

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 |
|-------------|----------|--------|----------|-----------------------|---------------------------------------|
| | Nexperia | 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

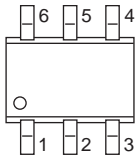
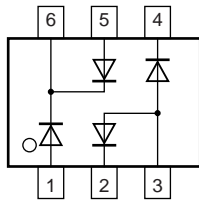
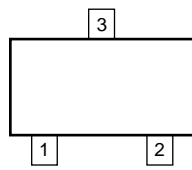
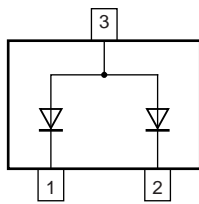
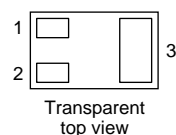
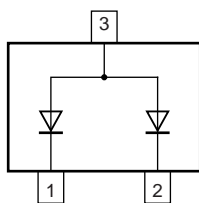
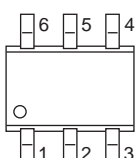
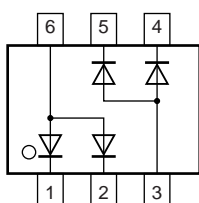
Table 2. Quick reference data

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------|-----------------------|--------------|-----|-----|-----|---------|
| Per diode | | | | | | |
| I_R | reverse current | $V_R = 80$ V | - | - | 0.5 | μ A |
| 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) |  |  <p>006aab103</p> |
| 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) |  <p>006aaa144</p> |  <p>006aab099</p> |
| 2 | cathode (diode 2) | | |
| 3 | common anode | | |
| BAW56M | | | |
| 1 | cathode (diode 1) |  <p>Transparent top view</p> |  <p>006aab099</p> |
| 2 | cathode (diode 2) | | |
| 3 | common anode | | |
| BAW56S | | | |
| 1 | cathode (diode 1) |  |  <p>006aab102</p> |
| 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 | | Version |
|-------------|---------|---|---------|
| | Name | Description | |
| 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 | $T_s = 60\text{ °C}$ | - | 250 | mA |
| | BAW56 | $T_{amb} \leq 25\text{ °C}$ | - | 215 | mA |
| | BAW56M | $T_{amb} \leq 25\text{ °C}$ | - | 150 | mA |
| | BAW56S | $T_s = 60\text{ °C}$ | - | 250 | mA |
| | BAW56T | $T_s = 90\text{ °C}$ | - | 150 | mA |
| | BAW56W | $T_{amb} \leq 25\text{ °C}$ | - | 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] | | | |
| | | $t_p = 1 \mu s$ | - | 4 | A |
| | | $t_p = 1 ms$ | - | 1 | A |
| | | $t_p = 1 s$ | - | 0.5 | A |
| P_{tot} | total power dissipation | [2] | | | |
| | BAV756S | $T_s = 60 \text{ }^\circ\text{C}$ | - | 350 | mW |
| | BAW56 | $T_{amb} \leq 25 \text{ }^\circ\text{C}$ | - | 250 | mW |
| | BAW56M | $T_{amb} \leq 25 \text{ }^\circ\text{C}$ [3] | - | 250 | mW |
| | BAW56S | $T_s = 60 \text{ }^\circ\text{C}$ | - | 350 | mW |
| | BAW56T | $T_s = 90 \text{ }^\circ\text{C}$ [4] | - | 170 | mW |
| | BAW56W | $T_{amb} \leq 25 \text{ }^\circ\text{C}$ | - | 200 | mW |
| Per device | | | | | |
| I_F | forward current | | | | |
| | BAV756S | $T_s = 60 \text{ }^\circ\text{C}$ | - | 100 | mA |
| | BAW56 | $T_{amb} \leq 25 \text{ }^\circ\text{C}$ | - | 125 | mA |
| | BAW56M | $T_{amb} \leq 25 \text{ }^\circ\text{C}$ | - | 75 | mA |
| | BAW56S | $T_s = 60 \text{ }^\circ\text{C}$ | - | 100 | mA |
| | BAW56T | $T_s = 90 \text{ }^\circ\text{C}$ | - | 75 | mA |
| | BAW56W | $T_{amb} \leq 25 \text{ }^\circ\text{C}$ | - | 130 | mA |
| T_j | junction temperature | | - | 150 | $^\circ\text{C}$ |
| T_{amb} | ambient temperature | | -65 | +150 | $^\circ\text{C}$ |
| T_{stg} | storage temperature | | -65 | +150 | $^\circ\text{C}$ |

[1] $T_j = 25 \text{ }^\circ\text{C}$ 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.

