



# PBSS5360Z

60 V, 3 A PNP low  $V_{CEsat}$  (BISS) transistor

19 February 2014

Product data sheet

## 1. General description

PNP low  $V_{CEsat}$  Breakthrough In Small Signal (BISS) transistor in a medium power SOT223 (SC-73) Surface-Mounted Device (SMD) plastic package.

NPN complement: PBSS4360Z.

## 2. Features and benefits

- Low collector-emitter saturation voltage  $V_{CEsat}$
- High collector current capability  $I_C$  and  $I_{CM}$
- High energy efficiency due to less heat generation
- AEC-Q101 qualified

## 3. Applications

- DC-to-DC conversion
- Supply line switching
- Battery charger
- LCD backlighting
- Driver in low supply voltage applications (e.g. lamps and LEDs)
- Inductive load driver (e.g. relays, buzzers and motors)

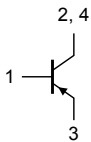
## 4. Quick reference data

Table 1. Quick reference data

| Symbol      | Parameter                               | Conditions                                                                                               | Min | Typ | Max | Unit       |
|-------------|-----------------------------------------|----------------------------------------------------------------------------------------------------------|-----|-----|-----|------------|
| $V_{CEO}$   | collector-emitter voltage               | open base                                                                                                | -   | -   | -60 | V          |
| $I_C$       | collector current                       |                                                                                                          | -   | -   | -3  | A          |
| $I_{CM}$    | peak collector current                  | $t_p \leq 1$ ms; single pulse                                                                            | -   | -   | -6  | A          |
| $R_{CEsat}$ | collector-emitter saturation resistance | $I_C = -2$ A; $I_B = -200$ mA; pulsed;<br>$t_p \leq 300$ $\mu$ s; $\delta \leq 0.02$ ; $T_{amb} = 25$ °C | -   | -   | 225 | m $\Omega$ |

## 5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline                                                                                  | Graphic symbol                                                                                |
|-----|--------|-------------|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| 1   | B      | base        | <br>SC-73 (SOT223) | <br>sym028 |
| 2   | C      | collector   |                                                                                                     |                                                                                               |
| 3   | E      | emitter     |                                                                                                     |                                                                                               |
| 4   | C      | collector   |                                                                                                     |                                                                                               |

## 6. Ordering information

Table 3. Ordering information

| Type number | Package |                                                                  |         |
|-------------|---------|------------------------------------------------------------------|---------|
|             | Name    | Description                                                      | Version |
| PBSS5360Z   | SC-73   | plastic surface-mounted package with increased heatsink; 4 leads | SOT223  |

