

# BAV70 series

## High-speed switching diodes

Rev. 07 — 27 November 2007

Product data sheet

## 1. Product profile

### 1.1 General description

High-speed switching diodes, encapsulated in small Surface-Mounted Device (SMD) plastic packages.

Table 1. Product overview

| Type number | Package |        |          | Package configuration | Configuration                           |
|-------------|---------|--------|----------|-----------------------|---|
|             | NXP     | JEITA  | JEDEC    |                       |   |
| BAV70       | SOT23   | -      | TO-236AB | small                 | dual common cathode                     |
| BAV70M      | SOT883  | SC-101 | -        | leadless ultra small  | dual common cathode                     |
| BAV70S      | SOT363  | SC-88  | -        | very small            | quadruple common cathode/common cathode |
| BAV70T      | SOT416  | SC-75  | -        | ultra small           | dual common cathode                     |
| BAV70W      | SOT323  | SC-70  | -        | very small            | dual common cathode                     |

### 1.2 Features

- High switching speed:  $t_{rr} \leq 4$  ns
- Low leakage current
- Small SMD plastic packages
- Low capacitance:  $C_d \leq 1.5$  pF
- Reverse voltage:  $V_R \leq 100$  V

### 1.3 Applications

- High-speed switching
- General-purpose switching

### 1.4 Quick reference data

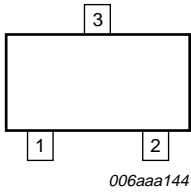
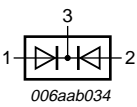
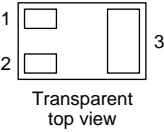
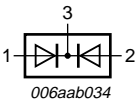
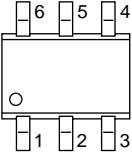
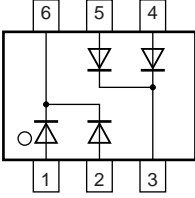
Table 2. Quick reference data

| Symbol    | Parameter             | Conditions   | Min | Typ | Max | Unit    |
|-----------|-----------------------|--------------|-----|-----|-----|---------|
| Per diode |                       |              |     |     |     |         |
| $I_R$     | reverse current       | $V_R = 80$ V | -   | -   | 0.5 | $\mu$ A |
| $V_R$     | reverse voltage       |              | -   | -   | 100 | V       |
| $t_{rr}$  | reverse recovery time |              | [1] | -   | 4   | ns      |

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

## 2. Pinning information

**Table 3. Pinning**

| Pin                          | Description                          | Simplified outline  | Symbol   |
|------------------------------|--------------------------------------|---|--|
| <b>BAV70; BAV70T; BAV70W</b> |                                      |   |  |
| 1                            | anode (diode 1)                      |  <p>006aaa144</p>            |  <p>006aab034</p>   |
| 2                            | anode (diode 2)                      |   |  |
| 3                            | common cathode                       |   |  |
| <b>BAV70M</b>                |                                      |   |  |
| 1                            | anode (diode 1)                      |  <p>Transparent top view</p> |  <p>006aab034</p>   |
| 2                            | anode (diode 2)                      |   |  |
| 3                            | common cathode                       |   |  |
| <b>BAV70S</b>                |                                      |   |  |
| 1                            | anode (diode 1)                      |                            |  <p>006aab104</p> |
| 2                            | anode (diode 2)                      |   |  |
| 3                            | common cathode (diode 3 and diode 4) |   |  |
| 4                            | anode (diode 3)                      |   |  |
| 5                            | anode (diode 4)                      |   |  |
| 6                            | common cathode (diode 1 and diode 2) |   |  |

## 3. Ordering information

**Table 4. Ordering information**

| Type number | Package |   | Version |
|-------------|---------|---|---------|
|             | Name    | Description   |         |
| BAV70       | -       | plastic surface-mounted package; 3 leads                                      | SOT23   |
| BAV70M      | SC-101  | leadless ultra small plastic package; 3 solder lands; body 1.0 × 0.6 × 0.5 mm | SOT883  |
| BAV70S      | SC-88   | plastic surface-mounted package; 6 leads                                      | SOT363  |
| BAV70T      | SC-75   | plastic surface-mounted package; 3 leads                                      | SOT416  |
| BAV70W      | SC-70   | plastic surface-mounted package; 3 leads                                      | SOT323  |

## 4. Marking

**Table 5. Marking codes**

| Type number | Marking code <sup>[1]</sup> |
|-------------|-----------------------------|
| BAV70       | A4*                         |
| BAV70M      | S4                          |
| BAV70S      | A4*                         |
| BAV70T      | A4                          |
| BAV70W      | A4*                         |

- [1] \* = -: made in Hong Kong  
 \* = p: made in Hong Kong  
 \* = t: made in Malaysia  
 \* = W: made in China