[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

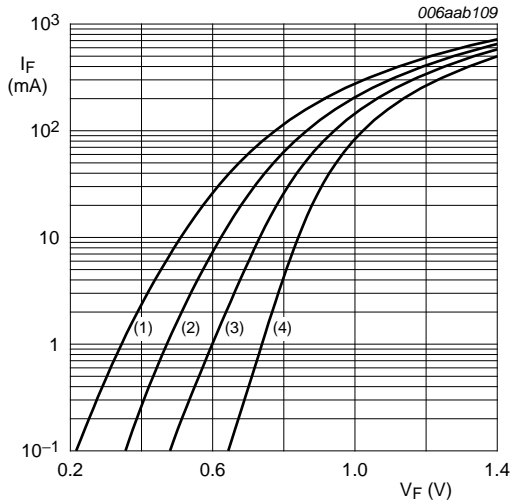
$T_{amb} = 25\text{ °C}$ unless otherwise specified.

| 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 |
| | | $I_F = 150\text{ mA}$ | - | - | 1.25 | 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 |
| | | $V_R = 80\text{ V}; T_j = 150\text{ °C}$ | - | - | 150 | μA |
| C_d | diode capacitance | $V_R = 0\text{ V}; f = 1\text{ MHz}$ | - | - | 2 | pF |
| t_{rr} | reverse recovery time | [2] | - | - | 4 | ns |
| V_{FR} | forward recovery voltage | [3] | - | - | 1.75 | V |

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

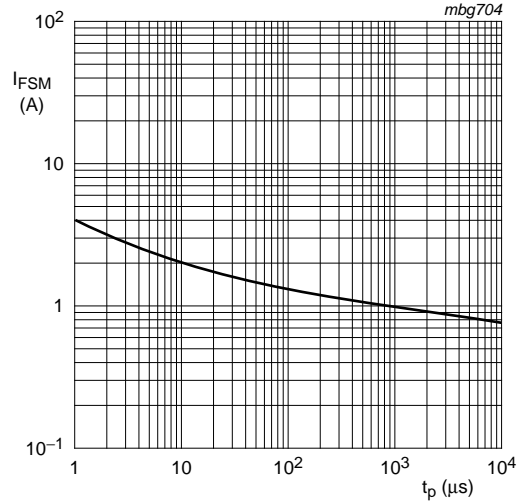
[2] When switched from $I_F = 10\text{ mA}$ to $I_R = 10\text{ mA}$; $R_L = 100\text{ }\Omega$; measured at $I_R = 1\text{ mA}$.

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



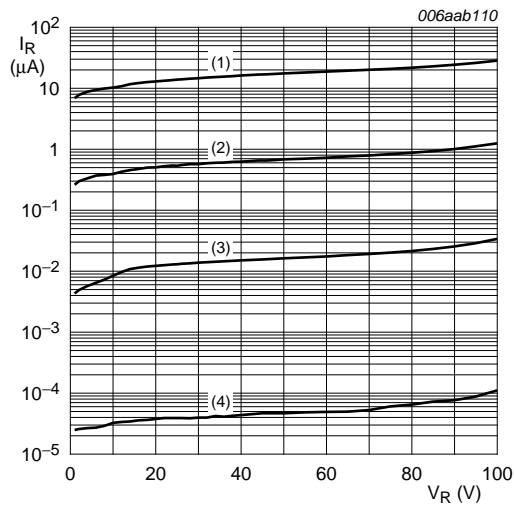
- (1) $T_{amb} = 150\text{ }^\circ\text{C}$
- (2) $T_{amb} = 85\text{ }^\circ\text{C}$
- (3) $T_{amb} = 25\text{ }^\circ\text{C}$
- (4) $T_{amb} = -40\text{ }^\circ\text{C}$