## 7. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| PBSS5360Z   | P5360Z       |

## 8. Limiting values

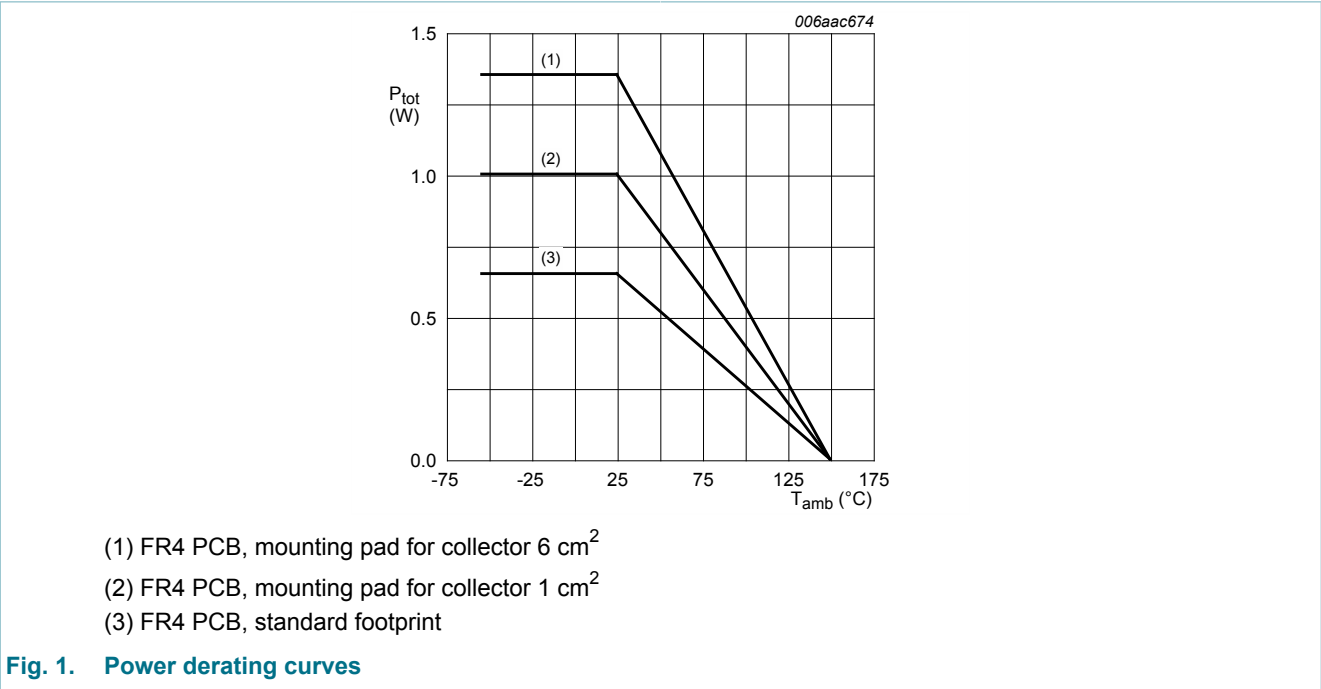
Table 5. Limiting values

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

| Symbol    | Parameter                 | Conditions                    |     | Min | Max  | Unit |
|-----------|---------------------------|-------------------------------|-----|-----|------|------|
| $V_{CBO}$ | collector-base voltage    | open emitter                  |     | -   | -80  | V    |
| $V_{CEO}$ | collector-emitter voltage | open base                     |     | -   | -60  | V    |
| $V_{EBO}$ | emitter-base voltage      | open collector                |     | -   | -7   | V    |
| $I_C$     | collector current         |                               |     | -   | -3   | A    |
| $I_{CM}$  | peak collector current    | $t_p \leq 1$ ms; single pulse |     | -   | -6   | A    |
| $I_B$     | base current              |                               |     | -   | -500 | mA   |
| $I_{BM}$  | peak base current         | $t_p \leq 1$ ms; single pulse |     | -   | -1   | A    |
| $P_{tot}$ | total power dissipation   |                               | [1] | -   | 0.65 | W    |
|           |                           |                               | [2] | -   | 1    | W    |
|           |                           |                               | [3] | -   | 1.35 | W    |

| Symbol           | Parameter            | Conditions |     | Min | Max | Unit |
|------------------|----------------------|------------|-----|-----|-----|------|
|                  |                      |            | [4] | -   | 2   | W    |
| T <sub>j</sub>   | junction temperature |            |     | -   | 150 | °C   |
| T <sub>amb</sub> | ambient temperature  |            |     | -55 | 150 | °C   |
| T <sub>stg</sub> | 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, single-sided copper, tin-plated, mounting pad for collector 1 cm<sup>2</sup>.
- [3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm<sup>2</sup>.
- [4] Device mounted on an FR4 PCB, 70 μm single-sided copper, tin-plated, mounting pad for collector 6 cm<sup>2</sup>.

