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Kind regards,

Team Nexperia

# BAV756S; BAW56 series

## High-speed switching diodes

Rev. 6 — 18 March 2015 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 | | |
| BAV756S | SOT363 | SC-88 | - | very small | quadruple common anode/common cathode |
| BAW56 | SOT23 | - | TO-236AB | small | dual common anode |
| BAW56M | SOT883 | SC-101 | - | leadless ultra small | dual common anode |
| BAW56S | SOT363 | SC-88 | - | very small | quadruple common anode/common anode |
| BAW56T | SOT416 | SC-75 | - | ultra small | dual common anode |
| BAW56W | SOT323 | SC-70 | - | very small | dual common anode |

### 1.2 Features and benefits

- High switching speed: $t_{rr} \leq 4$ ns
- Low leakage current
- Small SMD plastic packages
- Low capacitance: $C_d \leq 2$ pF
- Reverse voltage: $V_R \leq 90$ V
- AEC-Q101 qualified

### 1.3 Applications

- High-speed switching
- General-purpose switching

### 1.4 Quick reference data

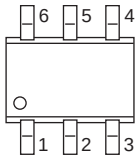
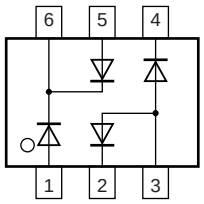
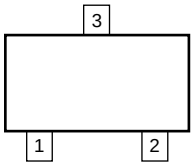
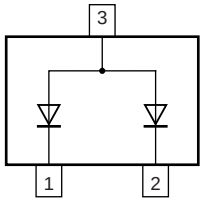
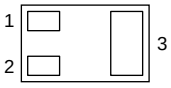
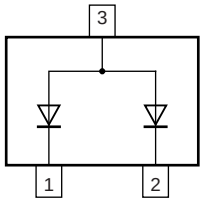
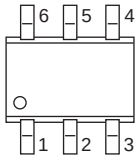
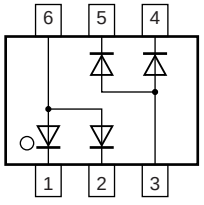
**Table 2. Quick reference data**

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Per diode** | | | | | | |
| $I_R$ | reverse current | $V_R$ = 80 V | - | - | 0.5 | µA |
| $V_R$ | reverse voltage | | - | - | 90 | 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 |
|---|---|---|---|
| **BAV756S** | | | |
| 1 | anode (diode 1) |  |  006aab103 |
| 2 | cathode (diode 2) | | |
| 3 | common anode (diode 2 and diode 3) | | |
| 4 | cathode (diode 3) | | |
| 5 | anode (diode 4) | | |
| 6 | common cathode (diode 1 and diode 4) | | |
| **BAW56; BAW56T; BAW56W** | | | |
| 1 | cathode (diode 1) |  006aaa144 |  006aab099 |
| 2 | cathode (diode 2) | | |
| 3 | common anode | | |
| **BAW56M** | | | |
| 1 | cathode (diode 1) |  Transparent top view |  006aab099 |
| 2 | cathode (diode 2) | | |
| 3 | common anode | | |
| **BAW56S** | | | |
| 1 | cathode (diode 1) |  |  006aab102 |
| 2 | cathode (diode 2) | | |
| 3 | common anode (diode 3 and diode 4) | | |
| 4 | cathode (diode 3) | | |
| 5 | cathode (diode 4) | | |
| 6 | common anode (diode 1 and diode 2) | | |

## 3. Ordering information

**Table 4. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| BAV756S | SC-88 | plastic surface-mounted package; 6 leads | SOT363 |
| BAW56 | - | plastic surface-mounted package; 3 leads | SOT23 |
| BAW56M | SC-101 | leadless ultra small plastic package; 3 solder lands; body 1.0 × 0.6 × 0.5 mm | SOT883 |
| BAW56S | SC-88 | plastic surface-mounted package; 6 leads | SOT363 |
| BAW56T | SC-75 | plastic surface-mounted package; 3 leads | SOT416 |
| BAW56W | SC-70 | plastic surface-mounted package; 3 leads | SOT323 |

## 4. Marking

**Table 5. Marking codes**

| Type number | Marking code[1] |
|---|---|
| BAV756S | A7* |
| BAW56 | A1* |
| BAW56M | S5 |
| BAW56S | A1* |
| BAW56T | A1 |
| BAW56W | A1* |

