

BAS16 series

High-speed switching diodes

Rev. 05 — 25 August 2008

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 | | | Configuration | Package configuration |
|-------------|---------|-------|----------|-----------------|---------------------------|
| | NXP | JEITA | JEDEC | | |
| BAS16 | SOT23 | - | TO-236AB | single | small |
| BAS16H | SOD123F | - | - | single | small and flat lead |
| BAS16J | SOD323F | SC-90 | - | single | very small and flat lead |
| BAS16L | SOD882 | - | - | single | leadless ultra small |
| BAS16T | SOT416 | SC-75 | - | single | ultra small |
| BAS16VV | SOT666 | - | - | triple isolated | ultra small and flat lead |
| BAS16VY | SOT363 | SC-88 | - | triple isolated | very small |
| BAS16W | SOT323 | SC-70 | - | single | very small |
| BAS316 | SOD323 | SC-76 | - | single | very small |
| BAS516 | SOD523 | SC-79 | - | single | ultra small and flat lead |

1.2 Features

- High switching speed: $t_{rr} \leq 4$ ns
- Low leakage current
- Repetitive peak reverse voltage: $V_{RRM} \leq 100$ V
- Low capacitance
- Reverse voltage: $V_R \leq 100$ V
- Small SMD plastic packages

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 | | | | | | |
| V_R | reverse voltage | | - | - | 100 | V |
| I_R | reverse current | $V_R = 80\text{ V}$ | - | - | 0.5 | μA |
| t_{rr} | reverse recovery time | | [1] | - | 4 | ns |

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

2. Pinning information

Table 3. Pinning

| Pin | Description | Simplified outline | Graphic symbol | |
|---------------------------------------|-------------------|--------------------|-----------------------------|------------------|
| BAS16; BAS16T; BAS16W | | | | |
| 1 | anode | <p>006aaa144</p> | <p>006aaa764</p> | |
| 2 | not connected | | | |
| 3 | cathode | | | |
| BAS16H; BAS16J; BAS316; BAS516 | | | | |
| 1 | cathode | [1] | <p>001aab540</p> | <p>006aab040</p> |
| 2 | anode | [1] | | |
| BAS16L | | | | |
| 1 | cathode | [1] | <p>Transparent top view</p> | <p>006aab040</p> |
| 2 | anode | [1] | | |
| BAS16VV; BAS16VY | | | | |
| 1 | anode (diode 1) | <p>001aab555</p> | <p>006aab106</p> | |
| 2 | anode (diode 2) | | | |
| 3 | anode (diode 3) | | | |
| 4 | cathode (diode 3) | | | |
| 5 | cathode (diode 2) | | | |
| 6 | cathode (diode 1) | | | |

[1] The marking bar indicates the cathode.

3. Ordering information

Table 4. Ordering information

| Type number | Package | | Version |
|-------------|---------|---|---------|
| | Name | Description | |
| BAS16 | - | plastic surface-mounted package; 3 leads | SOT23 |
| BAS16H | - | plastic surface-mounted package; 2 leads | SOD123F |
| BAS16J | SC-90 | plastic surface-mounted package; 2 leads | SOD323F |
| BAS16L | - | leadless ultra small plastic package; 2 terminals; body 1.0 × 0.6 × 0.5 mm | SOD882 |
| BAS16T | SC-75 | plastic surface-mounted package; 3 leads | SOT416 |
| BAS16VV | - | plastic surface-mounted package; 6 leads | SOT666 |
| BAS16VY | SC-88 | plastic surface-mounted package; 6 leads | SOT363 |
| BAS16W | SC-70 | plastic surface-mounted package; 3 leads | SOT323 |
| BAS316 | SC-76 | plastic surface-mounted package; 2 leads | SOD323 |
| BAS516 | SC-79 | plastic surface-mounted package; 2 leads | SOD523 |

4. Marking

Table 5. Marking codes

| Type number | Marking code ^[1] |
|-------------|-----------------------------|
| BAS16 | A6* |
| BAS16H | A1 |
| BAS16J | AR |
| BAS16L | S2 |
| BAS16T | A6 |
| BAS16VV | 53 |
| BAS16VY | 16* |
| BAS16W | A6* |
| BAS316 | A6 |
| BAS516 | 6 |

- [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 | | | | |
| | BAS16 | | [1] | 215 | mA |
| | BAS16H BAS16L | | [2] | 215 | mA |
| | BAS16T | | [1] | 155 | mA |
| | BAS16VV BAS16VY | | [1][3] | 200 | mA |
| | BAS16W | | [1] | 175 | mA |
| | BAS16J BAS316 BAS516 | | [1] | 250 | mA |
| I_{FRM} | repetitive peak forward current | $t_p \leq 0.5 \mu\text{s}$; $\delta \leq 0.25$ | - | 500 | mA |
| I_{FSM} | non-repetitive peak forward current | square wave | [4] | | |
| | | $t_p = 1 \mu\text{s}$ | - | 4 | A |
| | | $t_p = 1 \text{ms}$ | - | 1 | A |
| | | $t_p = 1 \text{s}$ | - | 0.5 | A |
| P_{tot} | total power dissipation | | | | |
| | BAS16 | $T_{amb} \leq 25 \text{ }^\circ\text{C}$ | [1] | 250 | mW |
| | BAS16H | $T_{amb} \leq 25 \text{ }^\circ\text{C}$ | [2][5] [6] | 380 | mW |
| | | | [5][6] [7] | 830 | mW |
| | BAS16J | $T_{amb} \leq 25 \text{ }^\circ\text{C}$ | [5][6] [7] | 550 | mW |
| | BAS16L | $T_{amb} \leq 25 \text{ }^\circ\text{C}$ | [2][5] [6] | 250 | mW |
| | BAS16T | $T_{sp} \leq 90 \text{ }^\circ\text{C}$ | [1] | 170 | mW |
| | BAS16VV | $T_{amb} \leq 25 \text{ }^\circ\text{C}$ | [1][3] [5][8] | 180 | mW |
| | BAS16VY | $T_{sp} \leq 85 \text{ }^\circ\text{C}$ | [1][3] [8] | 250 | mW |
| | BAS16W | $T_{amb} \leq 25 \text{ }^\circ\text{C}$ | [1] | 200 | mW |
| | BAS316 | $T_{sp} \leq 90 \text{ }^\circ\text{C}$ | [1][6] | 400 | mW |
| | BAS516 | $T_{sp} \leq 90 \text{ }^\circ\text{C}$ | [1][5] [6] | 500 | mW |

Table 6. Limiting values ...continued

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

| Symbol | Parameter | Conditions | Min | Max | Unit |
|-------------------|----------------------|------------|-----|------|------|
| Per device | | | | | |
| T_j | junction temperature | | - | 150 | °C |
| T_{amb} | ambient temperature | | -65 | +150 | °C |
| T_{stg} | storage temperature | | -65 | +150 | °C |

- [1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.
- [2] Device mounted on an FR4 PCB with 60 μ m copper strip line.
- [3] Single diode loaded.
- [4] $T_j = 25$ °C prior to surge.
- [5] Reflow soldering is the only recommended soldering method.
- [6] Soldering point of cathode tab.
- [7] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 cm².
- [8] Soldering points at pins 4, 5 and 6.