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



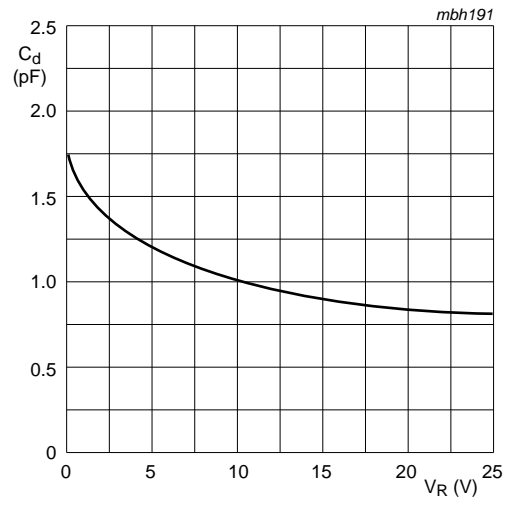
Based on square wave currents.
 $T_j = 25\text{ }^\circ\text{C}$; prior to surge

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



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

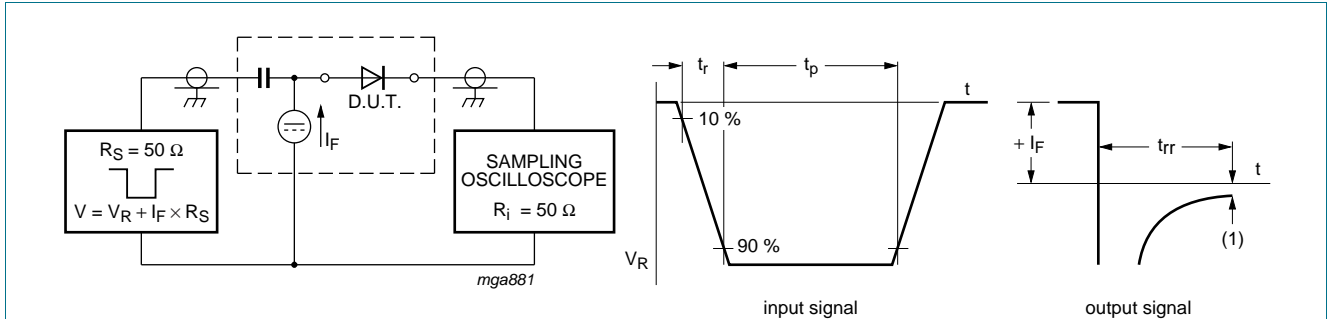
Fig 3. Reverse current as a function of reverse voltage; typical values