## 5. Limiting values

**Table 6. Limiting values**

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

| Symbol           | Parameter                           | Conditions                  | Min | Max | Unit |
|------------------|-------------------------------------|-----------------------------|-----|-----|------|
| <b>Per diode</b> |                                     |                             |     |     |      |
| $V_{RRM}$        | repetitive peak reverse voltage     |                             | -   | 100 | V    |
| $V_R$            | reverse voltage                     |                             | -   | 100 | V    |
| $I_F$            | forward current                     |                             |     |     |      |
|                  | BAV70                               | $T_{amb} \leq 25\text{ °C}$ | -   | 215 | mA   |
|                  | BAV70M                              | $T_s = 90\text{ °C}$        | -   | 150 | mA   |
|                  | BAV70S                              | $T_s = 60\text{ °C}$        | -   | 250 | mA   |
|                  | BAV70T                              | $T_s = 90\text{ °C}$        | -   | 150 | mA   |
|                  | BAV70W                              | $T_{amb} \leq 25\text{ °C}$ | -   | 175 | mA   |
| $I_{FRM}$        | repetitive peak forward current     |                             |     |     |      |
|                  | BAV70                               |                             | -   | 450 | mA   |
|                  | BAV70M                              |                             | -   | 500 | mA   |
|                  | BAV70S                              |                             | -   | 450 | mA   |
|                  | BAV70T                              |                             | -   | 500 | mA   |
|                  | BAV70W                              |                             | -   | 500 | mA   |
| $I_{FSM}$        | non-repetitive peak forward current | square wave                 |     |     |      |
|                  |                                     | $t_p = 1\ \mu\text{s}$      | -   | 4   | A    |
|                  |                                     | $t_p = 1\ \text{ms}$        | -   | 1   | A    |
|                  |                                     | $t_p = 1\ \text{s}$         | -   | 0.5 | A    |

**Table 6. Limiting values ...continued**

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

| Symbol            | Parameter               | Conditions               | Min | Max  | Unit |
|-------------------|-------------------------|--------------------------|-----|------|------|
| P <sub>tot</sub>  | total power dissipation |                          | [2] |      |      |
|                   | BAV70                   | T <sub>amb</sub> ≤ 25 °C | -   | 250  | mW   |
|                   | BAV70M                  | T <sub>amb</sub> ≤ 25 °C | [3] | 250  | mW   |
|                   | BAV70S                  | T <sub>s</sub> = 60 °C   | -   | 350  | mW   |
|                   | BAV70T                  | T <sub>s</sub> = 90 °C   | -   | 170  | mW   |
|                   | BAV70W                  | T <sub>amb</sub> ≤ 25 °C | -   | 200  | mW   |
| <b>Per device</b> |                         |                          |     |      |      |
| I <sub>F</sub>    | forward current         |                          |     |      |      |
|                   | BAV70                   | T <sub>amb</sub> ≤ 25 °C | -   | 125  | mA   |
|                   | BAV70M                  | T <sub>s</sub> = 90 °C   | -   | 75   | mA   |
|                   | BAV70S                  | T <sub>s</sub> = 60 °C   | -   | 100  | mA   |
|                   | BAV70T                  | T <sub>s</sub> = 90 °C   | -   | 75   | mA   |
|                   | BAV70W                  | T <sub>amb</sub> ≤ 25 °C | -   | 100  | mA   |
| T <sub>j</sub>    | junction temperature    |                          | -   | 150  | °C   |
| T <sub>amb</sub>  | ambient temperature     |                          | -65 | +150 | °C   |
| T <sub>stg</sub>  | storage temperature     |                          | -65 | +150 | °C   |

[1] T<sub>j</sub> = 25 °C prior to surge.

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

[3] Reflow soldering is the only recommended soldering method.

## 6. Thermal characteristics

**Table 7. Thermal characteristics**

| Symbol                | Parameter  | Conditions  | Min | Typ | Max | Unit |
|-----------------------|--|-------------|-----|-----|-----|------|
| <b>Per diode</b>      |  |             |     |     |     |      |
| R <sub>th(j-a)</sub>  | thermal resistance from junction to ambient      | in free air | [1] |     |     |      |
|                       | BAV70  |             | -   | -   | 500 | K/W  |
|                       | BAV70M   |             | [2] | -   | 500 | K/W  |
|                       | BAV70W   |             | -   | -   | 625 | K/W  |
| R <sub>th(j-t)</sub>  | thermal resistance from junction to tie-point    |             |     |     |     |      |
|                       | BAV70  |             | -   | -   | 360 | K/W  |
|                       | BAV70W   |             | -   | -   | 300 | K/W  |
| R <sub>th(j-sp)</sub> | thermal resistance from junction to solder point |             |     |     |     |      |
|                       | BAV70S   |             | -   | -   | 255 | K/W  |
|                       | BAV70T   |             | -   | -   | 350 | K/W  |

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

[2] Reflow soldering is the only recommended soldering method.

## 7. Characteristics

**Table 8. Characteristics**

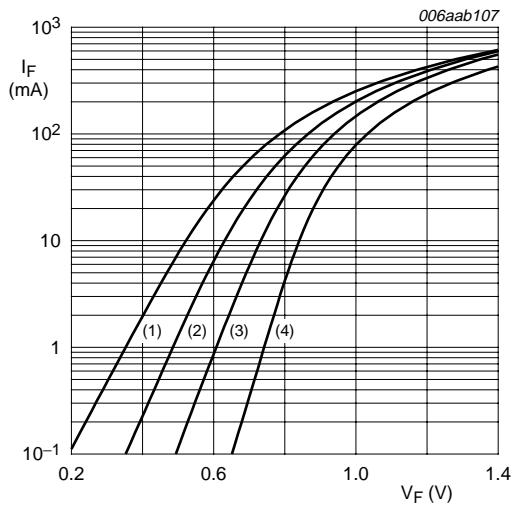
$T_{amb} = 25\text{ °C}$  unless otherwise specified.