6. Thermal characteristics

Table 7. Thermal characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---------------|---|-------------|--------|-----|-----|---------|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | | | | |
| | BAS16 | | [1] | - | - | 500 K/W |
| | BAS16H | | [2][3] | - | - | 330 K/W |
| | | | [3][4] | - | - | 150 K/W |
| | BAS16J | | [3][4] | - | - | 230 K/W |
| | BAS16L | | [2][3] | - | - | 500 K/W |
| | BAS16VV | | [2][3] | - | - | 700 K/W |
| | | | [5] | | | |
| | | | [3][4] | - | - | 410 K/W |
| | | [5] | | | | |
| | BAS16W | | [1] | - | - | 625 K/W |
| $R_{th(j-t)}$ | thermal resistance from junction to tie-point | | | | | |
| | BAS16 | | - | - | 330 | K/W |
| | BAS16W | | - | - | 300 | 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 | | | | | |
| | BAS16H | | [6] | - | 70 | K/W |
| | BAS16J | | [6] | - | 55 | K/W |
| | BAS16T | | - | - | 350 | K/W |
| | BAS16VY | | [5][7] | - | 260 | K/W |
| | BAS316 | | [6] | - | 150 | K/W |
| | BAS516 | | [6] | - | 120 | K/W |

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

[2] Device mounted on an FR4 PCB with 60 μ m copper strip line.

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

[4] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 cm².

[5] Single diode loaded.

[6] Soldering point of cathode tab.

[7] Soldering points at pins 4, 5 and 6.

7. Characteristics

Table 8. Characteristics

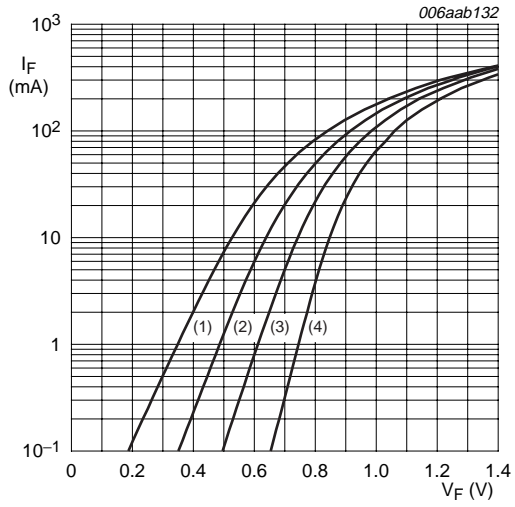
$T_{amb} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

| 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 | μ A |
| | | $V_R = 25\text{ V}; T_j = 150\text{ }^{\circ}\text{C}$ | - | - | 30 | μ A |
| | | $V_R = 80\text{ V}; T_j = 150\text{ }^{\circ}\text{C}$ | - | - | 50 | μ A |
| C_d | diode capacitance | $f = 1\text{ MHz}; V_R = 0\text{ V}$ | | | | |
| | | BAS16; BAS16H; BAS16J; BAS16L; BAS16T; BAS16VV; BAS16VY; BAS16W; BAS316 | - | - | 1.5 | pF |
| | | BAS516 | - | - | 1 | pF |
| t_{rr} | reverse recovery time | | [2] | - | 4 | ns |
| V_{FR} | forward recovery voltage | | [3] | - | 1.75 | V |

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

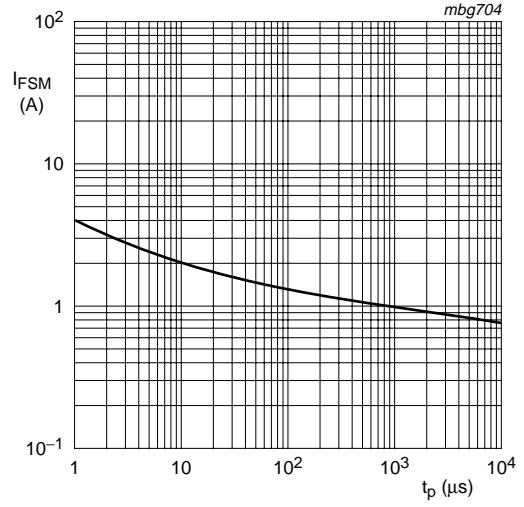
[2] When switched from $I_F = 10\text{ mA}$ to $I_R = 10\text{ mA}; R_L = 100\text{ }\Omega$; measured at $I_R = 1\text{ mA}$.

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



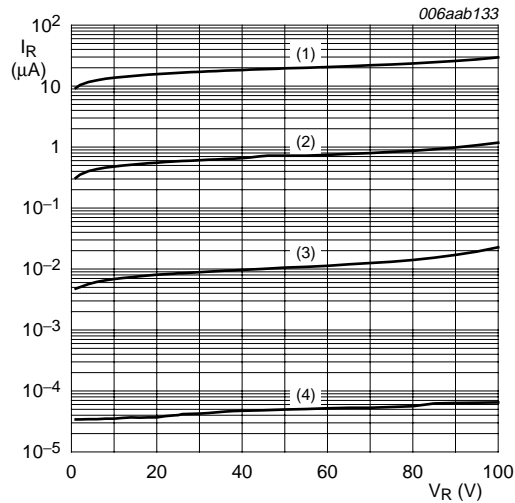
- (1) $T_{amb} = 150^\circ\text{C}$
- (2) $T_{amb} = 85^\circ\text{C}$
- (3) $T_{amb} = 25^\circ\text{C}$
- (4) $T_{amb} = -40^\circ\text{C}$

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



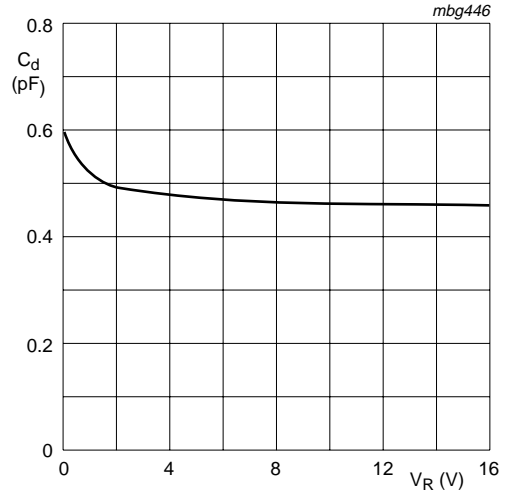
Based on square wave currents.
 $T_j = 25^\circ\text{C}$; prior to surge