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

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

8. Test information

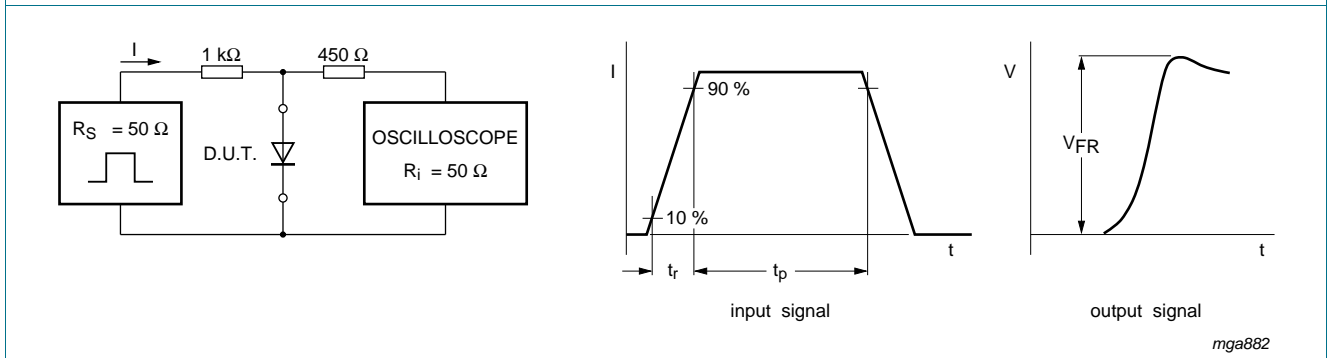


(1) $I_R = 1 \text{ mA}$

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



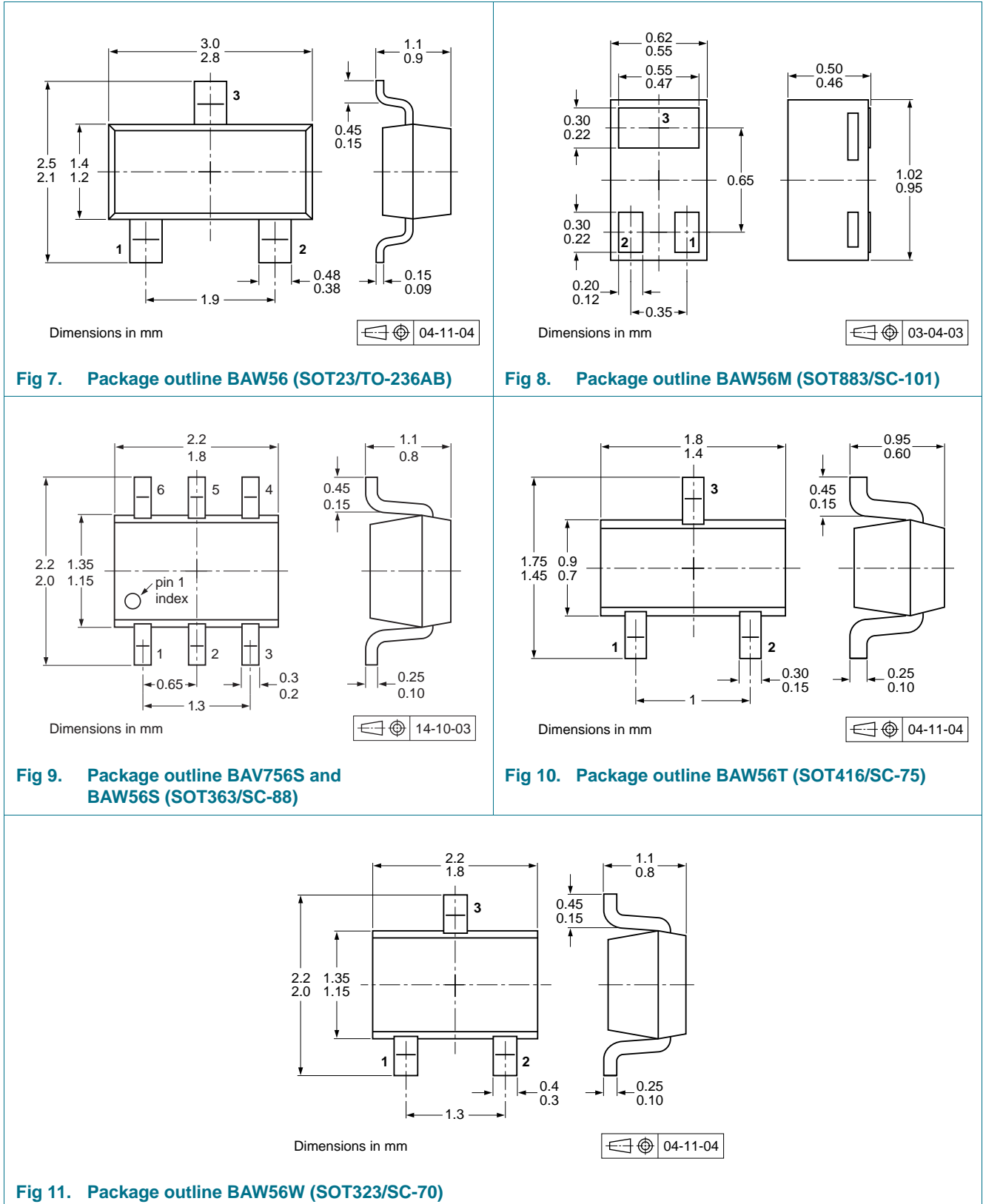
Input signal: forward pulse rise time $t_r = 20 \text{ ns}$; forward current pulse duration $t_p \geq 100 \text{ ns}$; duty cycle $\delta \leq 0.005$

