

# BZT52H series

## Single Zener diodes in a SOD123F package

Rev. 3 — 7 December 2010 Product data sheet

## 1. Product profile

### 1.1 General description

General-purpose Zener diodes in a SOD123F small and flat lead Surface-Mounted Device (SMD) plastic package.

### 1.2 Features and benefits

- Total power dissipation: ≤ 830 mW
- Wide working voltage range: nominal 2.4 V to 75 V (E24 range)
- Small plastic package suitable for surface-mounted design
- Low differential resistance
- AEC-Q101 qualified

### 1.3 Applications

- General regulation functions

### 1.4 Quick reference data

**Table 1. Quick reference data**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_F$ | forward voltage | $I_F$ = 10 mA | [1] | - | - | 0.9 | V |
| $P_{tot}$ | total power dissipation | $T_{amb} \leq 25$ °C | [2] | - | - | 375 | mW |
| | | | [3] | - | - | 830 | mW |

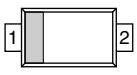
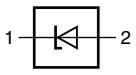
[1] Pulse test: $t_p \leq 300$ μs; $\delta \leq 0.02$.

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

[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 $cm^2$.

## 2. Pinning information

**Table 2. Pinning**

| Pin | Description | | Simplified outline | Graphic symbol |
|---|---|---|---|---|
| 1 | cathode | [1] |  |  |
| 2 | anode | | | |





006aaa152

[1] The marking bar indicates the cathode.

## 3. Ordering information

**Table 3. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| BZT52H-B2V4 to BZT52H-C75[1] | - | plastic surface-mounted package; 2 leads | SOD123F |

[1] The series consists of 74 types with nominal working voltages from 2.4 V to 75 V.

## 4. Marking

**Table 4. Marking codes**

| Type number | Marking code | Type number | Marking code | Type number | Marking code | Type number | Marking code |
|---|---|---|---|---|---|---|---|
| BZT52H-B2V4 | DC | BZT52H-B15 | DX | BZT52H-C2V4 | B3 | BZT52H-C15 | BN |
| BZT52H-B2V7 | DD | BZT52H-B16 | DY | BZT52H-C2V7 | B4 | BZT52H-C16 | BP |
| BZT52H-B3V0 | DE | BZT52H-B18 | DZ | BZT52H-C3V0 | B5 | BZT52H-C18 | BQ |
| BZT52H-B3V3 | DF | BZT52H-B20 | E1 | BZT52H-C3V3 | B6 | BZT52H-C20 | BR |
| BZT52H-B3V6 | DG | BZT52H-B22 | E2 | BZT52H-C3V6 | B7 | BZT52H-C22 | BS |
| BZT52H-B3V9 | DH | BZT52H-B24 | E3 | BZT52H-C3V9 | B8 | BZT52H-C24 | BT |
| BZT52H-B4V3 | DJ | BZT52H-B27 | E4 | BZT52H-C4V3 | B9 | BZT52H-C27 | BU |
| BZT52H-B4V7 | DK | BZT52H-B30 | E5 | BZT52H-C4V7 | BA | BZT52H-C30 | BV |
| BZT52H-B5V1 | DL | BZT52H-B33 | E6 | BZT52H-C5V1 | BB | BZT52H-C33 | BW |
| BZT52H-B5V6 | DM | BZT52H-B36 | E7 | BZT52H-C5V6 | BC | BZT52H-C36 | BX |
| BZT52H-B6V2 | DN | BZT52H-B39 | E8 | BZT52H-C6V2 | BD | BZT52H-C39 | BY |
| BZT52H-B6V8 | DP | BZT52H-B43 | E9 | BZT52H-C6V8 | BE | BZT52H-C43 | BZ |
| BZT52H-B7V5 | DQ | BZT52H-B47 | EA | BZT52H-C7V5 | BF | BZT52H-C47 | C1 |
| BZT52H-B8V2 | DR | BZT52H-B51 | EB | BZT52H-C8V2 | BG | BZT52H-C51 | C2 |
| BZT52H-B9V1 | DS | BZT52H-B56 | EC | BZT52H-C9V1 | BH | BZT52H-C56 | C3 |
| BZT52H-B10 | DT | BZT52H-B62 | ED | BZT52H-C10 | BJ | BZT52H-C62 | C4 |
| BZT52H-B11 | DU | BZT52H-B68 | EE | BZT52H-C11 | BK | BZT52H-C68 | C5 |
| BZT52H-B12 | DV | BZT52H-B75 | EF | BZT52H-C12 | BL | BZT52H-C75 | C6 |
| BZT52H-B13 | DW | - | - | BZT52H-C13 | BM | - | - |