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



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

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



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

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

8. Test information

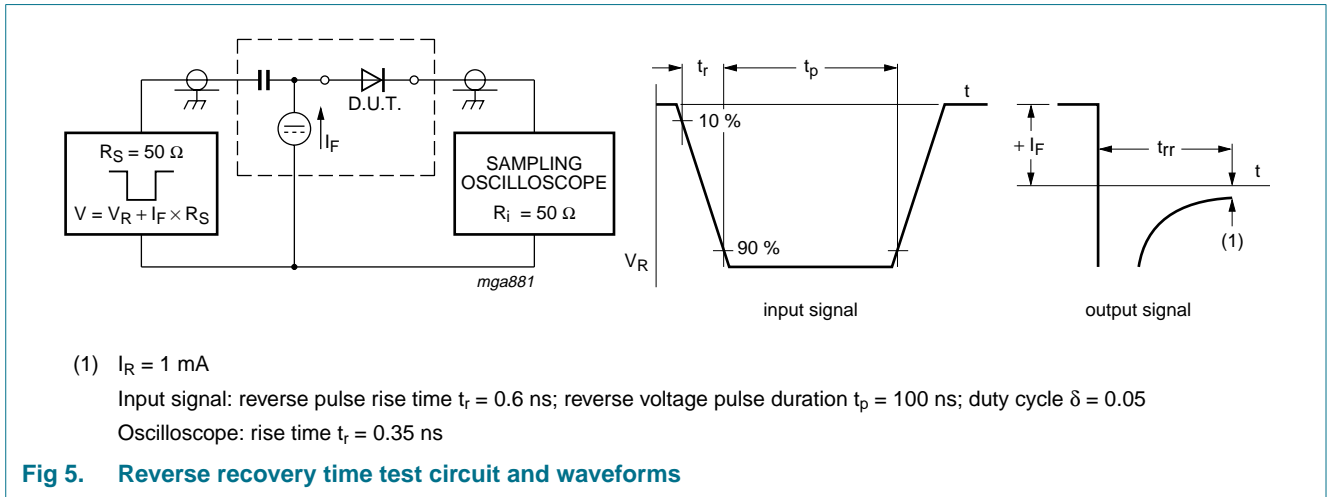


Fig 5. Reverse recovery time test circuit and waveforms

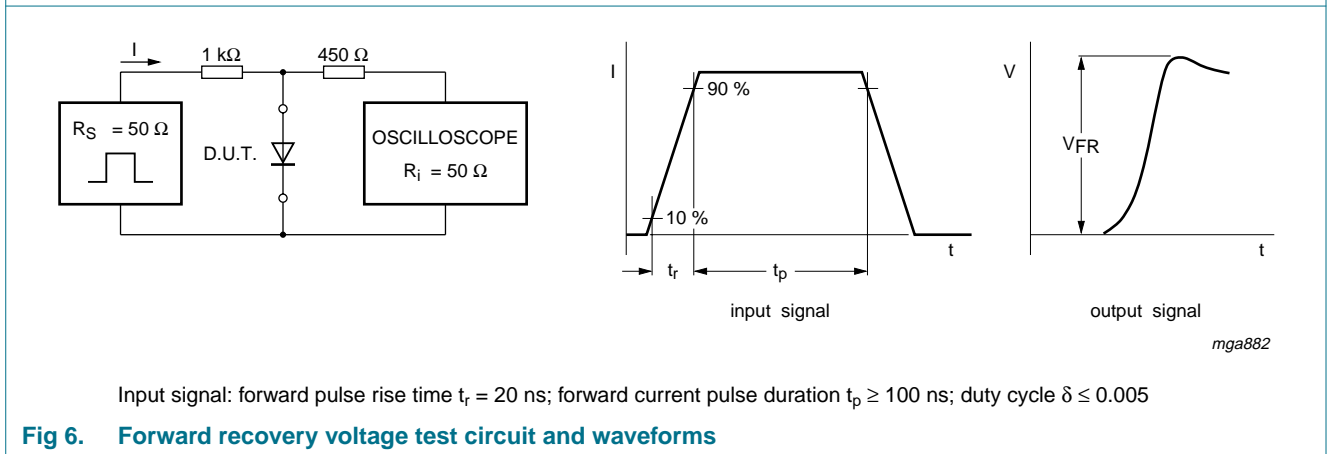


Fig 6. Forward recovery voltage test circuit and waveforms

9. Package outline

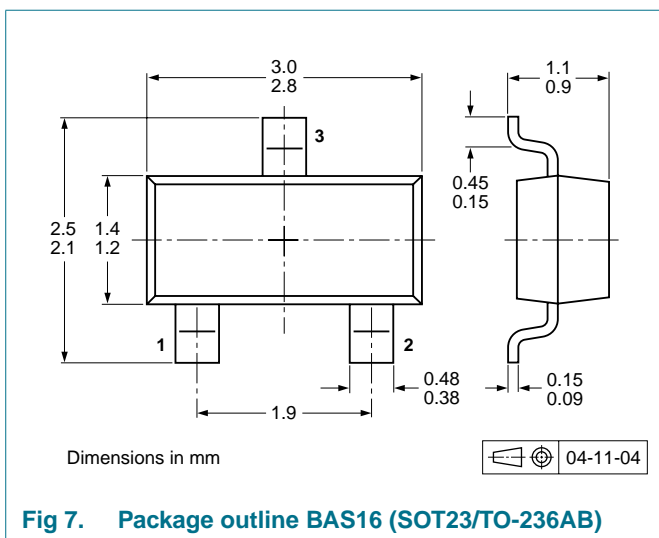


Fig 7. Package outline BAS16 (SOT23/TO-236AB)

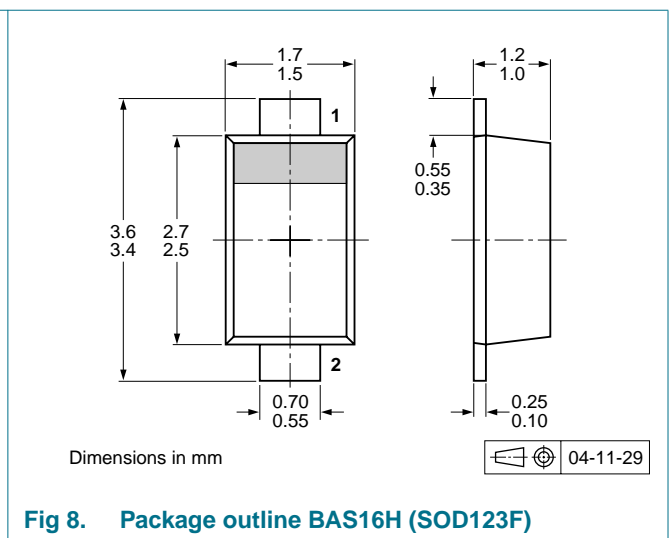
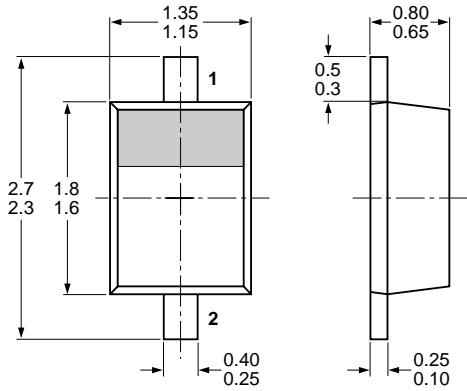


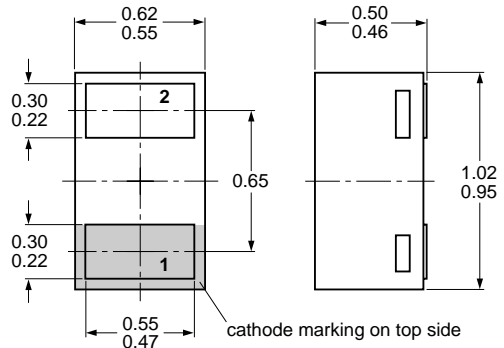
Fig 8. Package outline BAS16H (SOD123F)



Dimensions in mm



Fig 9. Package outline BAS16J (SOD323F/SC-90)



Dimensions in mm

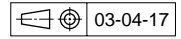
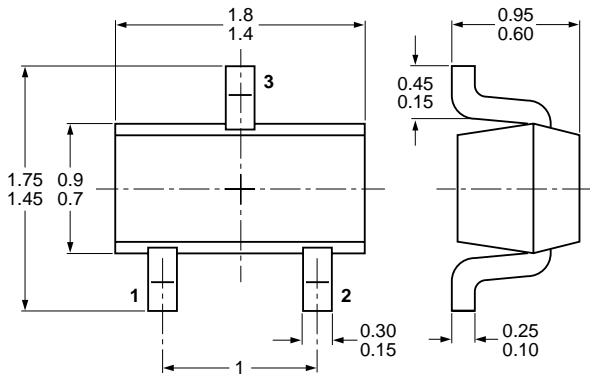