[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 | | - | 90 | V |
| $V_R$ | reverse voltage | | - | 90 | V |
| $I_F$ | forward current | | | | |
| | BAV756S | $T_s$ = 60 °C | - | 250 | mA |
| | BAW56 | $T_{amb} \leq$ 25 °C | - | 215 | mA |
| | BAW56M | $T_{amb} \leq$ 25 °C | - | 150 | mA |
| | BAW56S | $T_s$ = 60 °C | - | 250 | mA |
| | BAW56T | $T_s$ = 90 °C | - | 150 | mA |
| | BAW56W | $T_{amb} \leq$ 25 °C | - | 150 | mA |

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

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

| Symbol | Parameter | Conditions | Min | Max | Unit |
|---|---|---|---|---|---|
| $I_{FRM}$ | repetitive peak forward current | | - | 500 | mA |
| $I_{FSM}$ | non-repetitive peak forward current | square wave [1] | | | |
| | | $t_p$ = 1 μs | - | 4 | A |
| | | $t_p$ = 1 ms | - | 1 | A |
| | | $t_p$ = 1 s | - | 0.5 | A |
| $P_{tot}$ | total power dissipation | [2] | | | |
| | BAV756S | $T_s$ = 60 °C | - | 350 | mW |
| | BAW56 | $T_{amb} \leq$ 25 °C | - | 250 | mW |
| | BAW56M | $T_{amb} \leq$ 25 °C [3] | - | 250 | mW |
| | BAW56S | $T_s$ = 60 °C | - | 350 | mW |
| | BAW56T | $T_s$ = 90 °C [4] | - | 170 | mW |
| | BAW56W | $T_{amb} \leq$ 25 °C | - | 200 | mW |
| **Per device** | | | | | |
| $I_F$ | forward current | | | | |
| | BAV756S | $T_s$ = 60 °C | - | 100 | mA |
| | BAW56 | $T_{amb} \leq$ 25 °C | - | 125 | mA |
| | BAW56M | $T_{amb} \leq$ 25 °C | - | 75 | mA |
| | BAW56S | $T_s$ = 60 °C | - | 100 | mA |
| | BAW56T | $T_s$ = 90 °C | - | 75 | mA |
| | BAW56W | $T_{amb} \leq$ 25 °C | - | 130 | 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 °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.

[4] Single diode loaded.

## 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] | | | | |
| | BAW56 | | - | - | 500 | K/W |
| | BAW56M | [2] | - | - | 500 | K/W |
| | BAW56W | | - | - | 625 | K/W |

**Table 7. Thermal characteristics** *…continued*

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point | | | | | |
| | BAV756S | | - | - | 255 | K/W |
| | BAW56 | | - | - | 360 | K/W |
| | BAW56S | | - | - | 255 | K/W |
| | BAW56T | | - | - | 350 | K/W |
| | BAW56W | | - | - | 300 | 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**

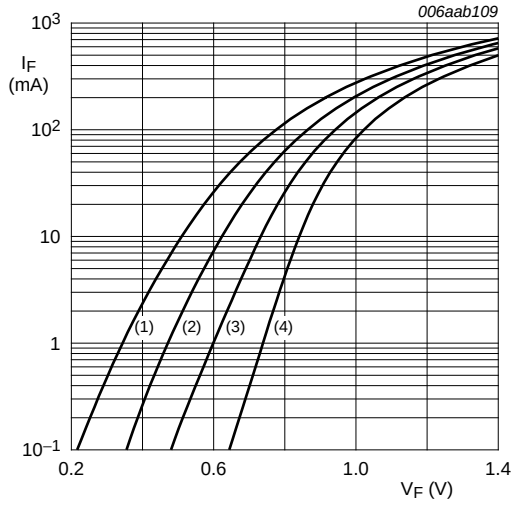
*$T_{amb}$ = 25 °C unless otherwise specified.*

