

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

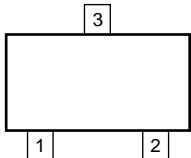
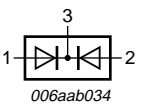
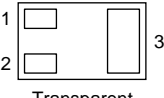
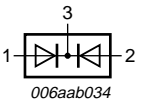
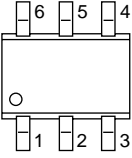
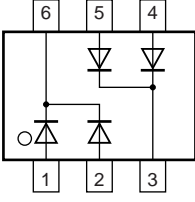
Table 2. Quick reference data

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------|-----------------------|--------------|-----|-----|-----|---------|
| Per diode | | | | | | |
| I_R | reverse current | $V_R = 80$ V | - | - | 0.5 | μ 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; $R_L = 100$ Ω ; measured at $I_R = 1$ mA.

2. Pinning information

Table 3. Pinning

| Pin | Description | Simplified outline | Symbol |
|------------------------------|--------------------------------------|---|--|
| BAV70; BAV70T; BAV70W | | | |
| 1 | anode (diode 1) |  <p>006aaa144</p> |  <p>006aab034</p> |
| 2 | anode (diode 2) | | |
| 3 | common cathode | | |
| BAV70M | | | |
| 1 | anode (diode 1) |  <p>Transparent top view</p> |  <p>006aab034</p> |
| 2 | anode (diode 2) | | |
| 3 | common cathode | | |
| BAV70S | | | |
| 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 ^[1] |
|-------------|-----------------------------|
| 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 |
|------------------|-------------------------------------|-----------------------------|-----|-----|------|
| Per diode | | | | | |
| 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_{tot} | total power dissipation | | [2] | | |
| | BAV70 | $T_{amb} \leq 25\text{ °C}$ | - | 250 | mW |
| | BAV70M | $T_{amb} \leq 25\text{ °C}$ | [3] | 250 | mW |
| | BAV70S | $T_s = 60\text{ °C}$ | - | 350 | mW |
| | BAV70T | $T_s = 90\text{ °C}$ | - | 170 | mW |
| | BAV70W | $T_{amb} \leq 25\text{ °C}$ | - | 200 | mW |
| Per device | | | | | |
| I_F | forward current | | | | |
| | BAV70 | $T_{amb} \leq 25\text{ °C}$ | - | 125 | mA |
| | BAV70M | $T_s = 90\text{ °C}$ | - | 75 | mA |
| | BAV70S | $T_s = 60\text{ °C}$ | - | 100 | mA |
| | BAV70T | $T_s = 90\text{ °C}$ | - | 75 | mA |
| | BAV70W | $T_{amb} \leq 25\text{ °C}$ | - | 100 | mA |
| T_j | junction temperature | | - | 150 | °C |
| T_{amb} | ambient temperature | | -65 | +150 | °C |
| T_{stg} | storage temperature | | -65 | +150 | °C |

[1] $T_j = 25\text{ °C}$ 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 |
|------------------|--|-------------|-----|-----|-----|------|
| Per diode | | | | | | |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | [1] | | | |
| | BAV70 | | - | - | 500 | K/W |
| | BAV70M | | [2] | - | 500 | K/W |
| | BAV70W | | - | - | 625 | K/W |
| $R_{th(j-t)}$ | thermal resistance from junction to tie-point | | | | | |
| | BAV70 | | - | - | 360 | K/W |
| | BAV70W | | - | - | 300 | K/W |
| $R_{th(j-sp)}$ | 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

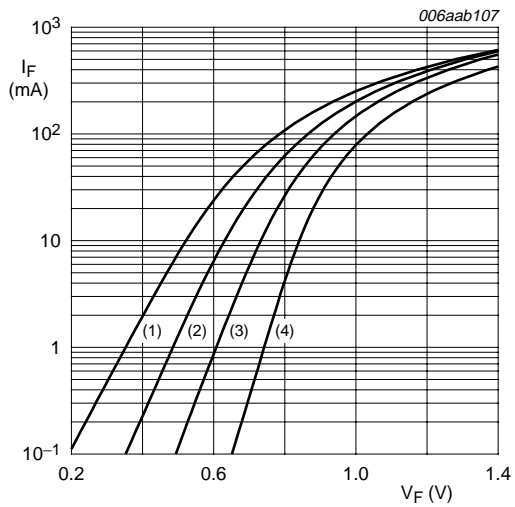
$T_{amb} = 25\text{ °C}$ unless otherwise specified.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|------------------|--------------------------|--|-----|-----|------|---------------|
| Per diode | | | | | | |
| 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 | μA |
| | | $V_R = 25\text{ V}; T_j = 150\text{ °C}$ | - | - | 30 | μA |
| | | $V_R = 80\text{ V}; T_j = 150\text{ °C}$ | - | - | 100 | μA |
| 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: $t_p \leq 300\text{ }\mu\text{s}$; $\delta \leq 0.02$.