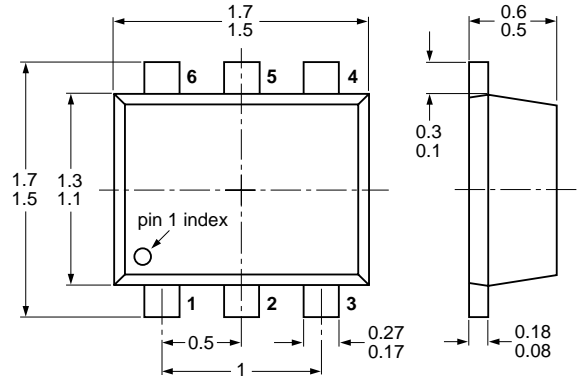
Fig 10. Package outline BAS16L (SOD882)



Dimensions in mm



Fig 11. Package outline BAS16T (SOT416/SC-75)



Dimensions in mm

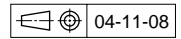
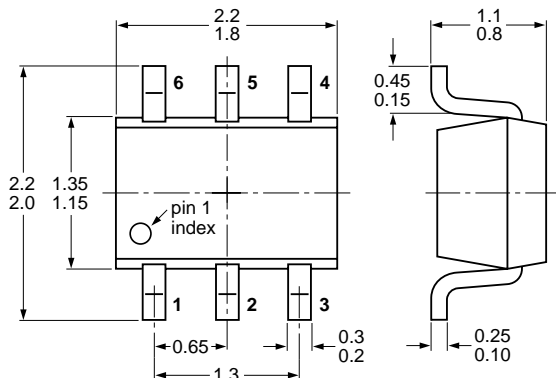


Fig 12. Package outline BAS16VV (SOT666)



Dimensions in mm

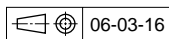
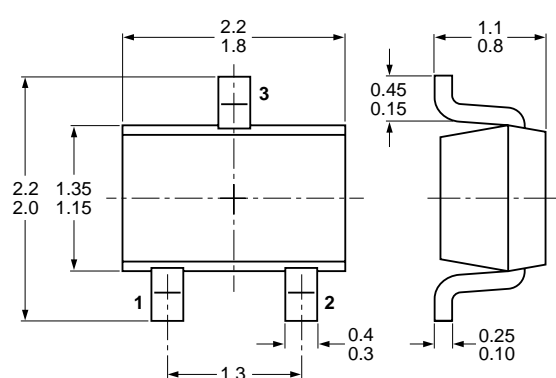


Fig 13. Package outline BAS16VY (SOT363)



Dimensions in mm

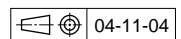


Fig 14. Package outline BAS16W (SOT323/SC-70)

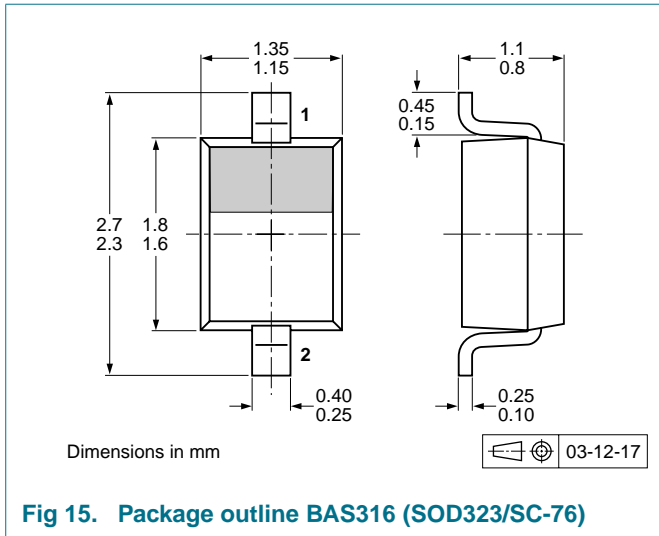


Fig 15. Package outline BAS316 (SOD323/SC-76)

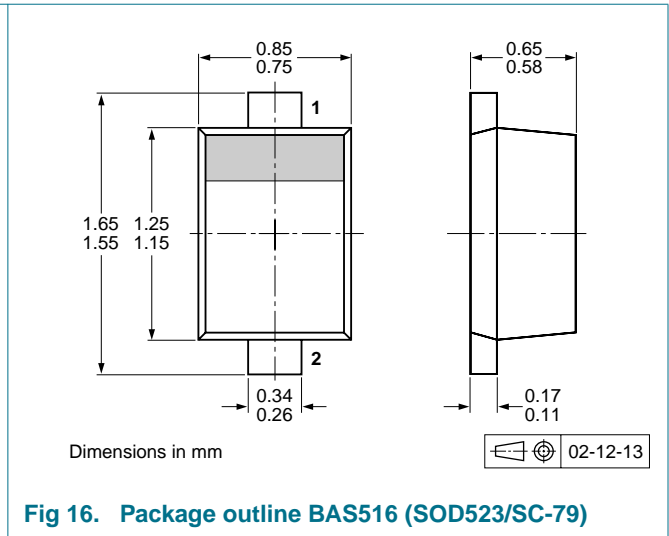


Fig 16. Package outline BAS516 (SOD523/SC-79)

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 | 4000 | 8000 | 10000 |
| BAS16 | SOT23 | 4 mm pitch, 8 mm tape and reel | -215 | - | - | -235 |
| BAS16H | SOD123F | 4 mm pitch, 8 mm tape and reel | -115 | - | - | -135 |
| BAS16J | SOD323F | 4 mm pitch, 8 mm tape and reel | -115 | - | - | -135 |
| BAS16L | SOD882 | 2 mm pitch, 8 mm tape and reel | - | - | - | -315 |
| BAS16T | SOT416 | 4 mm pitch, 8 mm tape and reel | -115 | - | - | -135 |
| BAS16VV | SOT666 | 2 mm pitch, 8 mm tape and reel | - | - | -315 | - |
| | | 4 mm pitch, 8 mm tape and reel | - | -115 | - | - |
| BAS16VY | 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 |
| BAS16W | SOT323 | 4 mm pitch, 8 mm tape and reel | -115 | - | - | -135 |
| BAS316 | SOD323 | 4 mm pitch, 8 mm tape and reel | -115 | - | - | -135 |
| BAS516 | SOD523 | 2 mm pitch, 8 mm tape and reel | - | - | -315 | - |
| | | 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

