li> <li><a href="#">Section 8 "Test information"</a>: added</li> <li><a href="#">Figure 5</a>: replaced by minimized package outline drawing</li> <li><a href="#">Section 10 "Packing information"</a>: added</li> <li><a href="#">Section 11 "Soldering"</a>: added</li> <li><a href="#">Section 13 "Legal information"</a>: updated</li> </ul> |                       |               |                  |
| 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 | -             | -                |

## 13. Legal information

### 13.1 Data sheet status

| Document status <sup>[1][2]</sup> | Product status <sup>[3]</sup> | 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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nxp.com>.

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