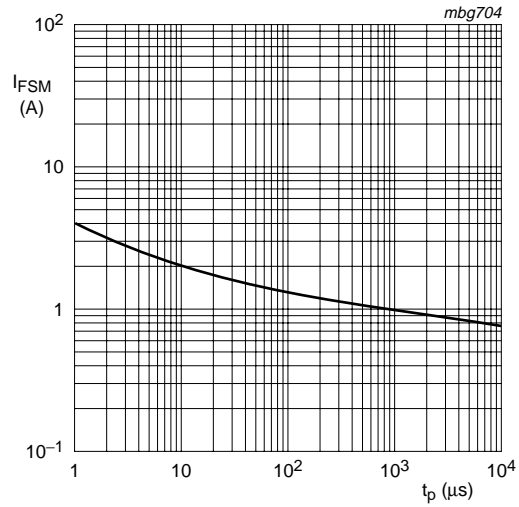
[2] When switched from $I_F = 10\text{ mA}$ to $I_R = 10\text{ mA}$; $R_L = 100\text{ }\Omega$; measured at $I_R = 1\text{ mA}$.

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



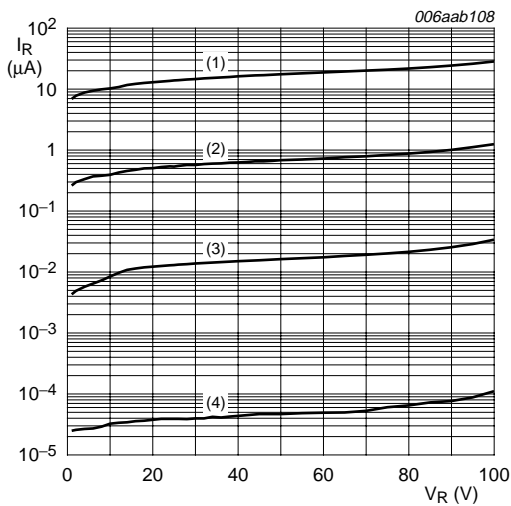
- (1) $T_{amb} = 150\text{ °C}$
- (2) $T_{amb} = 85\text{ °C}$
- (3) $T_{amb} = 25\text{ °C}$
- (4) $T_{amb} = -40\text{ °C}$

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



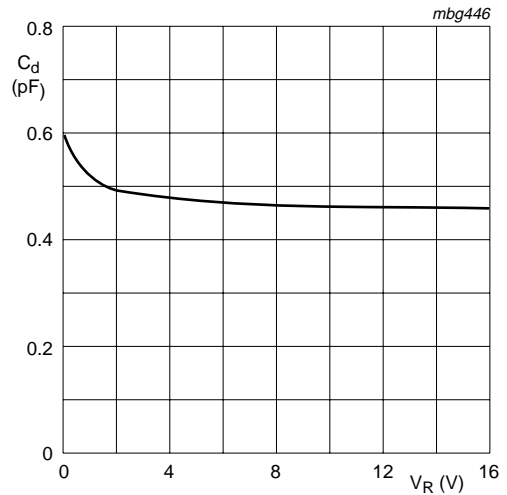
Based on square wave currents.
 $T_j = 25\text{ °C}$; prior to surge