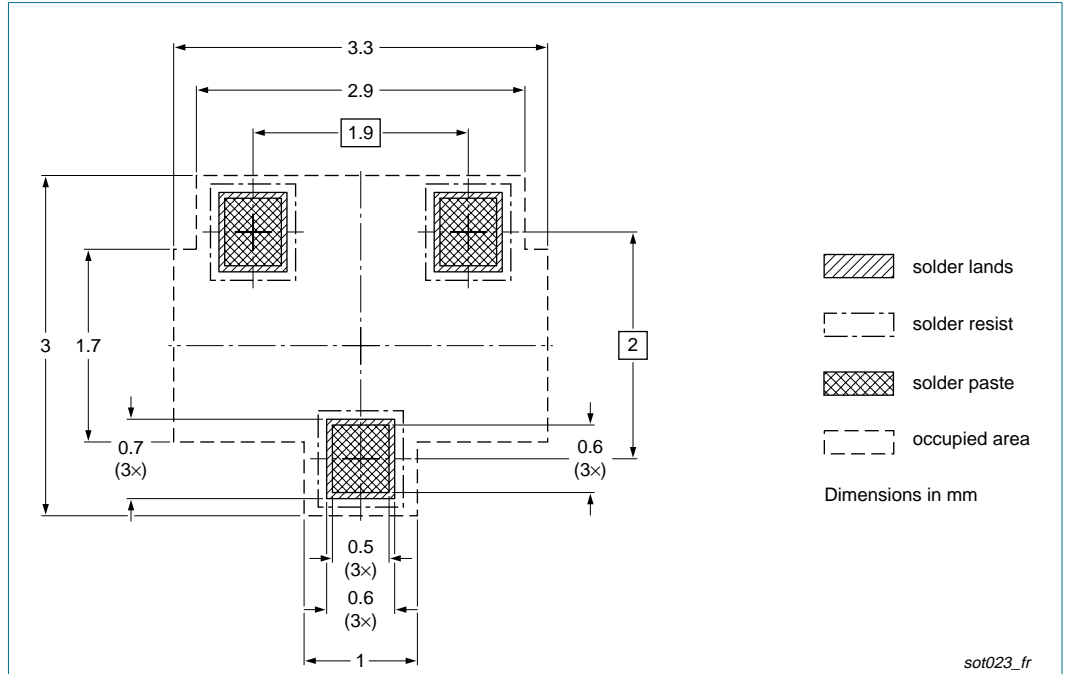


Fig 17. Reflow soldering footprint BAS16 (SOT23/TO-236AB)

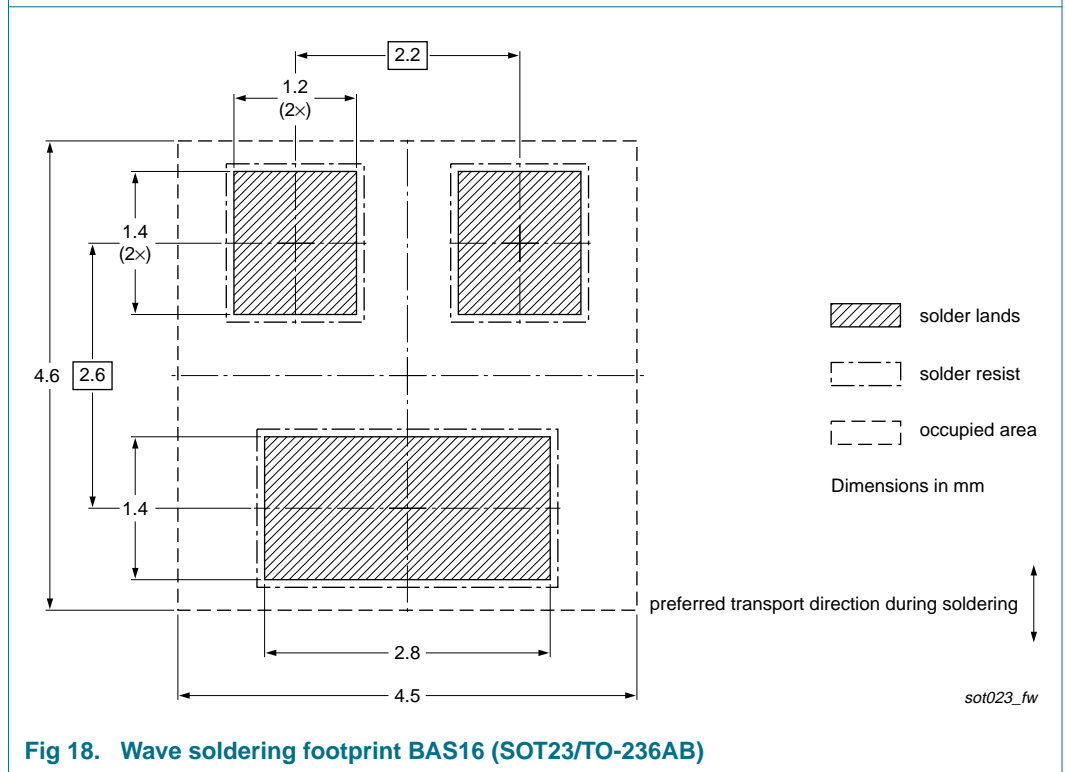
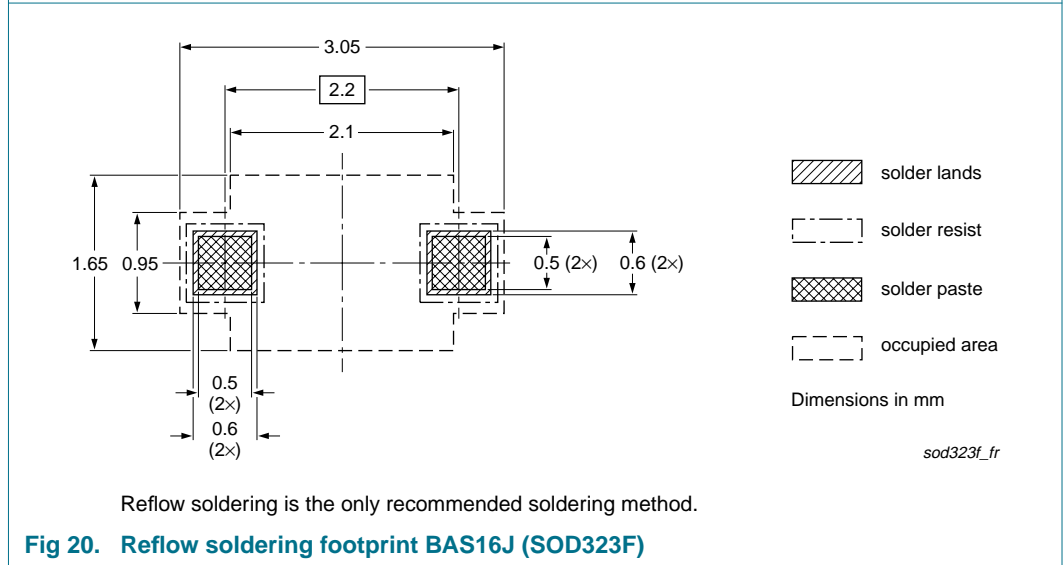
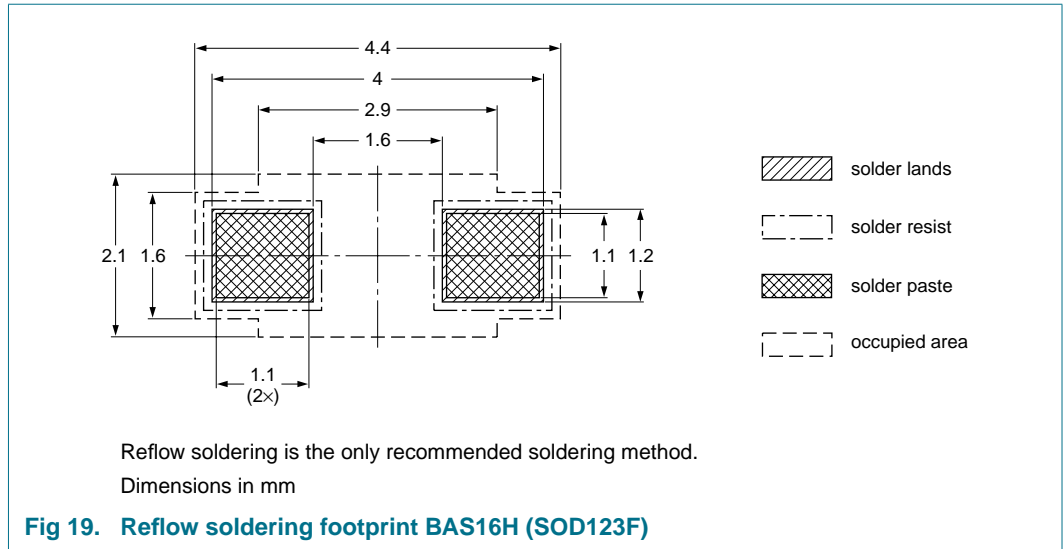
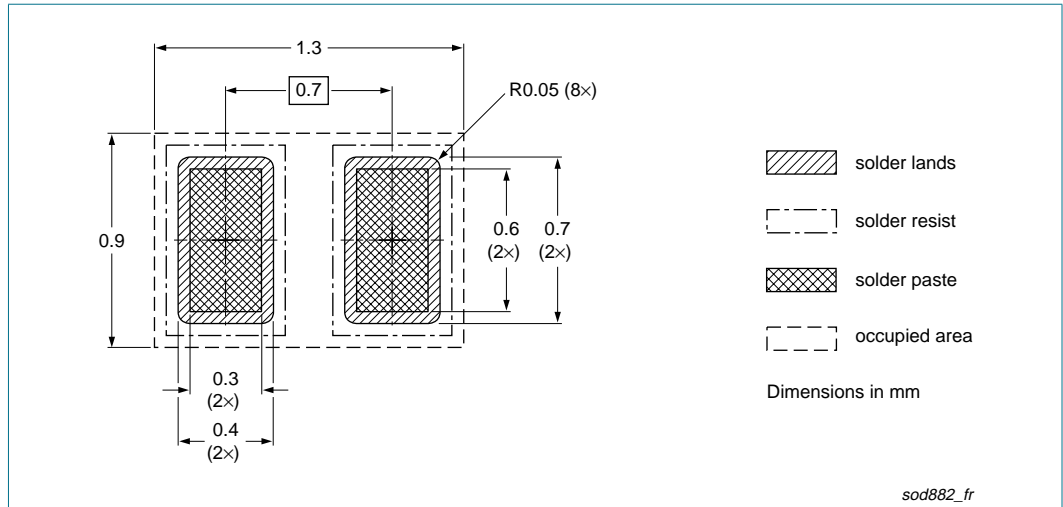