Fig 6. Forward recovery voltage test circuit and waveforms

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 9. Packing methods

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

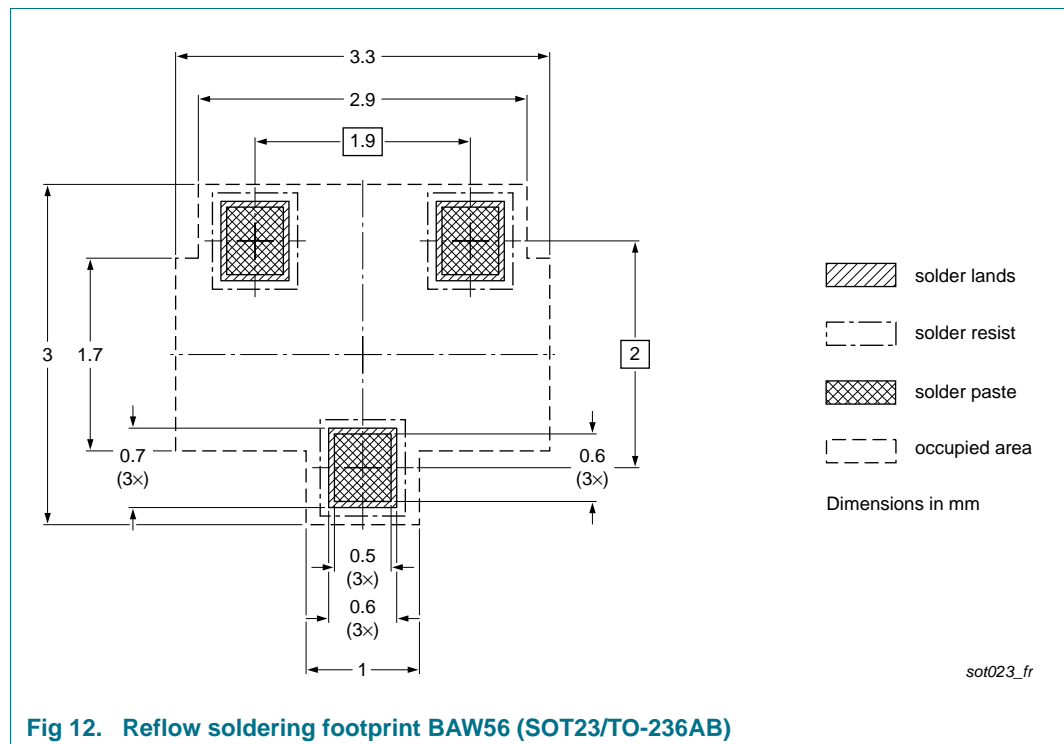
| Type number | Package | Description | Packing quantity | |
|-------------|---------|---|------------------|-------|
| | | | 3000 | 10000 |
| BAV756S | SOT363 | 4 mm pitch, 8 mm tape and reel; T1 ^[2] | -115 | -135 |
| | | 4 mm pitch, 8 mm tape and reel; T2 ^[3] | -125 | -165 |
| BAW56 | SOT23 | 4 mm 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