| Symbol           | Parameter                | Conditions                               | Min | Typ | Max  | Unit          |
|------------------|--------------------------|--|-----|-----|------|---------------|
| <b>Per diode</b> |                          |  |     |     |      |               |
| $V_F$            | forward voltage          |  | [1] |     |      |               |
|                  |                          | $I_F = 1\text{ mA}$                      | -   | -   | 715  | mV            |
|                  |                          | $I_F = 10\text{ mA}$                     | -   | -   | 855  | mV            |
|                  |                          | $I_F = 50\text{ mA}$                     | -   | -   | 1    | V             |
| $I_R$            | reverse current          | $V_R = 25\text{ V}$                      | -   | -   | 30   | nA            |
|                  |                          | $V_R = 80\text{ V}$                      | -   | -   | 0.5  | $\mu\text{A}$ |
|                  |                          | $V_R = 25\text{ V}; T_j = 150\text{ °C}$ | -   | -   | 30   | $\mu\text{A}$ |
|                  |                          | $V_R = 80\text{ V}; T_j = 150\text{ °C}$ | -   | -   | 100  | $\mu\text{A}$ |
| $C_d$            | diode capacitance        | $V_R = 0\text{ V}; f = 1\text{ MHz}$     | -   | -   | 1.5  | pF            |
| $t_{rr}$         | reverse recovery time    |  | [2] | -   | 4    | ns            |
| $V_{FR}$         | forward recovery voltage |  | [3] | -   | 1.75 | V             |

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

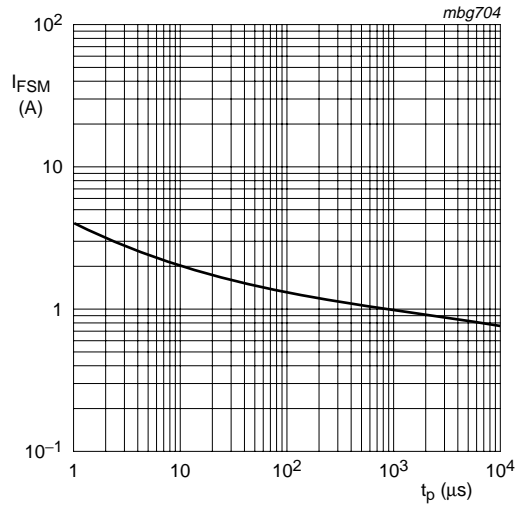
[2] When switched from  $I_F = 10\text{ mA}$  to  $I_R = 10\text{ mA}$ ;  $R_L = 100\text{ }\Omega$ ; measured at  $I_R = 1\text{ mA}$ .

[3] When switched from  $I_F = 10\text{ mA}$ ;  $t_r = 20\text{ ns}$ .



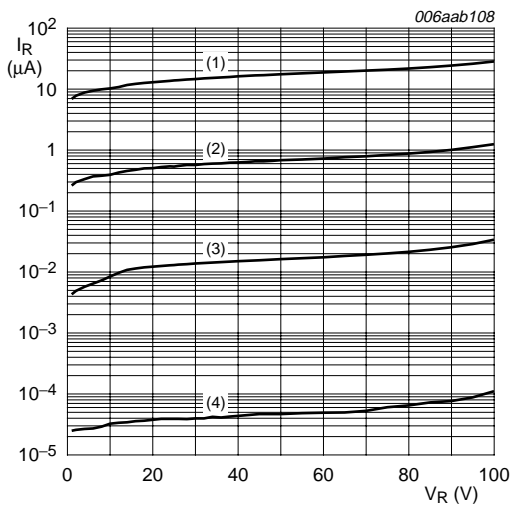
- (1)  $T_{amb} = 150\text{ °C}$
- (2)  $T_{amb} = 85\text{ °C}$
- (3)  $T_{amb} = 25\text{ °C}$
- (4)  $T_{amb} = -40\text{ °C}$

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



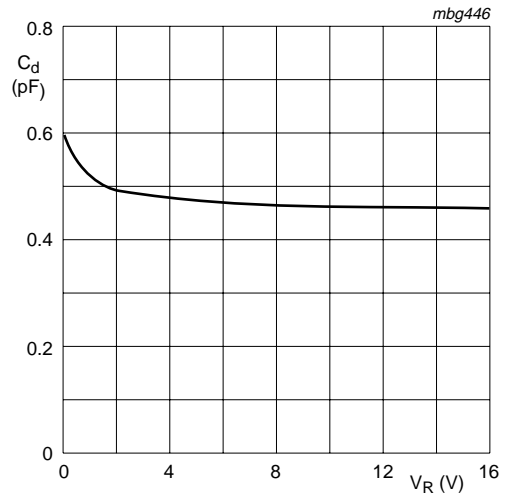
Based on square wave currents.  
 $T_j = 25\text{ °C}$ ; prior to surge

**Fig 2. Non-repetitive peak forward current as a function of pulse duration; maximum values**



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

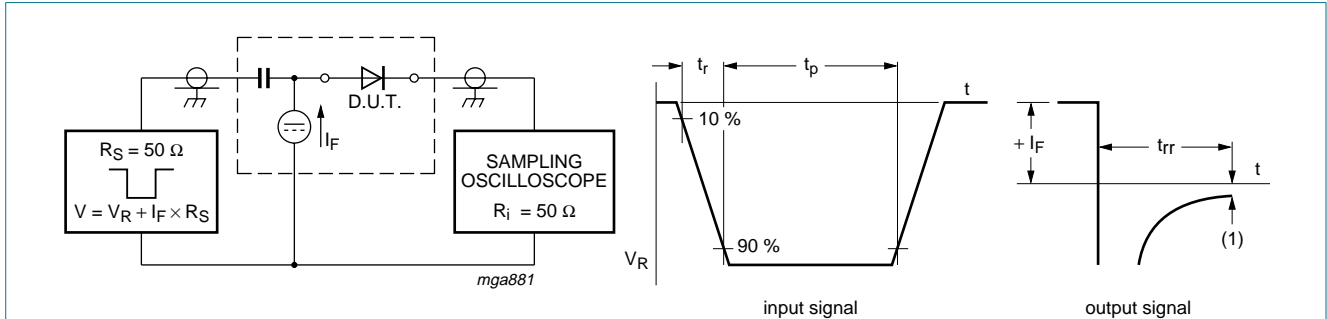
**Fig 3. Reverse current as a function of reverse voltage; typical values**