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Per diode** | | | | | | |
| $V_F$ | forward voltage | [1] | | | | |
| | | $I_F$ = 1 mA | - | - | 715 | mV |
| | | $I_F$ = 10 mA | - | - | 855 | mV |
| | | $I_F$ = 50 mA | - | - | 1 | V |
| | | $I_F$ = 150 mA | - | - | 1.25 | V |
| $I_R$ | reverse current | $V_R$ = 25 V | - | - | 30 | nA |
| | | $V_R$ = 80 V | - | - | 0.5 | μA |
| | | $V_R$ = 25 V; $T_j$ = 150 °C | - | - | 30 | μA |
| | | $V_R$ = 80 V; $T_j$ = 150 °C | - | - | 150 | μA |
| $C_d$ | diode capacitance | $V_R$ = 0 V; f = 1 MHz | - | - | 2 | pF |
| $t_{rr}$ | reverse recovery time | [2] | - | - | 4 | ns |
| $V_{FR}$ | forward recovery voltage | [3] | - | - | 1.75 | V |

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

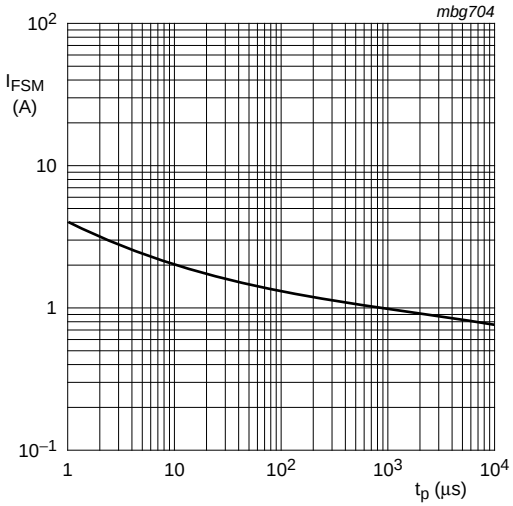
[2] When switched from $I_F$ = 10 mA to $I_R$ = 10 mA; $R_L$ = 100 Ω; measured at $I_R$ = 1 mA.

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



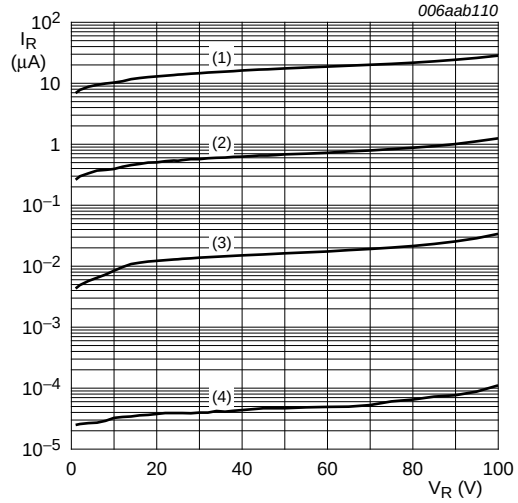

(1) $T_{amb}$ = 150 °C
(2) $T_{amb}$ = 85 °C
(3) $T_{amb}$ = 25 °C
(4) $T_{amb}$ = −40 °C