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) $T_{amb} = -40\text{ °C}$

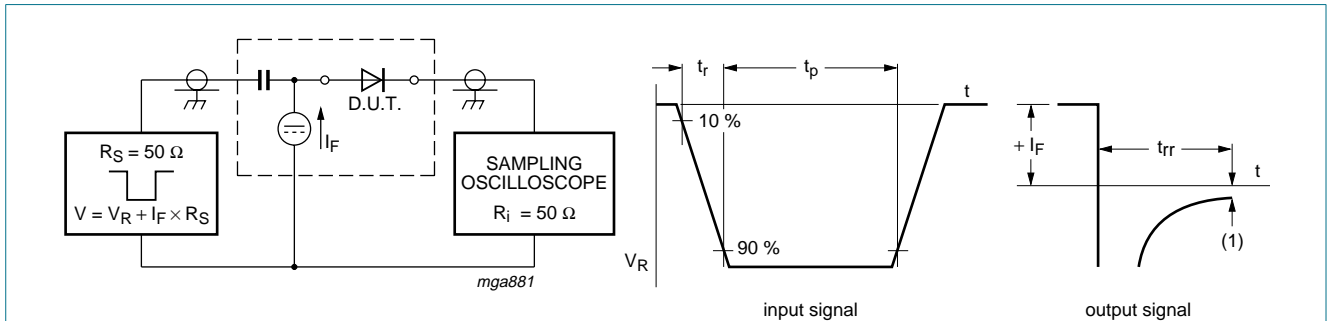
Fig 3. Reverse current as a function of reverse voltage; typical values



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

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

8. Test information

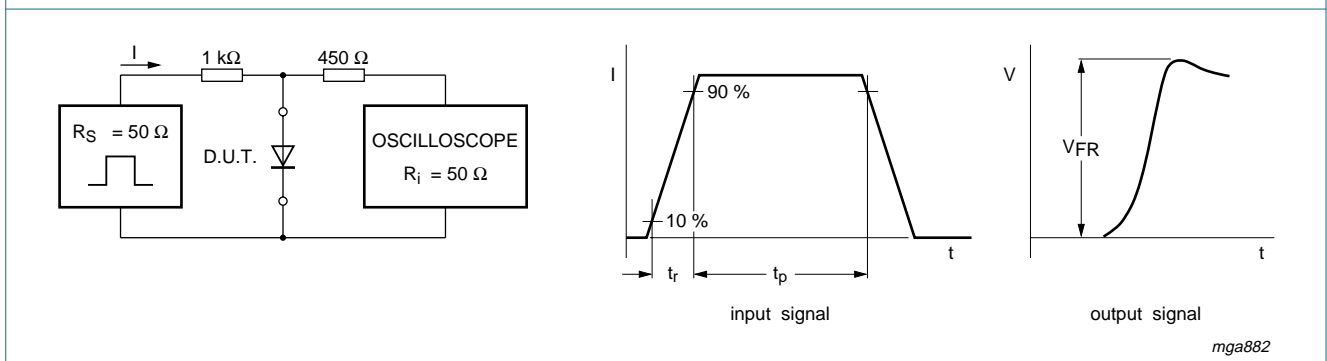


(1) $I_R = 1 \text{ mA}$

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

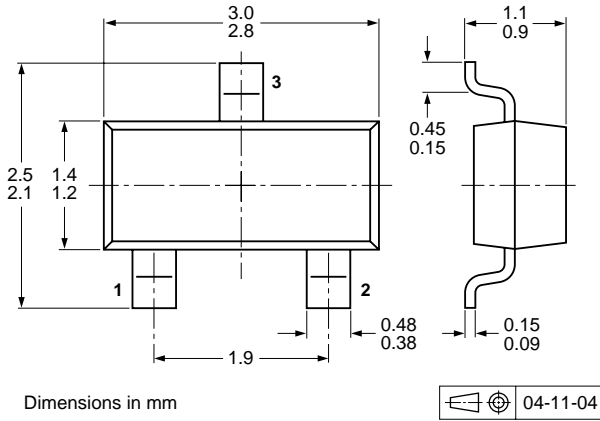


Fig 7. Package outline BAV70 (SOT23/TO-236AB)

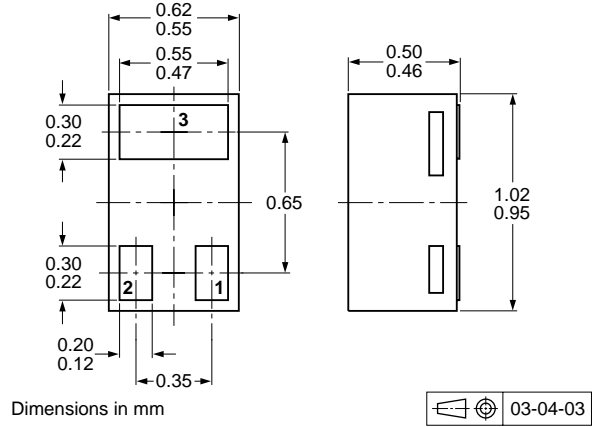


Fig 8. Package outline BAV70M (SOT883/SC-101)