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

**Fig 4. Diode capacitance as a function of reverse voltage; typical values**

**8. Test information**

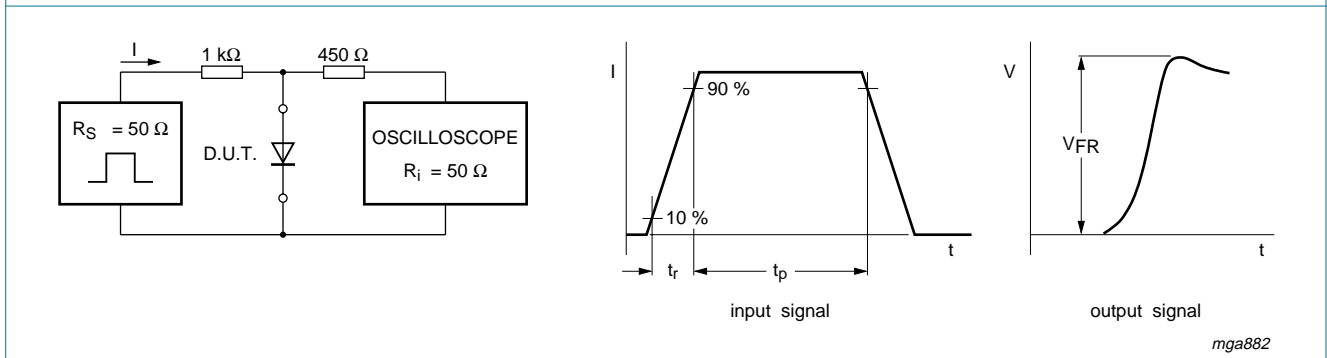


(1)  $I_R = 1 \text{ mA}$

Input signal: reverse pulse rise time  $t_r = 0.6 \text{ ns}$ ; reverse voltage pulse duration  $t_p = 100 \text{ ns}$ ; duty cycle  $\delta = 0.05$

Oscilloscope: rise time  $t_r = 0.35 \text{ ns}$

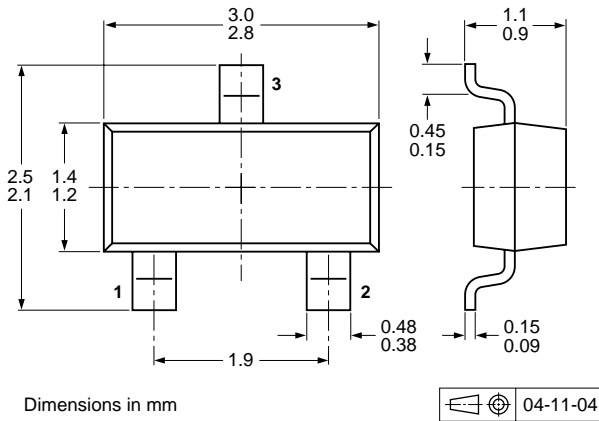
**Fig 5. Reverse recovery time test circuit and waveforms**



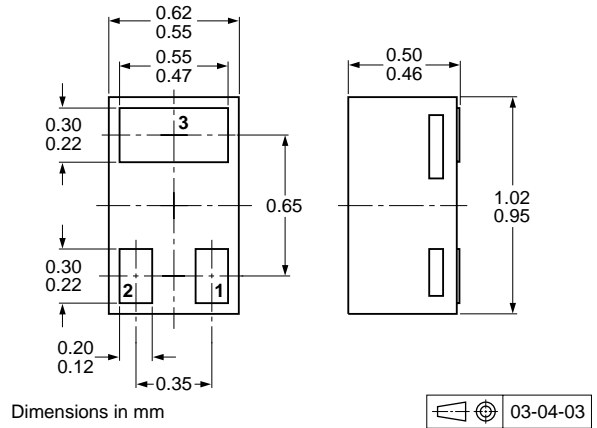
Input signal: forward pulse rise time  $t_r = 20 \text{ ns}$ ; forward current pulse duration  $t_p \geq 100 \text{ ns}$ ; duty cycle  $\delta \leq 0.005$

**Fig 6. Forward recovery voltage test circuit and waveforms**

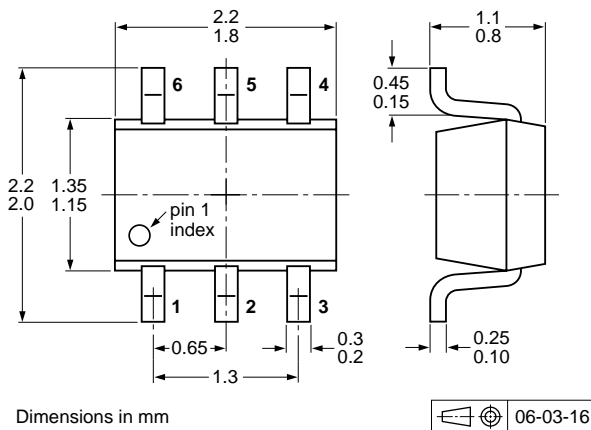
**9. Package outline**



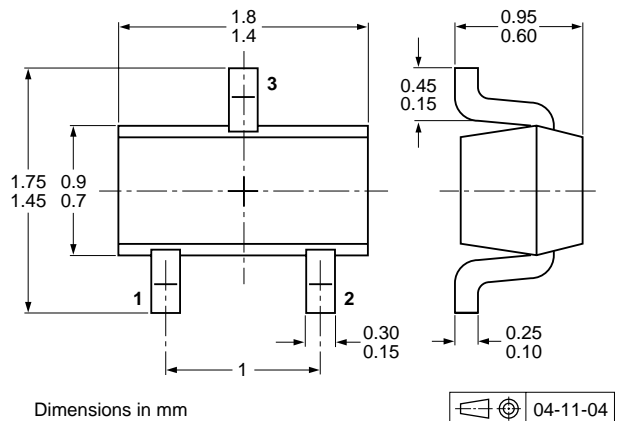
**Fig 7. Package outline BAV70 (SOT23/TO-236AB)**