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



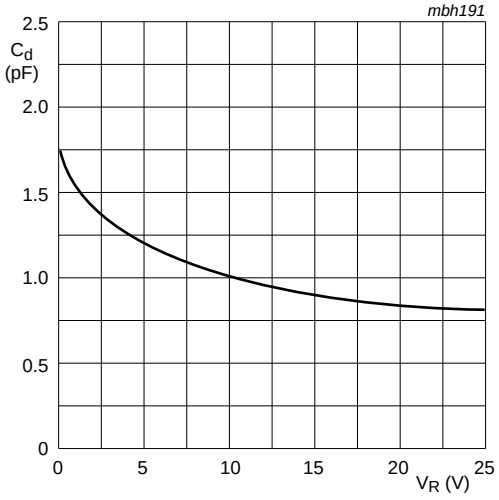

Based on square wave currents.
$T_j$ = 25 °C; prior to surge

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




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

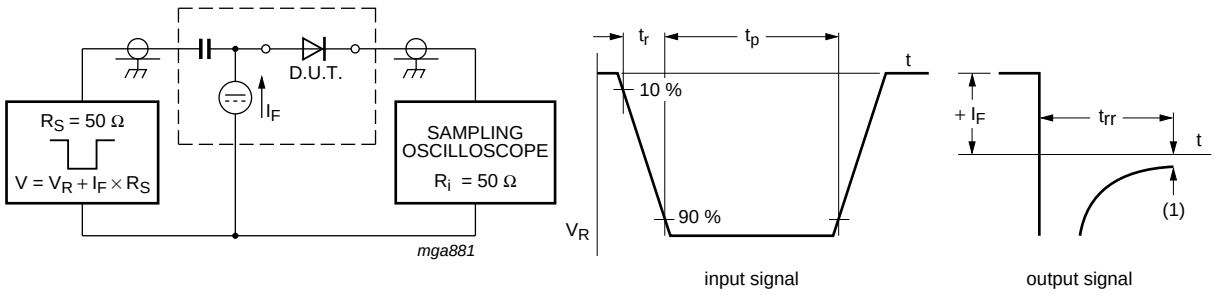
**Fig 3. Reverse current as a function of reverse voltage; typical values**