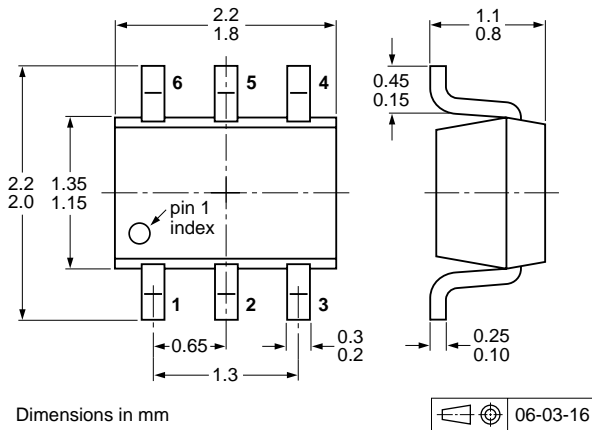


Fig 9. Package outline BAV70S (SOT363/SC-88)

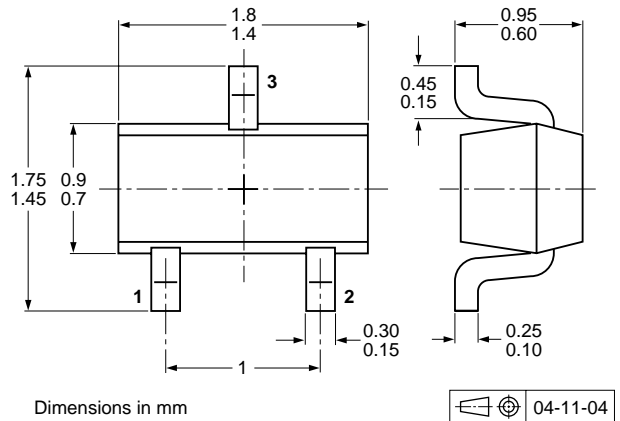


Fig 10. Package outline BAV70T (SOT416/SC-75)

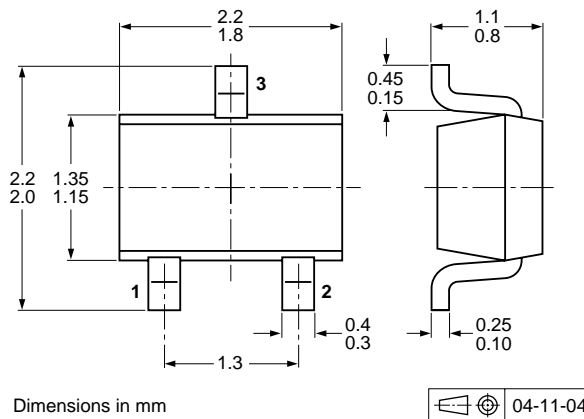


Fig 11. Package outline BAV70W (SOT323/SC-70)

10. Packing information

Table 9. Packing methods

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

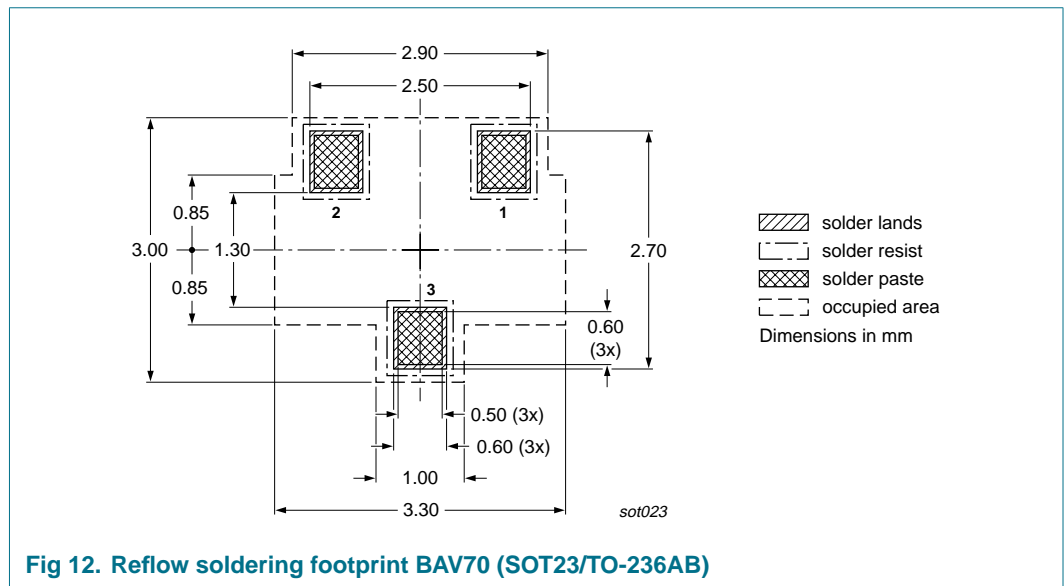
| Type number | Package | Description | Packing quantity | |
|-------------|---------|------------------------------------|---------------------|-------|
| | | | 3000 | 10000 |
| BAV70 | SOT23 | 4 mm pitch, 8 mm tape and reel | -215 | -235 |
| BAV70M | SOT883 | 2 mm pitch, 8 mm tape and reel | - | -315 |
| BAV70S | SOT363 | 4 mm pitch, 8 mm tape and reel; T1 | ^[2] -115 | -135 |
| | | 4 mm pitch, 8 mm tape and reel; T2 | ^[3] -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