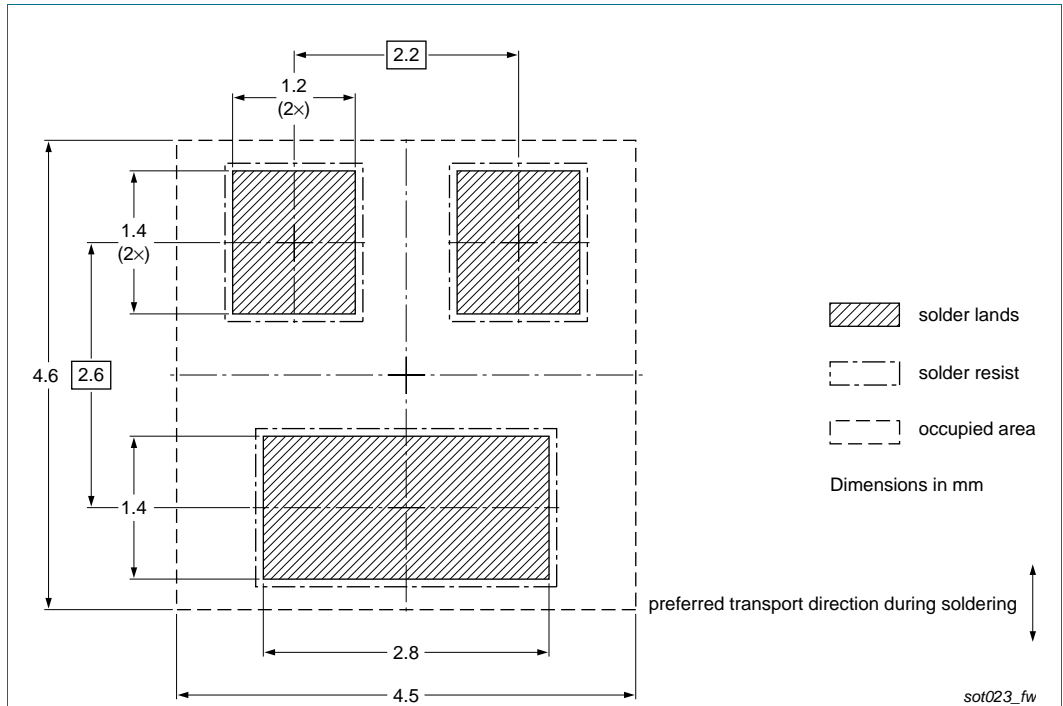
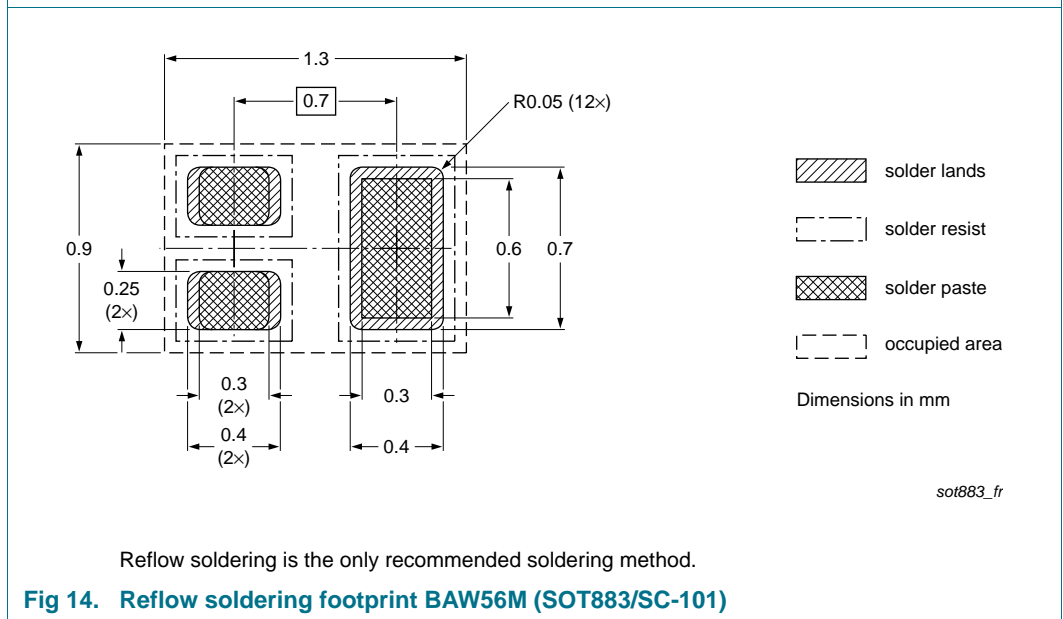


Fig 13. Wave soldering footprint BAW56 (SOT23/TO-236AB)



Reflow soldering is the only recommended soldering method.