Fig 18. Wave soldering footprint BAS16 (SOT23/TO-236AB)





Reflow soldering is the only recommended soldering method.

Fig 21. Reflow soldering footprint BAS16L (SOD882)

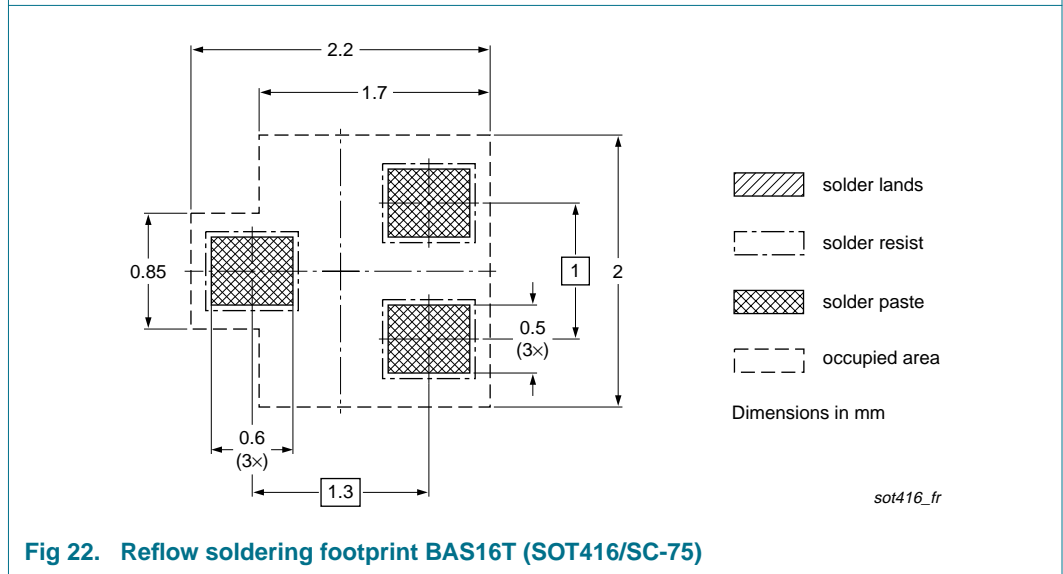
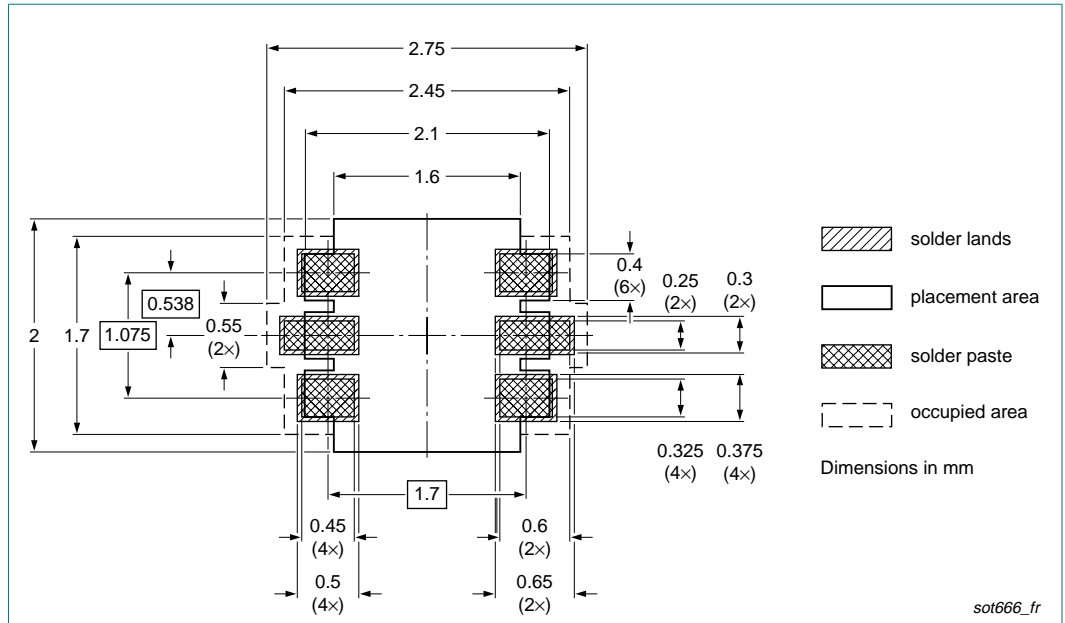


Fig 22. Reflow soldering footprint BAS16T (SOT416/SC-75)



Reflow soldering is the only recommended soldering method.