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## 5. Limiting values

**Table 5. Limiting values**

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

| Symbol | Parameter | Conditions | | Min | Max | Unit |
|---|---|---|---|---|---|---|
| $I_F$ | forward current | | | - | 250 | mA |
| $I_{ZSM}$ | non-repetitive peak reverse current | | | - | see Table 8, 9 and 10 | |
| $P_{ZSM}$ | non-repetitive peak reverse power dissipation | | [1] | - | 40 | W |
| $P_{tot}$ | total power dissipation | $T_{amb} \leq 25$ °C | [2] | - | 375 | mW |
| | | | [3] | - | 830 | mW |
| $T_j$ | junction temperature | | | - | 150 | °C |
| $T_{amb}$ | ambient temperature | | | −65 | +150 | °C |
| $T_{stg}$ | storage temperature | | | −65 | +150 | °C |

[1] $t_p$ = 100 μs; square wave; $T_j$ = 25 °C prior to surge.

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

[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 $cm^2$.

## 6. Thermal characteristics

**Table 6. Thermal characteristics**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | [1] | - | - | 330 | K/W |
| | | | [2] | - | - | 150 | K/W |
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point | | [3] | - | - | 70 | K/W |

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

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 $cm^2$.

[3] Soldering point of cathode tab.


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# 7. Characteristics

**Table 7. Characteristics**

*$T_j$ = 25 °C unless otherwise specified.*

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_F$ | forward voltage | $I_F$ = 10 mA | [1] | - | - | 0.9 | V |

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

**Table 8. Characteristics per type; BZT52H-B2V4 to BZT52H-C24**

*$T_j$ = 25 °C unless otherwise specified.*

| BZT52H -xxx | Sel | Working voltage $V_Z$ (V); $I_Z$ = 5 mA | | Maximum differential resistance $r_{dif}$ (Ω) | | Reverse current $I_R$ (μA) | | Temperature coefficient $S_Z$ (mV/K); $I_Z$ = 5 mA | | Diode capacitance $C_d$ (pF)[1] | Non-repetitive peak reverse current $I_{ZSM}$ (A)[2] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Min | Max | $I_Z$ = 1 mA | $I_Z$ = 5 mA | Max | $V_R$ (V) | Min | Max | Max | Max |
| 2V4 | B | 2.35 | 2.45 | 400 | 85 | 50 | 1 | –3.5 | 0.0 | 450 | 6.0 |
| | C | 2.2 | 2.6 | | | | | | | | |
| 2V7 | B | 2.65 | 2.75 | 500 | 83 | 20 | 1 | –3.5 | 0.0 | 450 | 6.0 |
| | C | 2.5 | 2.9 | | | | | | | | |
| 3V0 | B | 2.94 | 3.06 | 500 | 95 | 10 | 1 | –3.5 | 0.0 | 450 | 6.0 |
| | C | 2.8 | 3.2 | | | | | | | | |
| 3V3 | B | 3.23 | 3.37 | 500 | 95 | 5 | 1 | –3.5 | 0.0 | 450 | 6.0 |
| | C | 3.1 | 3.5 | | | | | | | | |
| 3V6 | B | 3.53 | 3.67 | 500 | 95 | 5 | 1 | –3.5 | 0.0 | 450 | 6.0 |
| | C | 3.4 | 3.8 | | | | | | | | |
| 3V9 | B | 3.82 | 3.98 | 500 | 95 | 3 | 1 | –3.5 | 0.0 | 450 | 6.0 |
| | C | 3.7 | 4.1 | | | | | | | | |
| 4V3 | B | 4.21 | 4.39 | 500 | 95 | 3 | 1 | –3.5 | 0.0 | 450 | 6.0 |
| | C | 4.0 | 4.6 | | | | | | | | |
| 4V7 | B | 4.61 | 4.79 | 500 | 78 | 3 | 2 | –3.5 | 0.2 | 300 | 6.0 |
| | C | 4.4 | 5.0 | | | | | | | | |
| 5V1 | B | 5.0 | 5.2 | 480 | 60 | 2 | 2 | –2.7 | 1.2 | 300 | 6.0 |
| | C | 4.8 | 5.4 | | | | | | | | |
| 5V6 | B | 5.49 | 5.71 | 400 | 40 | 1 | 2 | –2.0 | 2.5 | 300 | 6.0 |
| | C | 5.2 | 6.0 | | | | | | | | |
| 6V2 | B | 6.08 | 6.32 | 150 | 10 | 3 | 4 | 0.4 | 3.7 | 200 | 6.0 |
| | C | 5.8 | 6.6 | | | | | | | | |
| 6V8 | B | 6.66 | 6.94 | 80 | 8 | 2 | 4 | 1.2 | 4.5 | 200 | 6.0 |
| | C | 6.4 | 7.2 | | | | | | | | |
| 7V5 | B | 7.35 | 7.65 | 80 | 10 | 1 | 5 | 2.5 | 5.3 | 150 | 4.0 |
| | C | 7.0 | 7.9 | | | | | | | | |
| 8V2 | B | 8.04 | 8.36 | 80 | 10 | 0.7 | 5 | 3.2 | 6.2 | 150 | 4.0 |
| | C | 7.7 | 8.7 | | | | | | | | |