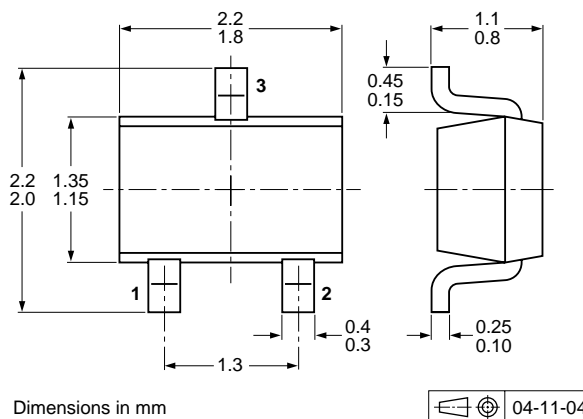
**Fig 8. Package outline BAV70M (SOT883/SC-101)**



**Fig 9. Package outline BAV70S (SOT363/SC-88)**



**Fig 10. Package outline BAV70T (SOT416/SC-75)**



**Fig 11. Package outline BAV70W (SOT323/SC-70)**



## 10. Packing information

**Table 9. Packing methods**

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

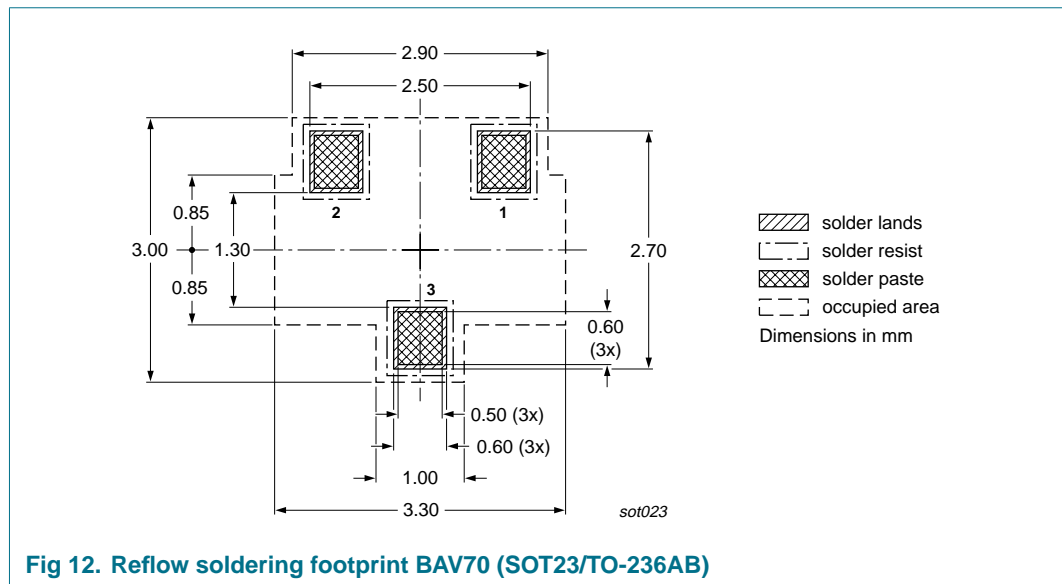
| Type number | Package | Description                        | Packing quantity    |       |
|-------------|---------|------------------------------------|---------------------|-------|
|             |         |                                    | 3000                | 10000 |
| BAV70       | SOT23   | 4 mm pitch, 8 mm tape and reel     | -215                | -235  |
| BAV70M      | SOT883  | 2 mm pitch, 8 mm tape and reel     | -                   | -315  |
| BAV70S      | SOT363  | 4 mm pitch, 8 mm tape and reel; T1 | <sup>[2]</sup> -115 | -135  |
|             |         | 4 mm pitch, 8 mm tape and reel; T2 | <sup>[3]</sup> -125 | -165  |
| BAV70T      | SOT416  | 4 mm pitch, 8 mm tape and reel     | -115                | -135  |
| BAV70W      | SOT323  | 4 mm pitch, 8 mm tape and reel     | -115                | -135  |