Fig 23. Reflow soldering footprint BAS16VV (SOT666)

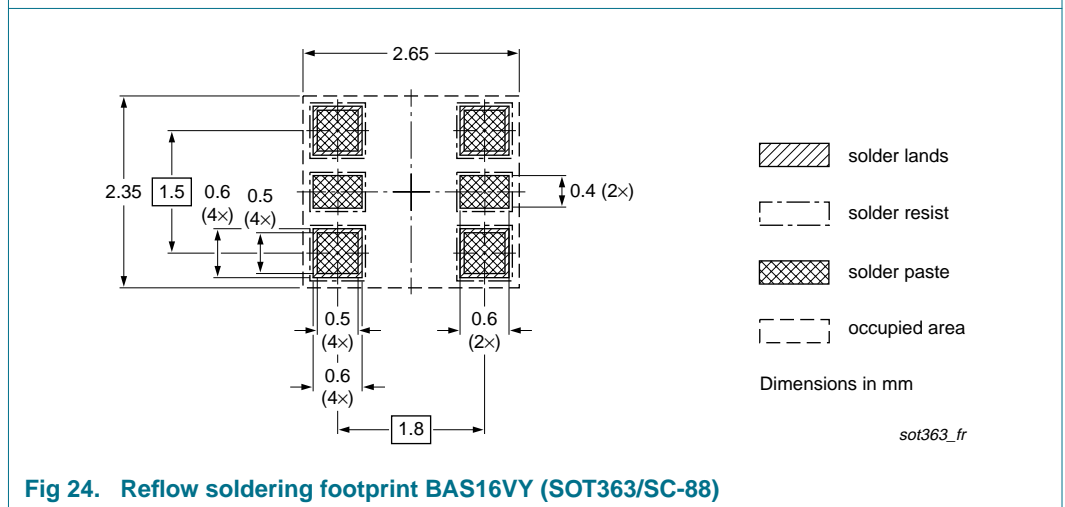


Fig 24. Reflow soldering footprint BAS16VY (SOT363/SC-88)

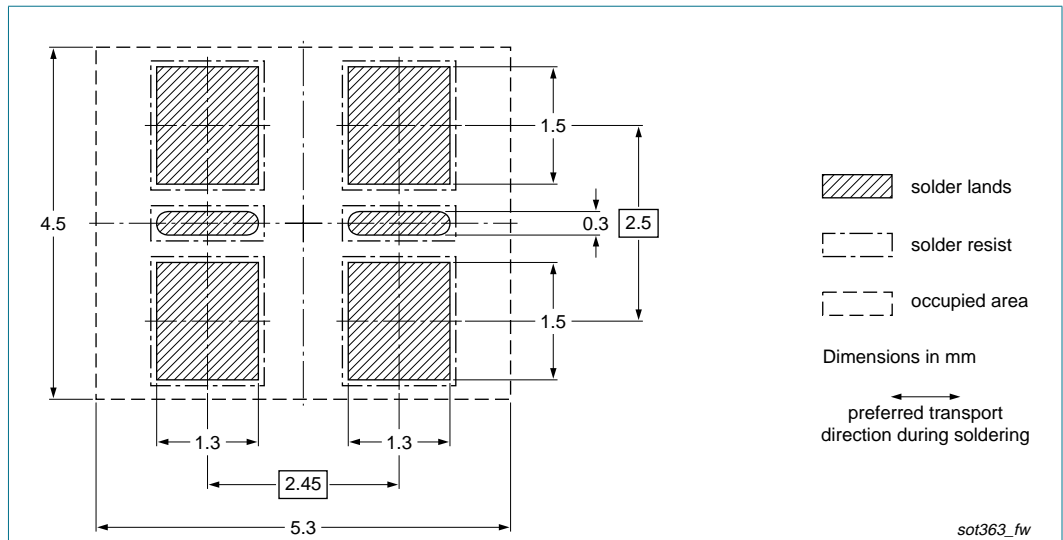


Fig 25. Wave soldering footprint BAS16VY (SOT363/SC-88)

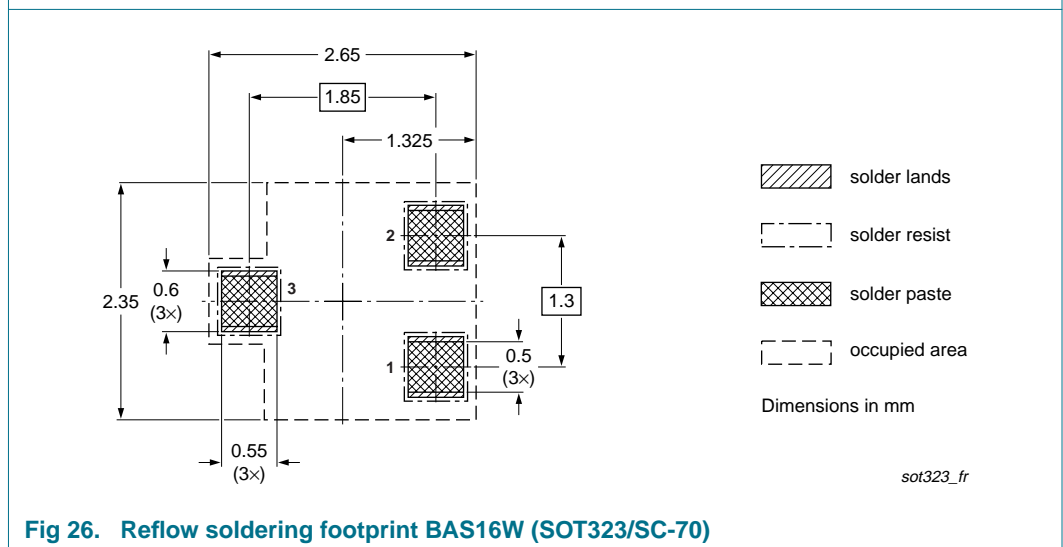


Fig 26. Reflow soldering footprint BAS16W (SOT323/SC-70)

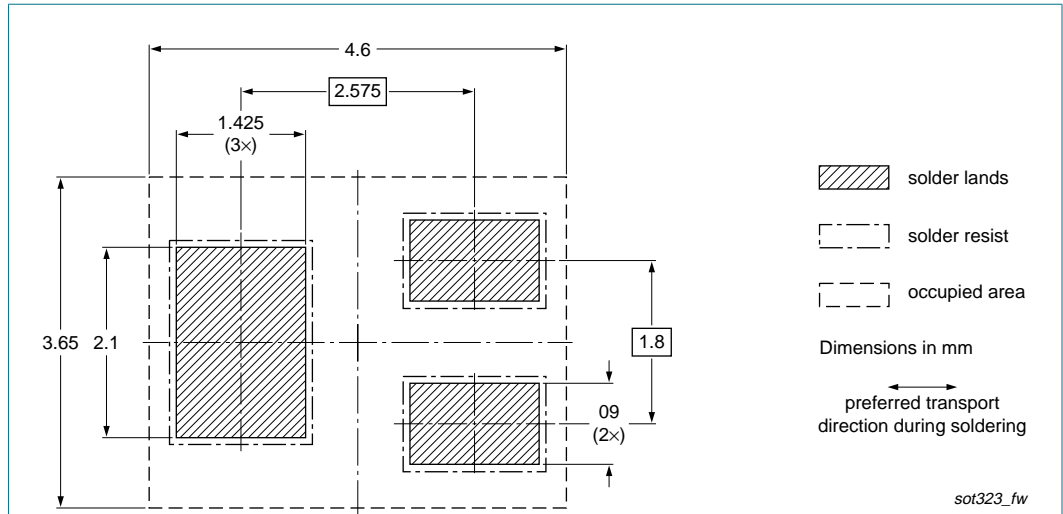


Fig 27. Wave soldering footprint BAS16W (SOT323/SC-70)