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**Table 8. Characteristics per type; BZT52H-B2V4 to BZT52H-C24** *…continued*

*$T_j$ = 25 °C unless otherwise specified.*

| BZT52H -xxx | Sel | Working voltage $V_Z$ (V); $I_Z$ = 5 mA | | Maximum differential resistance $r_{dif}$ (Ω) | | Reverse current $I_R$ (μA) | | Temperature coefficient $S_Z$ (mV/K); $I_Z$ = 5 mA | | Diode capacitance $C_d$ (pF)[1] | Non-repetitive peak reverse current $I_{ZSM}$ (A)[2] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Min | Max | $I_Z$ = 1 mA | $I_Z$ = 5 mA | Max | $V_R$ (V) | Min | Max | Max | Max |
| 9V1 | B | 8.92 | 9.28 | 100 | 10 | 0.5 | 6 | 3.8 | 7.0 | 150 | 3.0 |
| | C | 8.5 | 9.6 | | | | | | | | |
| 10 | B | 9.8 | 10.2 | 70 | 10 | 0.2 | 7 | 4.5 | 8.0 | 90 | 3.0 |
| | C | 9.4 | 10.6 | | | | | | | | |
| 11 | B | 10.8 | 11.2 | 70 | 10 | 0.1 | 8 | 5.4 | 9.0 | 85 | 2.5 |
| | C | 10.4 | 11.6 | | | | | | | | |
| 12 | B | 11.8 | 12.2 | 90 | 10 | 0.1 | 8 | 6.0 | 10.0 | 85 | 2.5 |
| | C | 11.4 | 12.7 | | | | | | | | |
| 13 | B | 12.7 | 13.3 | 110 | 10 | 0.1 | 8 | 7.0 | 11.0 | 80 | 2.5 |
| | C | 12.4 | 14.1 | | | | | | | | |
| 15 | B | 14.7 | 15.3 | 110 | 15 | 0.05 | 10.5 | 9.2 | 13.0 | 75 | 2.0 |
| | C | 13.8 | 15.6 | | | | | | | | |
| 16 | B | 15.7 | 16.3 | 170 | 20 | 0.05 | 11.2 | 10.4 | 14.0 | 75 | 1.5 |
| | C | 15.3 | 17.1 | | | | | | | | |
| 18 | B | 17.6 | 18.4 | 170 | 20 | 0.05 | 12.6 | 12.4 | 16.0 | 70 | 1.5 |
| | C | 16.8 | 19.1 | | | | | | | | |
| 20 | B | 19.6 | 20.4 | 220 | 20 | 0.05 | 14 | 14.4 | 18.0 | 60 | 1.5 |
| | C | 18.8 | 21.2 | | | | | | | | |
| 22 | B | 21.6 | 22.4 | 220 | 25 | 0.05 | 15.4 | 16.4 | 20.0 | 60 | 1.25 |
| | C | 20.8 | 23.3 | | | | | | | | |
| 24 | B | 23.5 | 24.5 | 220 | 30 | 0.05 | 16.8 | 18.4 | 22.0 | 55 | 1.25 |
| | C | 22.8 | 25.6 | | | | | | | | |

[1] f = 1 MHz; $V_R$ = 0 V.