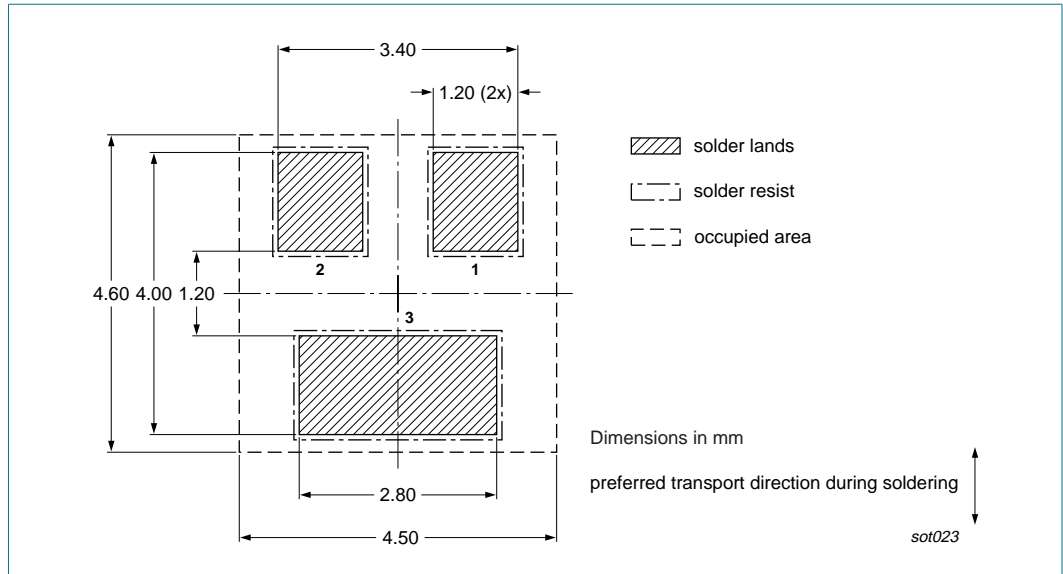


Fig 13. Wave soldering footprint BAV70 (SOT23/TO-236AB)