f = 1 MHz; $T_{amb}$ = 25 °C

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

# 8. Test information

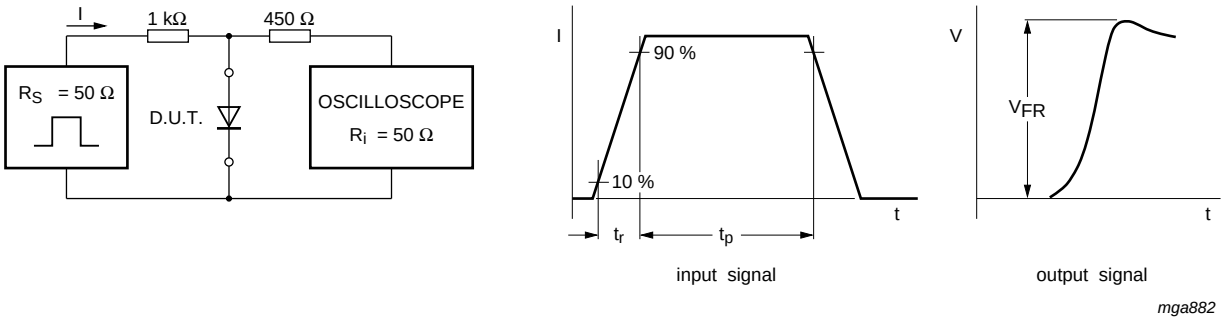



(1) $I_R$ = 1 mA

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

Oscilloscope: rise time $t_r$ = 0.35 ns

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




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

**Fig 6. Forward recovery voltage 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

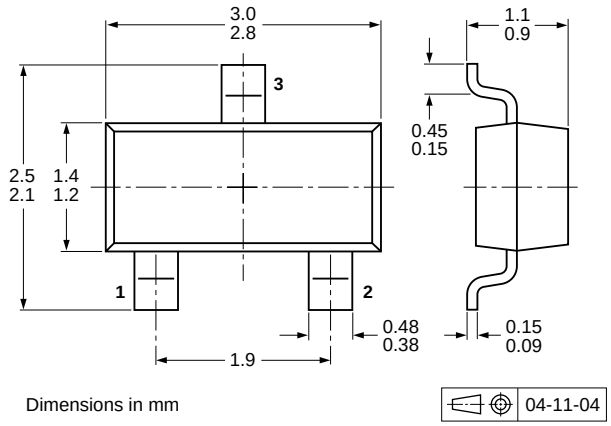



**Fig 7. Package outline BAW56 (SOT23/TO-236AB)**

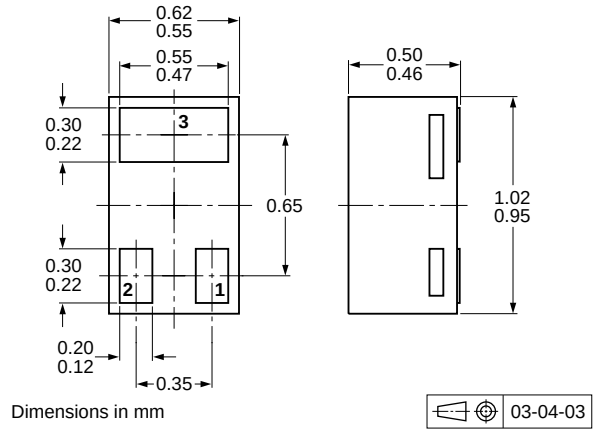



**Fig 8. Package outline BAW56M (SOT883/SC-101)**

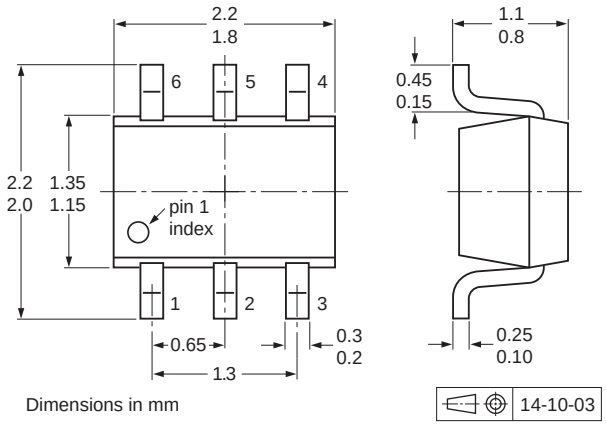



**Fig 9. Package outline BAV756S and BAW56S (SOT363/SC-88)**

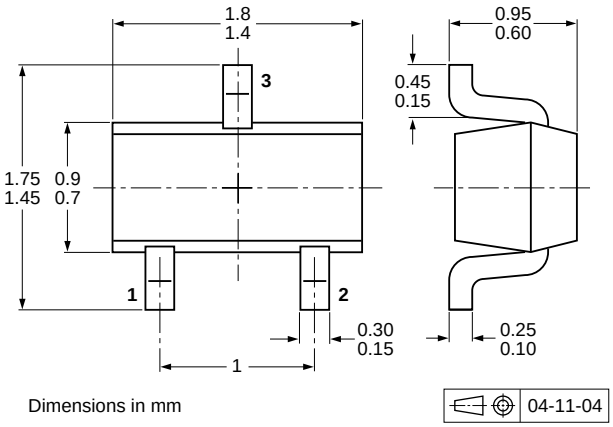



**Fig 10. Package outline BAW56T (SOT416/SC-75)**

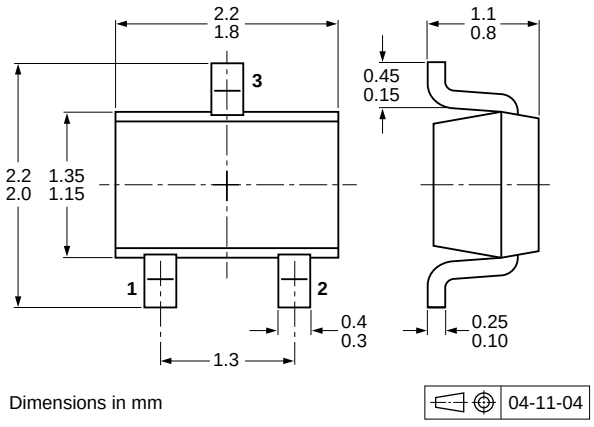



**Fig 11. Package outline BAW56W (SOT323/SC-70)**

## 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 |
| BAV756S | 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 |
| BAW56 | SOT23 | 4 mm pitch, 8 mm tape and reel | -215 | -235 |
| BAW56M | SOT883 | 2 mm pitch, 8 mm tape and reel | - | -315 |
| BAW56S | 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 |
| BAW56T | SOT416 | 4 mm pitch, 8 mm tape and reel | -115 | -135 |
| BAW56W | 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