[2] $t_p$ = 100 μs; $T_{amb}$ = 25 °C.


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**Table 9. Characteristics per type; BZT52H-B27 to BZT52H-C51**

*$T_j$ = 25 °C unless otherwise specified.*

| BZT52H -xxx | Sel | Working voltage $V_Z$ (V); $I_Z$ = 2 mA | | Maximum differential resistance $r_{dif}$ (Ω) | | Reverse current $I_R$ (μA) | | Temperature coefficient $S_Z$ (mV/K); $I_Z$ = 5 mA | | Diode capacitance $C_d$ (pF)[1] | Non-repetitive peak reverse current $I_{ZSM}$ (A)[2] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Min | Max | $I_Z$ = 1 mA | $I_Z$ = 5 mA | Max | $V_R$ (V) | Min | Max | Max | Max |
| 27 | B | 26.5 | 27.5 | 250 | 40 | 0.05 | 18.9 | 21.4 | 25.3 | 50 | 1.0 |
| | C | 25.1 | 28.9 | | | | | | | | |
| 30 | B | 29.4 | 30.6 | 250 | 40 | 0.05 | 21 | 24.4 | 29.4 | 50 | 1.0 |
| | C | 28.0 | 32.0 | | | | | | | | |
| 33 | B | 32.3 | 33.7 | 250 | 40 | 0.05 | 23.1 | 27.4 | 33.4 | 45 | 0.9 |
| | C | 31.0 | 35.0 | | | | | | | | |
| 36 | B | 35.3 | 36.7 | 250 | 60 | 0.05 | 25.2 | 30.4 | 37.4 | 45 | 0.8 |
| | C | 34.0 | 38.0 | | | | | | | | |
| 39 | B | 38.2 | 39.8 | 300 | 75 | 0.05 | 27.3 | 33.4 | 41.2 | 45 | 0.7 |
| | C | 37.0 | 41.0 | | | | | | | | |
| 43 | B | 42.1 | 43.9 | 325 | 80 | 0.05 | 30.1 | 37.6 | 46.6 | 40 | 0.6 |
| | C | 40.0 | 46.0 | | | | | | | | |
| 47 | B | 46.1 | 47.9 | 325 | 90 | 0.05 | 32.9 | 42.0 | 51.8 | 40 | 0.5 |
| | C | 44.0 | 50.0 | | | | | | | | |
| 51 | B | 50.0 | 52.0 | 350 | 100 | 0.05 | 35.7 | 46.6 | 57.2 | 40 | 0.4 |
| | C | 48.0 | 54.0 | | | | | | | | |

[1] f = 1 MHz; $V_R$ = 0 V.

[2] $t_p$ = 100 μs; $T_{amb}$ = 25 °C.