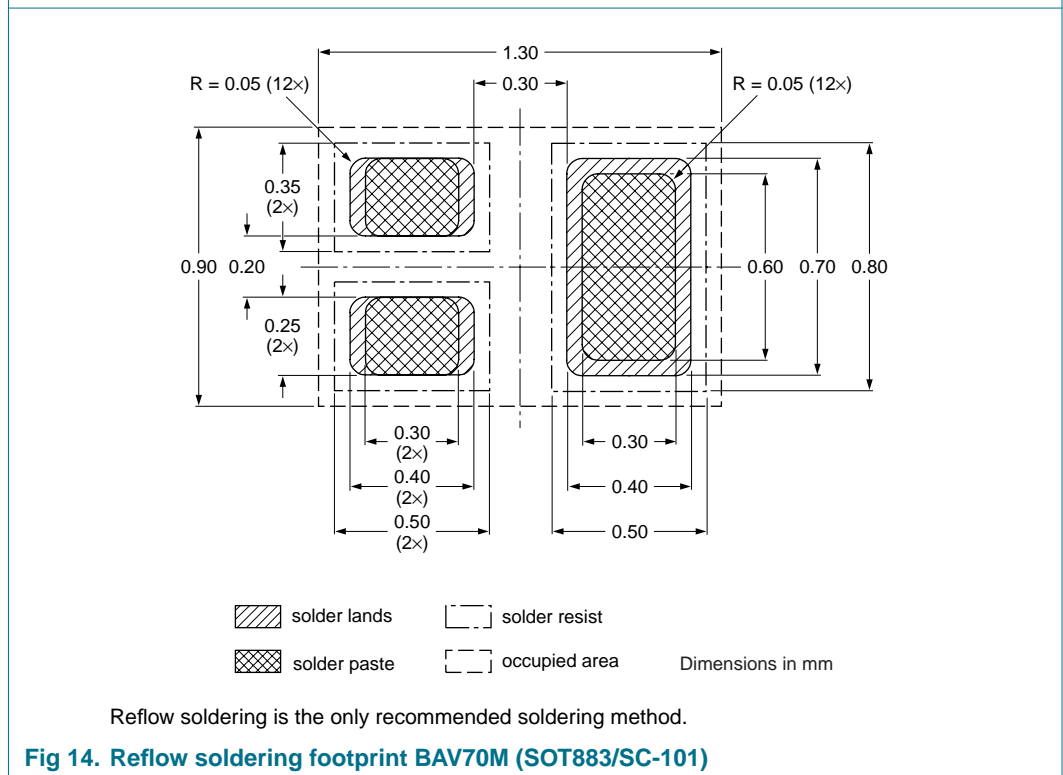


Fig 14. Reflow soldering footprint BAV70M (SOT883/SC-101)

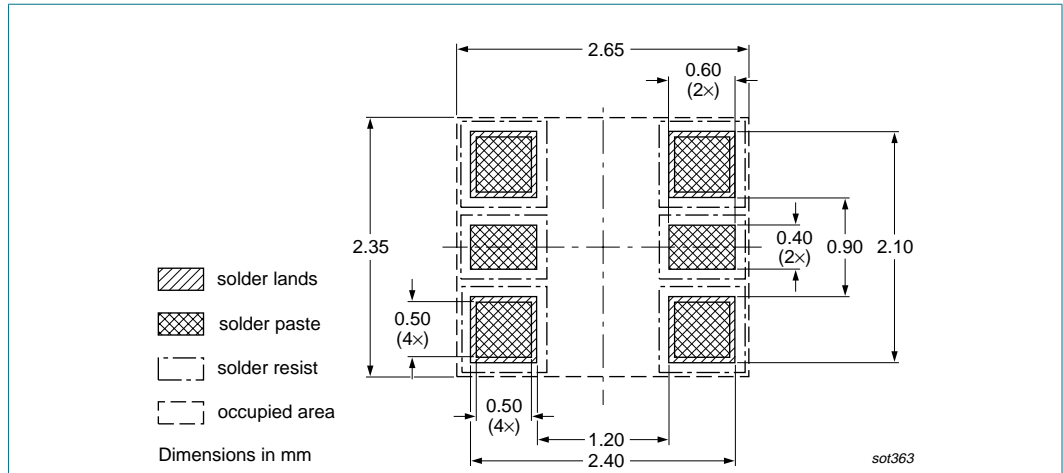


Fig 15. Reflow soldering footprint BAV70S (SOT363/SC-88)