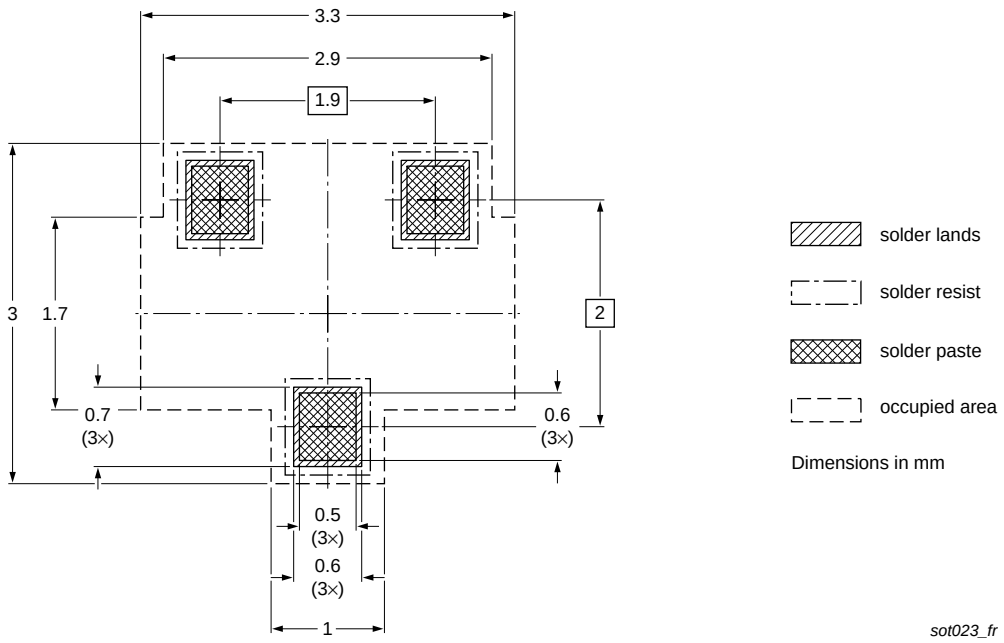



**Fig 12. Reflow soldering footprint BAW56 (SOT23/TO-236AB)**

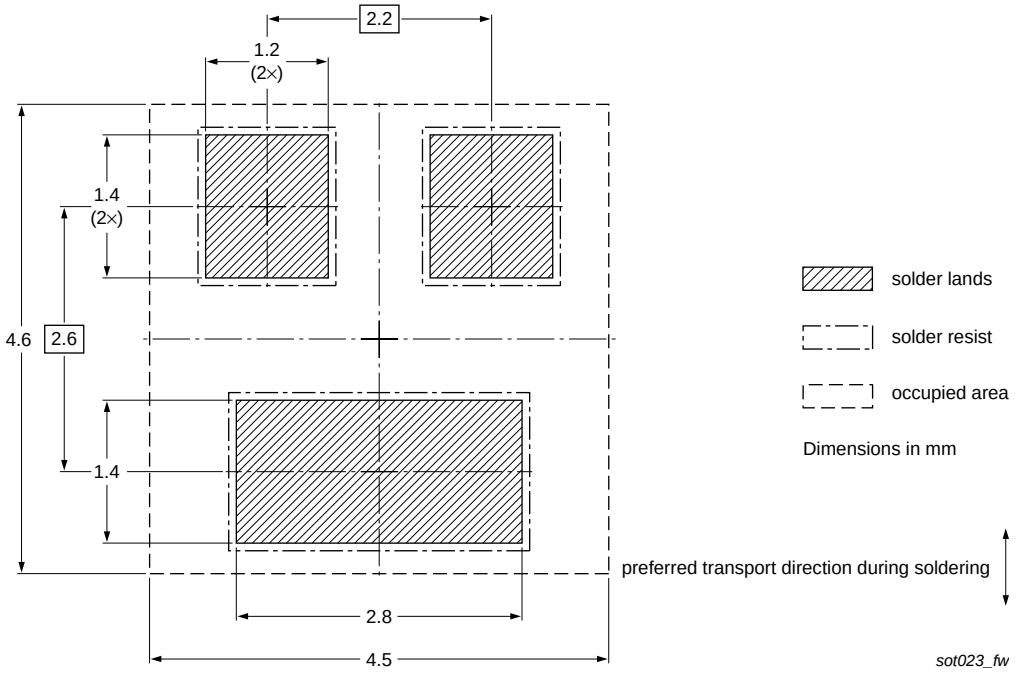
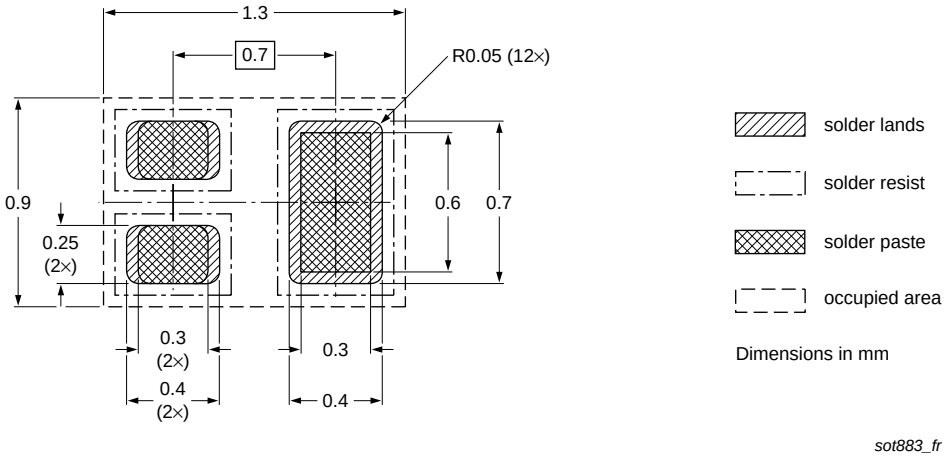