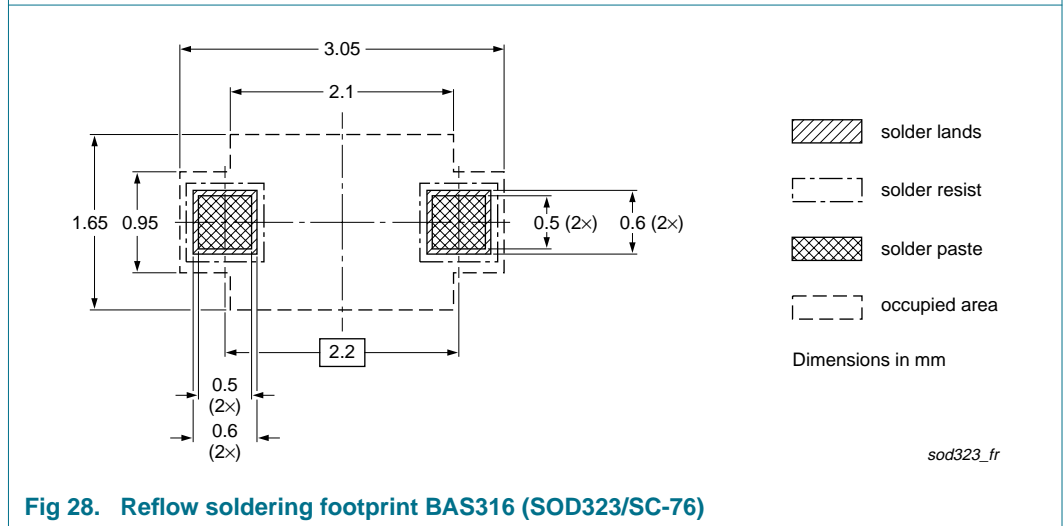


Fig 28. Reflow soldering footprint BAS316 (SOD323/SC-76)

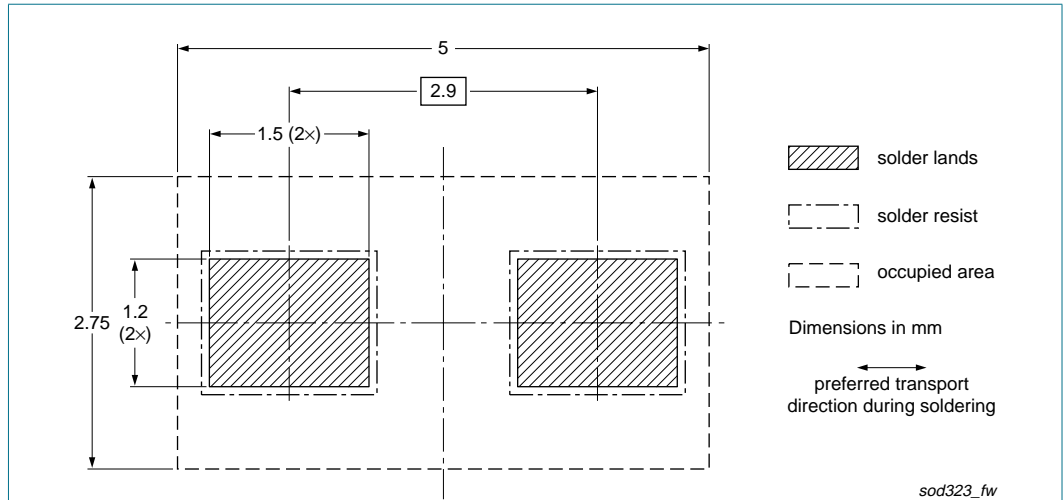


Fig 29. Wave soldering footprint BAS316 (SOD323/SC-76)

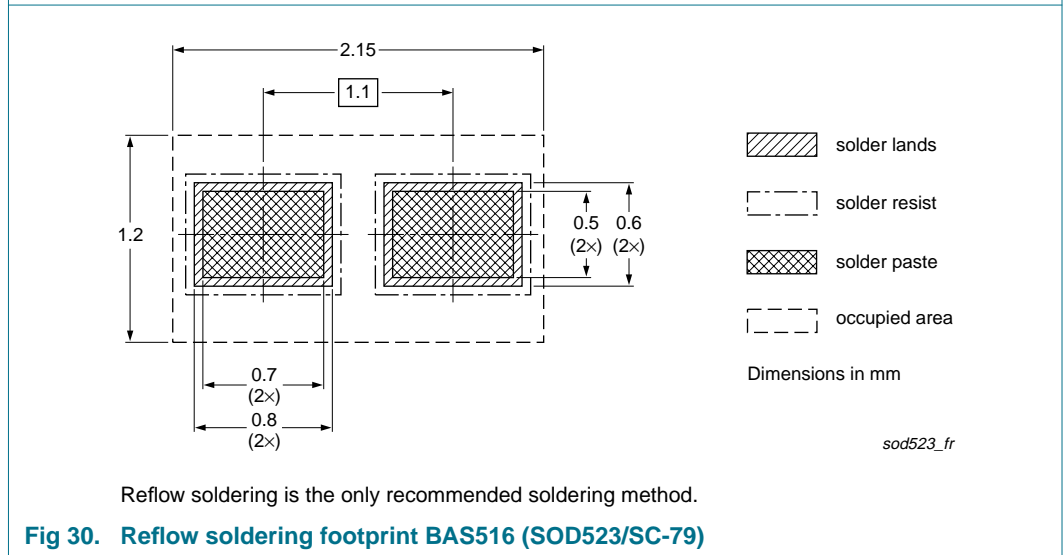


Fig 30. Reflow soldering footprint BAS516 (SOD523/SC-79)

12. Revision history

Table 10. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|-------------------|--------------|-----------------------|---------------|---|
| BAS16_SER_5 | 20080825 | Product data sheet | - | BAS16_4 BAS16H_1 BAS16J_1 BAS16L_1 BAS16T_1 BAS16VV_BAS16VY_3 BAS16W_4 BAS316_4 BAS516_1 |
| 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. • Table 5 “Marking codes”: marking code amended for BAS16W • Table 6 “Limiting values”: for BAS16, BAS16T, BAS16W and BAS516 change of V_{RRM} maximum value from 85 V to 100 V • Table 6 “Limiting values”: for BAS16, BAS16L, BAS16T, BAS16W and BAS516 change of V_R maximum value from 75 V to 100 V • Table 8 “Characteristics”: change of I_R condition V_R from 75 V to 80 V for $T_j = 25\text{ °C}$ • Table 8 “Characteristics”: change of I_R maximum value from 1.0 μA to 0.5 μA for $V_R = 80\text{ V}$ and $T_j = 25\text{ °C}$ • Table 8 “Characteristics”: change of I_R condition V_R from 75 V to 80 V for $T_j = 150\text{ °C}$ • Section 13 “Legal information”: updated |
| BAS16_4 | 20011010 | Product specification | - | BAS16_3 |
| BAS16H_1 | 20050415 | Product data sheet | - | - |
| BAS16J_1 | 20070308 | Product data sheet | - | - |
| BAS16L_1 | 20030623 | Product specification | - | - |
| BAS16T_1 | 19980120 | Product specification | - | - |
| BAS16VV_BAS16VY_3 | 20070420 | Product data sheet | - | BAS16VV_BAS16VY_2 |
| BAS16W_4 | 19990506 | Product specification | - | BAS16W_3 |
| BAS316_4 | 20040204 | Product specification | - | BAS316_3 |
| BAS516_1 | 19980831 | Product specification | - | - |

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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Date of release: 25 August 2008

Document identifier: BAS16_SER_5