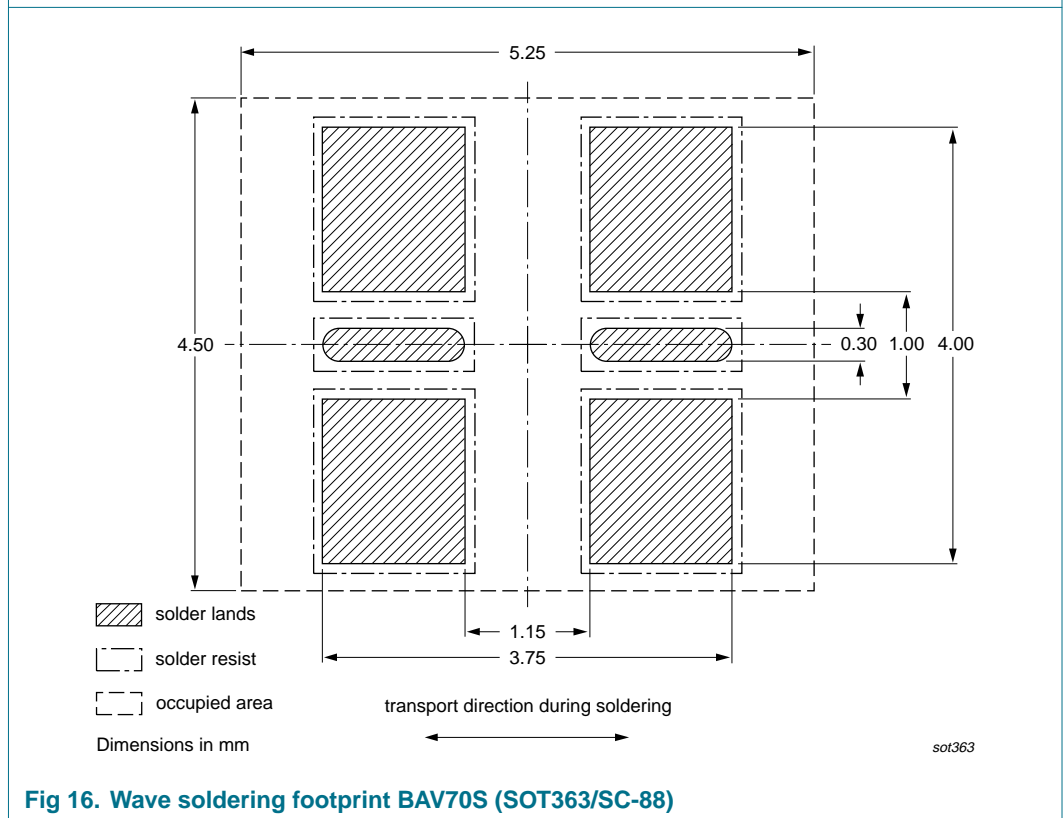


Fig 16. Wave soldering footprint BAV70S (SOT363/SC-88)

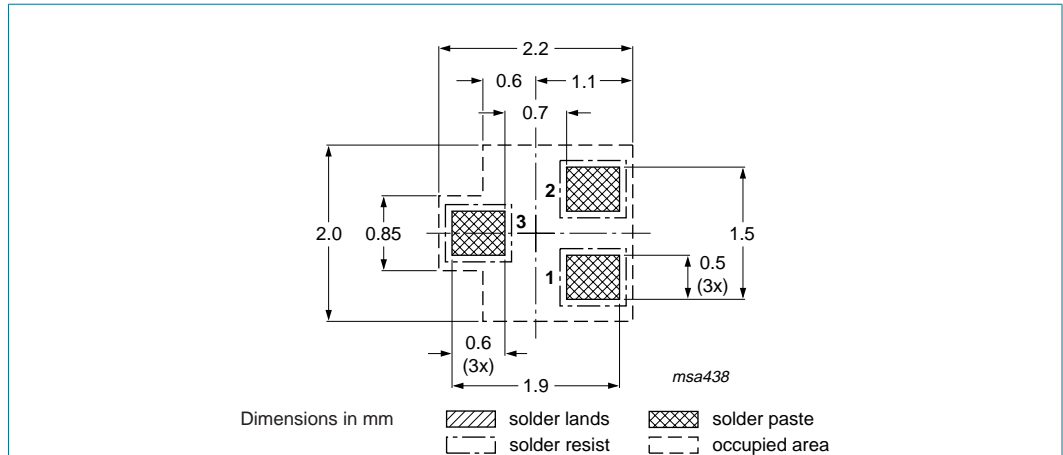


Fig 17. Reflow soldering footprint BAV70T (SOT416/SC-75)

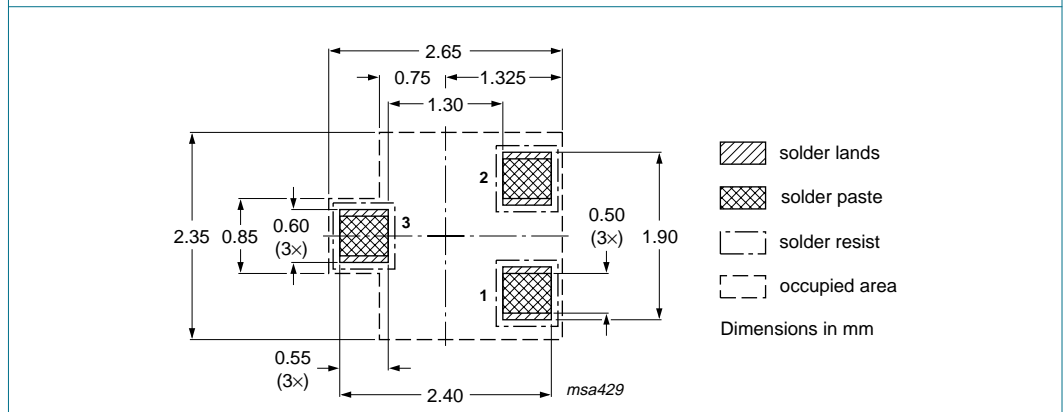


Fig 18. Reflow soldering footprint BAV70W (SOT323/SC-70)