**Table 10. Characteristics per type; BZT52H-B56 to BZT52H-C75**

*$T_j$ = 25 °C unless otherwise specified.*

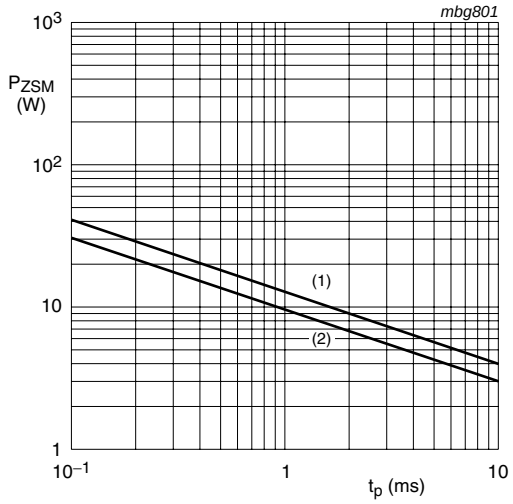
| BZT52H -xxx | Sel | Working voltage $V_Z$ (V); $I_Z$ = 2 mA | | Maximum differential resistance $r_{dif}$ (Ω) | | Reverse current $I_R$ (μA) | | Temperature coefficient $S_Z$ (mV/K); $I_Z$ = 5 mA | | Diode capacitance $C_d$ (pF)[1] | Non-repetitive peak reverse current $I_{ZSM}$ (A)[2] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Min | Max | $I_Z$ = 0.5 mA | $I_Z$ = 2 mA | Max | $V_R$ (V) | Min | Max | Max | Max |
| 56 | B | 54.9 | 57.1 | 375 | 120 | 0.05 | 39.2 | 52.2 | 63.8 | 40 | 0.3 |
| | C | 52.0 | 60.0 | | | | | | | | |
| 62 | B | 60.8 | 63.2 | 400 | 140 | 0.05 | 43.4 | 58.8 | 71.6 | 35 | 0.3 |
| | C | 58.0 | 66.0 | | | | | | | | |
| 68 | B | 66.6 | 69.4 | 400 | 160 | 0.05 | 47.6 | 65.6 | 79.8 | 35 | 0.25 |
| | C | 64.0 | 72.0 | | | | | | | | |
| 75 | B | 73.5 | 76.5 | 400 | 175 | 0.05 | 52.5 | 73.4 | 88.6 | 35 | 0.20 |
| | C | 70.0 | 79.0 | | | | | | | | |

[1] f = 1 MHz; $V_R$ = 0 V.

[2] $t_p$ = 100 μs; $T_{amb}$ = 25 °C.


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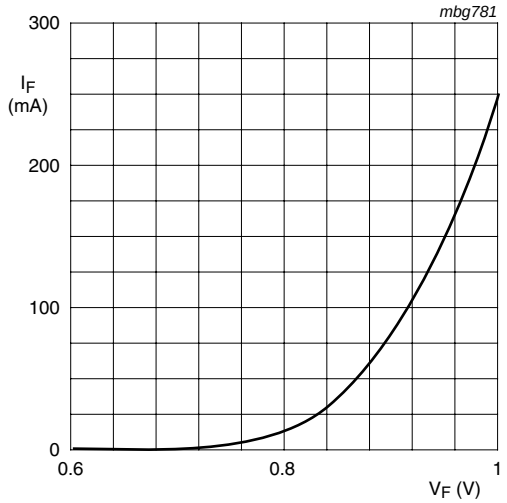
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(1) $T_j$ = 25 °C (prior to surge)

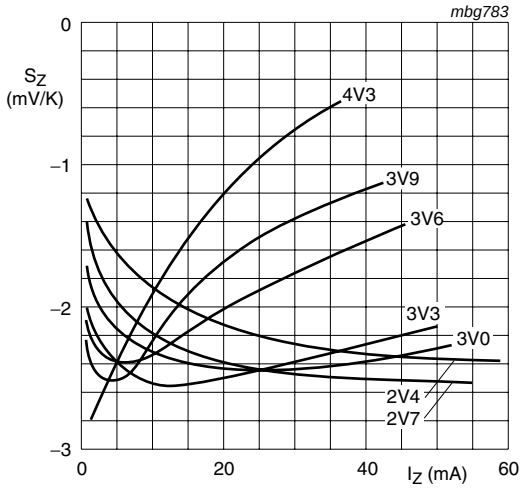
(2) $T_j$ = 150 °C (prior to surge)

**Fig 1. Non-repetitive peak reverse power dissipation as a function of pulse duration; maximum values**




$T_j$ = 25 °C

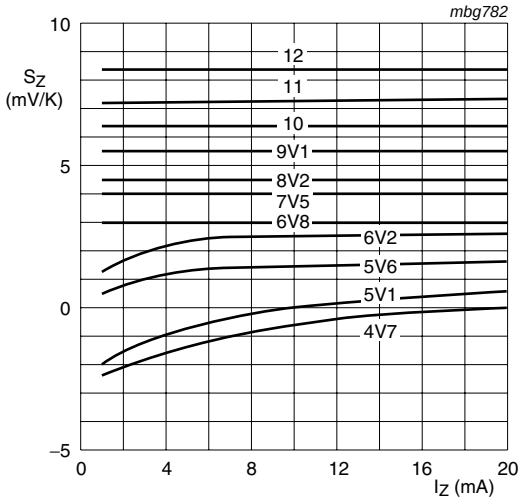
**Fig 2. Forward current as a function of forward voltage; typical values**