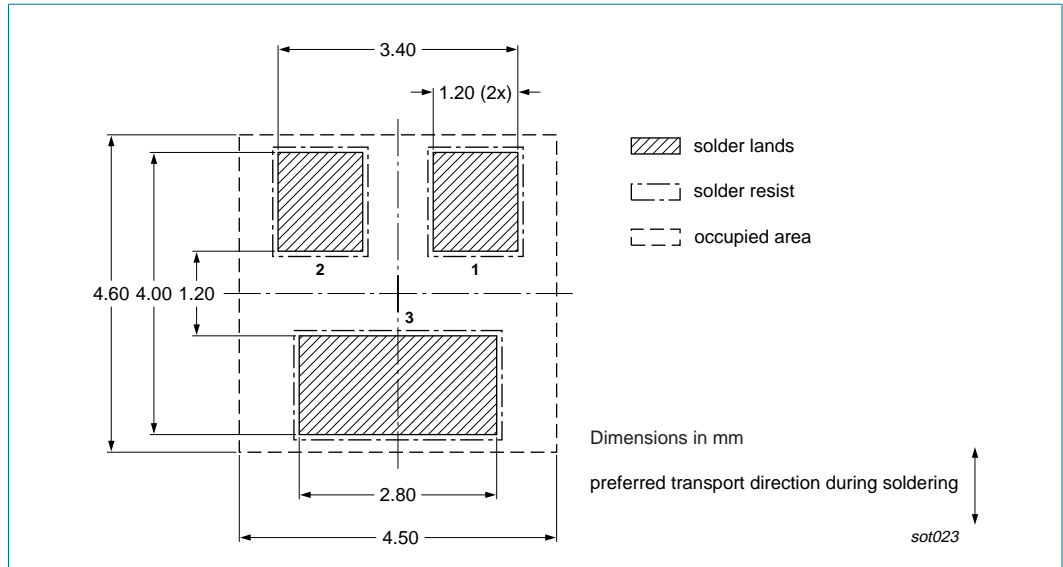
[1] For further information and the availability of packing methods, see [Section 14](#).