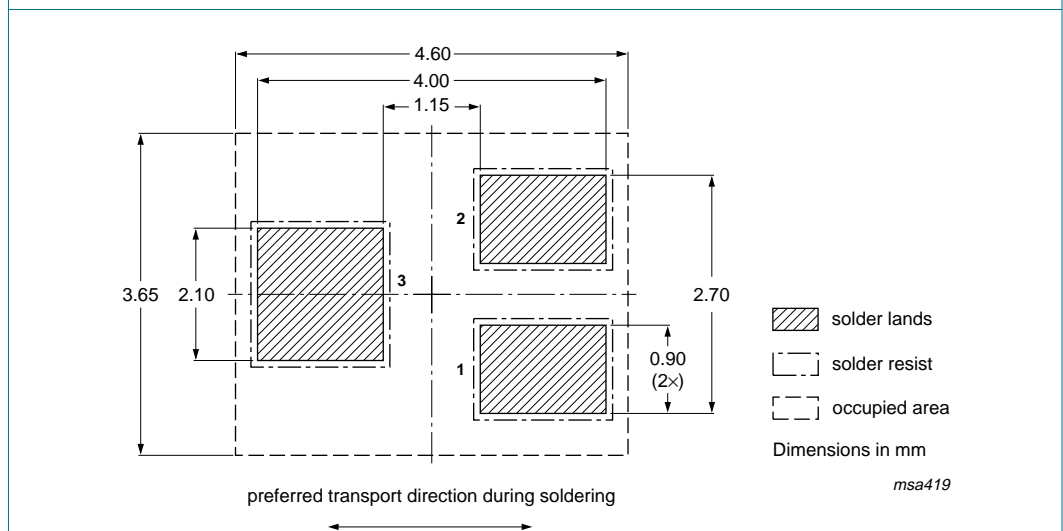


Fig 19. Wave soldering footprint BAV70W (SOT323/SC-70)

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 BAV70S_2 BAV70T_3 BAV70W_6 |
| Modifications: | <ul style="list-style-type: none"> • The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. • Legal texts have been adapted to the new company name where appropriate. • Type number BAV70M added • Section 1.1 “General description”: amended • Table 1 “Product overview”: added • Table 2 “Quick reference data”: added • Table 6 “Limiting values”: for BAV70, BAV70S and BAV70W change of V_{RRM} maximum value from 85 V to 100 V • Table 6 “Limiting values”: for BAV70, BAV70S and BAV70W change of V_R maximum value from 75 V to 100 V • Table 8 “Characteristics”: for BAV70, BAV70S, BAV70T and BAV70W change of I_R condition V_R from 75 V to 80 V for $T_j = 25\text{ °C}$ • Table 8 “Characteristics”: for BAV70, BAV70S and BAV70W change of I_R maximum value from 2.5 μA to 0.5 μA for $T_j = 25\text{ °C}$ • Table 8 “Characteristics”: for BAV70T change of I_R maximum value from 2.0 μA to 0.5 μA for $T_j = 25\text{ °C}$ • Table 8 “Characteristics”: for BAV70, BAV70S, BAV70T and BAV70W change of I_R maximum value from 60 μA to 30 μA for I_R condition $V_R = 25\text{ V}$; $T_j = 150\text{ °C}$ • Table 8 “Characteristics”: for BAV70, BAV70S, BAV70T and BAV70W change of I_R condition V_R from 75 V to 80 V for $T_j = 150\text{ °C}$ • Section 8 “Test information”: added • Section 10 “Packing information”: added • Section 11 “Soldering”: added • Section 13 “Legal information”: updated | | | |
| 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 ^{[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".

[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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Please be aware that important notices concerning this document and the product(s) described herein, have been included in section 'Legal information'.



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Date of release: 27 November 2007

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