BZT52H-B/C2V4 to BZT52H-B/C4V3

$T_j$ = 25 °C to 150 °C

**Fig 3. Temperature coefficient as a function of working current; typical values**




BZT52H-B/C4V7 to BZT52H-B/C12

$T_j$ = 25 °C to 150 °C

**Fig 4. Temperature coefficient as a function of working current; typical values**


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# 8. Test information

## 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

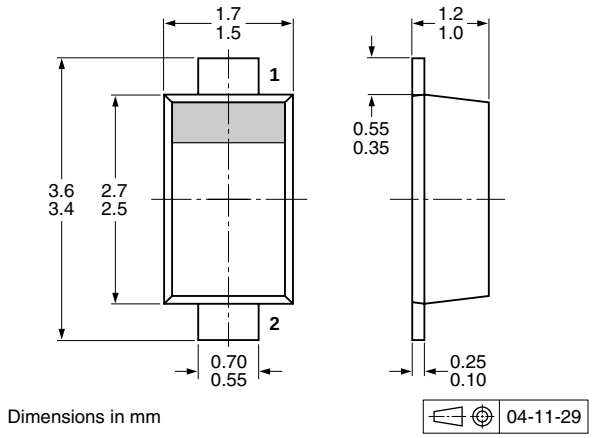



**Fig 5. Package outline SOD123F**

# 10. Packing information

**Table 11. Packing methods**

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

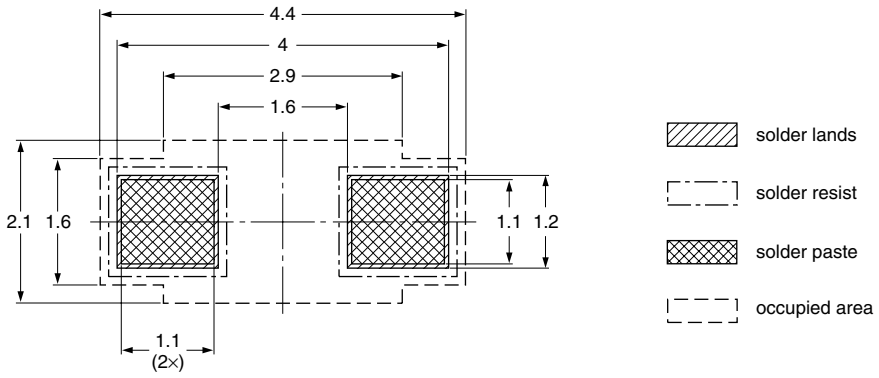
| Type number | Package | Description | Packing quantity | |
|---|---|---|---|---|
| | | | 3000 | 10000 |
| BZT52H-B2V4 to BZT52H-C75 | SOD123F | 4 mm pitch, 8 mm tape and reel | -115 | -135 |

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


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## 11. Soldering




Reflow soldering is the only recommended soldering method.

Dimensions in mm.

**Fig 6. Reflow soldering footprint SOD123F**


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## 12. Revision history

**Table 12. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| BZT52H_SER v.3 | 20101207 | Product data sheet | - | BZT52H_SER v.2 |
| Modifications: | • Added selection B.<br>• Section 1.2 “Features and benefits”: amended.<br>• Table 2 “Pinning”: graphic symbol updated.<br>• Section 8 “Test information”: added.<br>• Section 13 “Legal information”: updated. | | | |
| BZT52H_SER v.2 | 20091115 | Product data sheet | - | BZT52H_SER v.1 |
| BZT52H_SER v.1 | 20051222 | Product data sheet | - | - |


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# 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.

## 13.2 Definitions

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For more information, please visit: **http://www.nxp.com**

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