[2] T1: normal taping

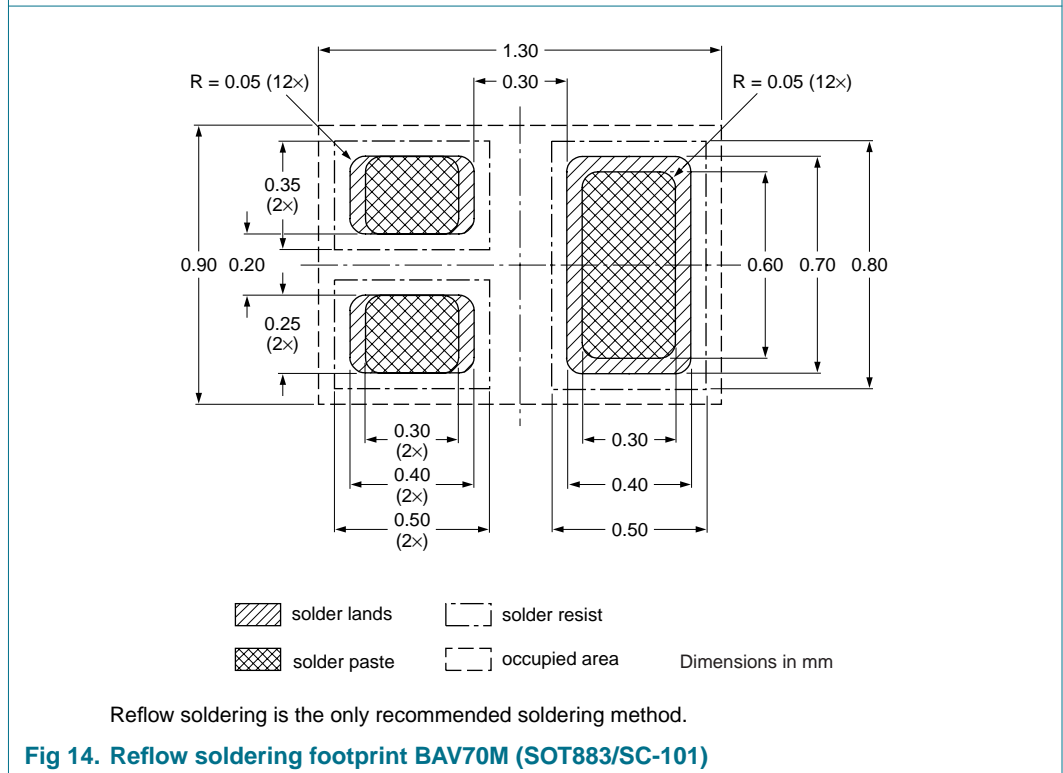
[3] T2: reverse taping

## 11. Soldering

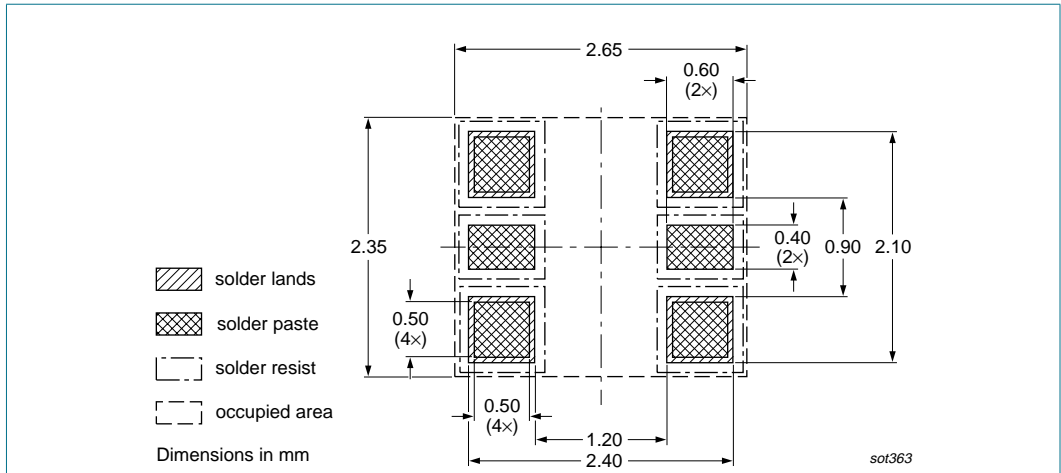




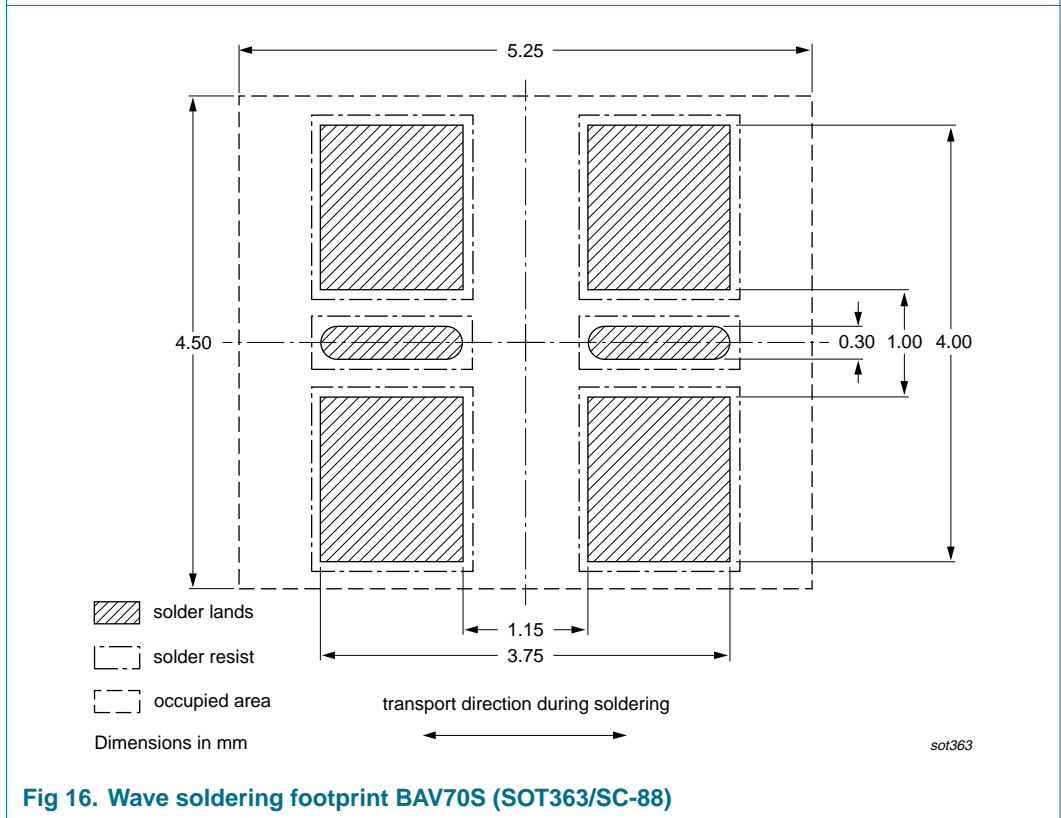
**Fig 13. Wave soldering footprint BAV70 (SOT23/TO-236AB)**



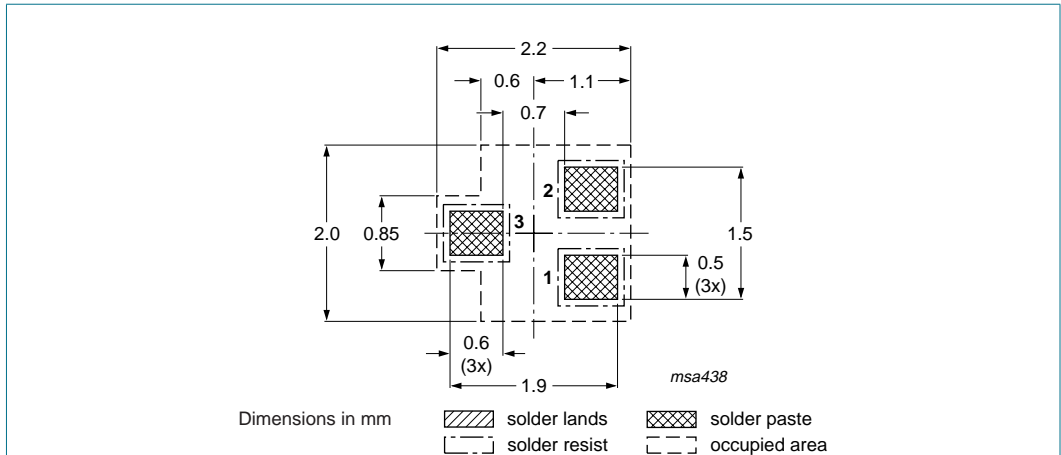
**Fig 14. Reflow soldering footprint BAV70M (SOT883/SC-101)**



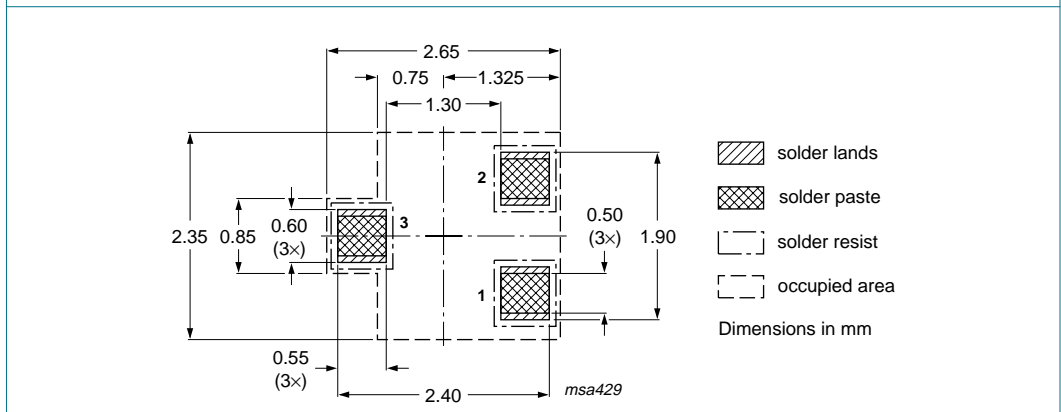
**Fig 15. Reflow soldering footprint BAV70S (SOT363/SC-88)**