**Fig 13. Wave soldering footprint BAW56 (SOT23/TO-236AB)**




Reflow soldering is the only recommended soldering method.

**Fig 14. Reflow soldering footprint BAW56M (SOT883/SC-101)**

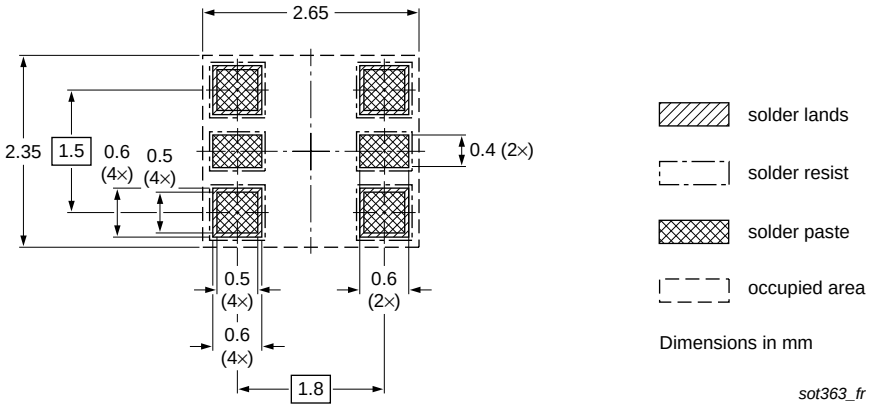



**Fig 15. Reflow soldering footprint BAV756S and BAW56S (SOT363/SC-88)**

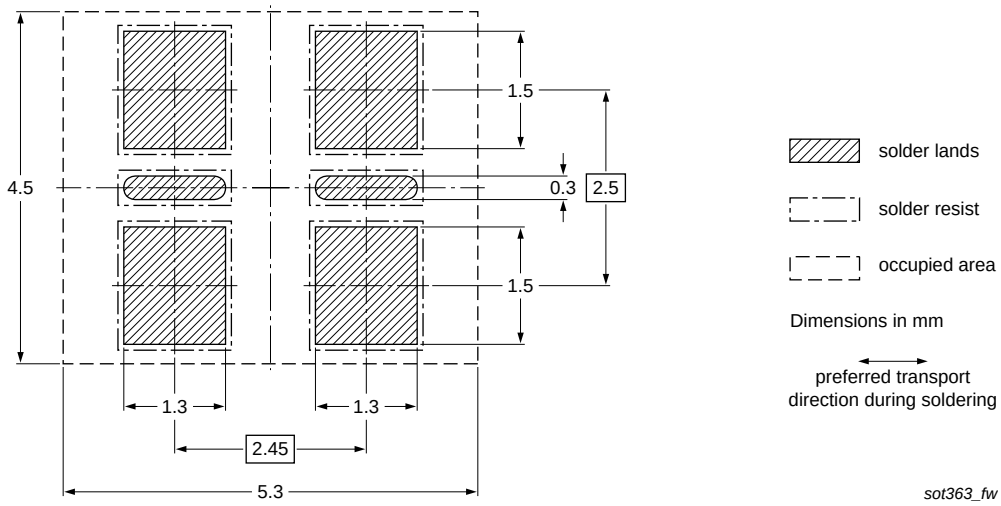



**Fig 16. Wave soldering footprint BAV756S and BAW56S (SOT363/SC-88)**

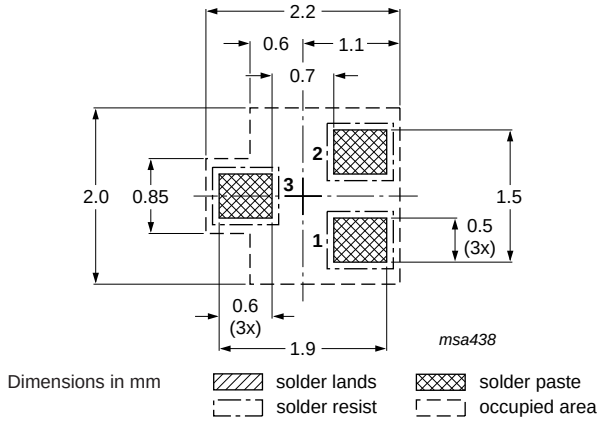



**Fig 17. Reflow soldering footprint BAW56T (SOT416/SC-75)**

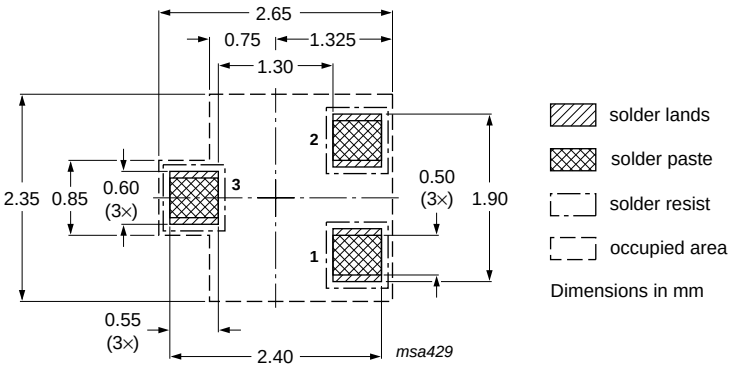



**Fig 18. Reflow soldering footprint BAW56W (SOT323/SC-70)**

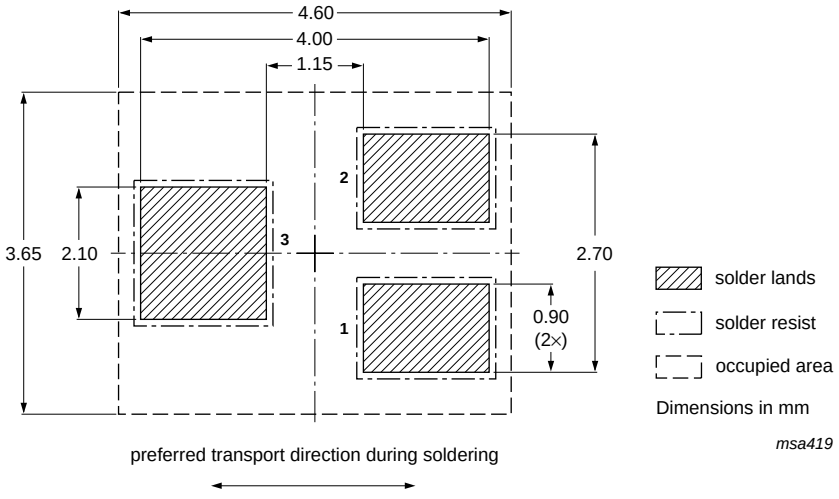



**Fig 19. Wave soldering footprint BAW56W (SOT323/SC-70)**

## 12. Revision history

**Table 10. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| BAV756S_BAW56_SER v.6 | 20150318 | Product data sheet | - | BAV756S_BAW56_SER_5 |
| Modifications: | • The format of this data sheet 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. | | | |
| BAV756S_BAW56_SER_5 | 20071126 | Product data sheet | - | BAV756S_2<br>BAW56_4<br>BAW56S_2<br>BAW56T_2<br>BAW56W_4 |
| BAV756S_2 | 19971021 | Product specification | - | BAV756S_1 |
| BAW56_4 | 20030325 | Product specification | - | BAW56_3 |
| BAW56S_2 | 19971021 | Product specification | - | BAW56S_1 |
| BAW56T_2 | 19971219 | Product specification | - | - |
| BAW56W_4 | 19990511 | Product specification | - | BAW56W_3 |

# 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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## 14. Contact information

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For sales office addresses, please send an email to: **salesaddresses@nxp.com**

## 15. Contents





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