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

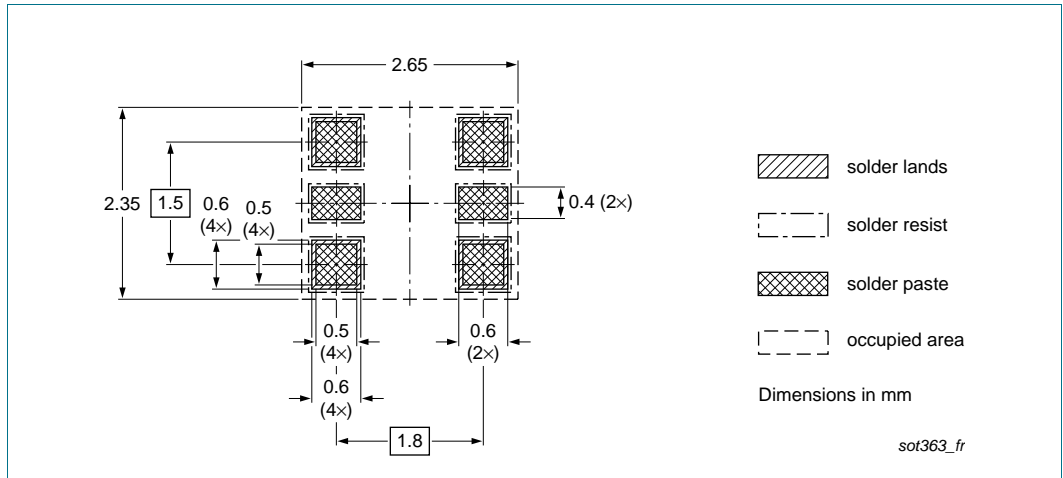


Fig 15. Reflow soldering footprint BAV756S and BAW56S (SOT363/SC-88)

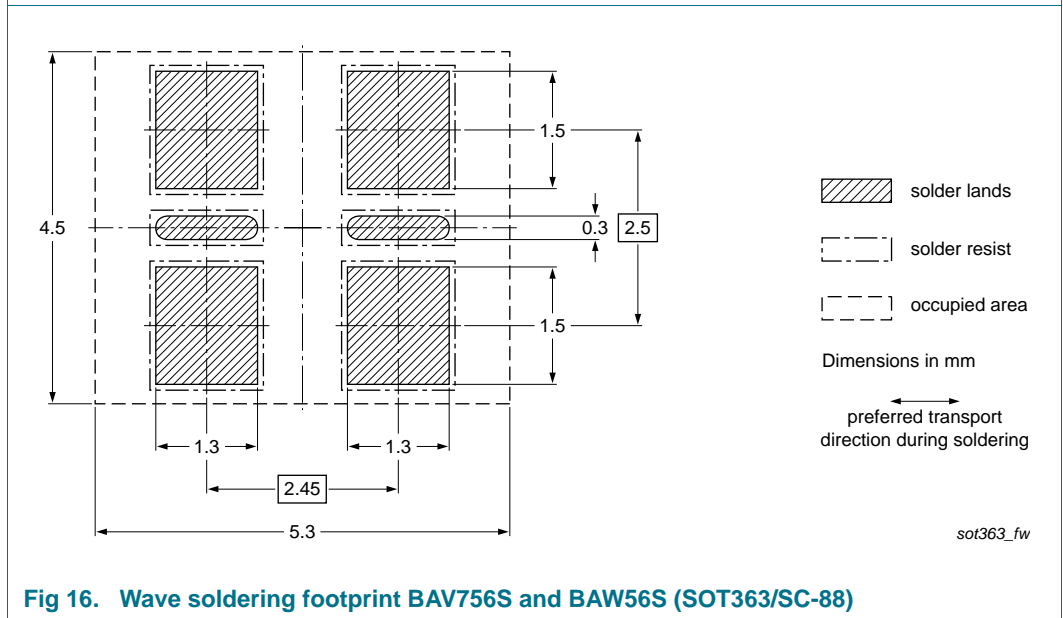


Fig 16. Wave soldering footprint BAV756S and BAW56S (SOT363/SC-88)

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: | <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. | | | |
| BAV756S_BAW56_SER_5 | 20071126 | Product data sheet | - | BAV756S_2 BAW56_4 BAW56S_2 BAW56T_2 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.nexperia.com>.

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

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