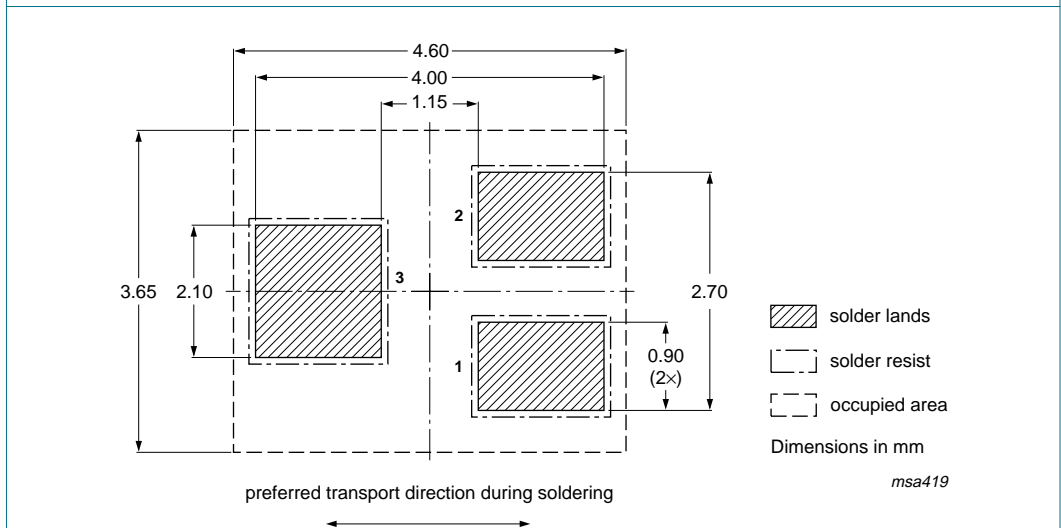
**Fig 16. Wave soldering footprint BAV70S (SOT363/SC-88)**



**Fig 17. Reflow soldering footprint BAV70T (SOT416/SC-75)**



**Fig 18. Reflow soldering footprint BAV70W (SOT323/SC-70)**



**Fig 19. Wave soldering footprint BAV70W (SOT323/SC-70)**

## 12. Revision history

**Table 10. Revision history**

| Document ID    | Release date | Data sheet status     | Change notice | Supersedes   |
|----------------|--------------|-----------------------|---------------|--|
| BAV70_SER_7    | 20071127     | Product data sheet    | -             | BAV70_6<br>BAV70S_2<br>BAV70T_3<br>BAV70W_6  |
| Modifications: |              |                       |               |  |
|                |              |                       |               | <ul style="list-style-type: none"> <li>• The format of this data sheet 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>• Type number BAV70M added</li> <li>• <a href="#">Section 1.1 “General description”</a>: amended</li> <li>• <a href="#">Table 1 “Product overview”</a>: added</li> <li>• <a href="#">Table 2 “Quick reference data”</a>: added</li> <li>• <a href="#">Table 6 “Limiting values”</a>: for BAV70, BAV70S and BAV70W change of <math>V_{RRM}</math> maximum value from 85 V to 100 V</li> <li>• <a href="#">Table 6 “Limiting values”</a>: for BAV70, BAV70S and BAV70W change of <math>V_R</math> maximum value from 75 V to 100 V</li> <li>• <a href="#">Table 8 “Characteristics”</a>: for BAV70, BAV70S, BAV70T and BAV70W change of <math>I_R</math> condition <math>V_R</math> from 75 V to 80 V for <math>T_j = 25\text{ °C}</math></li> <li>• <a href="#">Table 8 “Characteristics”</a>: for BAV70, BAV70S and BAV70W change of <math>I_R</math> maximum value from 2.5 <math>\mu\text{A}</math> to 0.5 <math>\mu\text{A}</math> for <math>T_j = 25\text{ °C}</math></li> <li>• <a href="#">Table 8 “Characteristics”</a>: for BAV70T change of <math>I_R</math> maximum value from 2.0 <math>\mu\text{A}</math> to 0.5 <math>\mu\text{A}</math> for <math>T_j = 25\text{ °C}</math></li> <li>• <a href="#">Table 8 “Characteristics”</a>: for BAV70, BAV70S, BAV70T and BAV70W change of <math>I_R</math> maximum value from 60 <math>\mu\text{A}</math> to 30 <math>\mu\text{A}</math> for <math>I_R</math> condition <math>V_R = 25\text{ V}</math>; <math>T_j = 150\text{ °C}</math></li> <li>• <a href="#">Table 8 “Characteristics”</a>: for BAV70, BAV70S, BAV70T and BAV70W change of <math>I_R</math> condition <math>V_R</math> from 75 V to 80 V for <math>T_j = 150\text{ °C}</math></li> <li>• <a href="#">Section 8 “Test information”</a>: added</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> |
| BAV70_6        | 20020403     | Product specification | -             | BAV70_5  |
| BAV70S_2       | 19971021     | Product specification | -             | BAV70S_1   |
| BAV70T_3       | 20040204     | Product specification | -             | BAV70T_2   |
| BAV70W_6       | 20020405     | Product specification | -             | BAV70W_5   |

## 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".

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