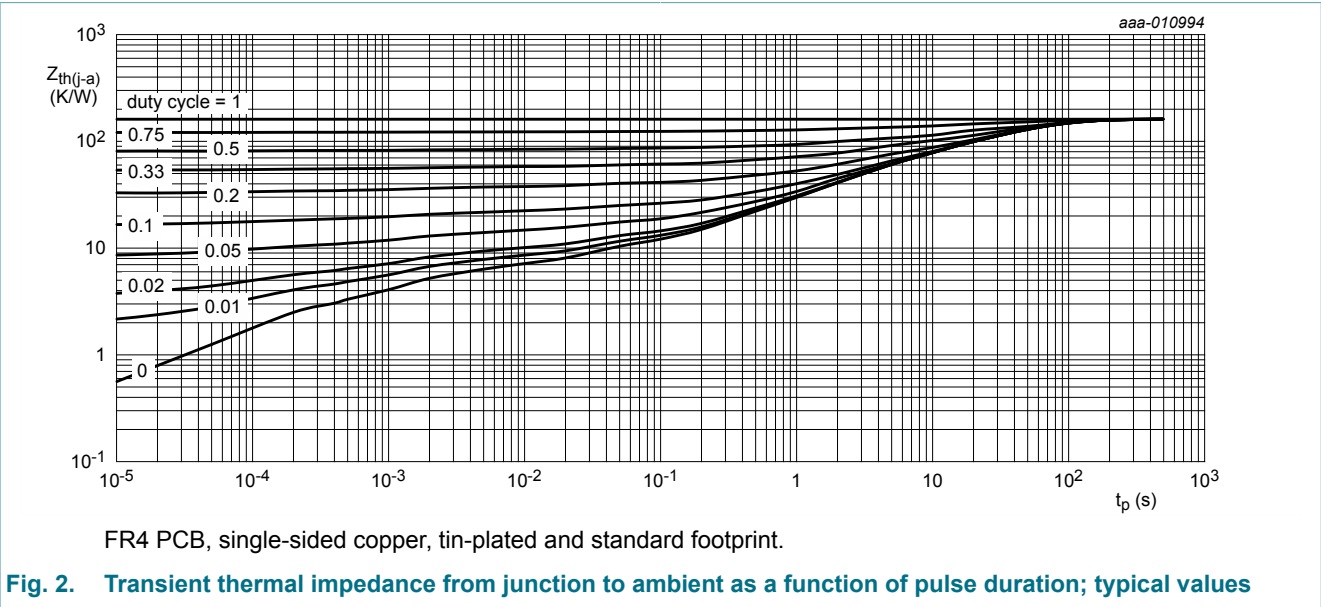


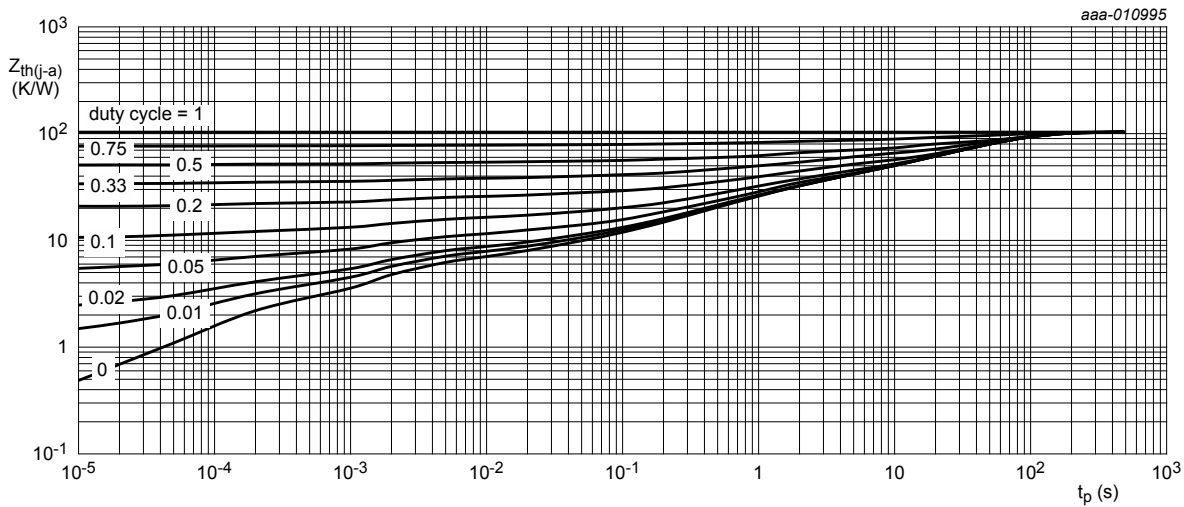
9. Thermal characteristics

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] | -   | -   | 192 | K/W  |
|                |                                                  |             | [2] | -   | -   | 125 | K/W  |
|                |                                                  |             | [3] | -   | -   | 93  | K/W  |
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point |             |     | -   | -   | 16  | K/W  |

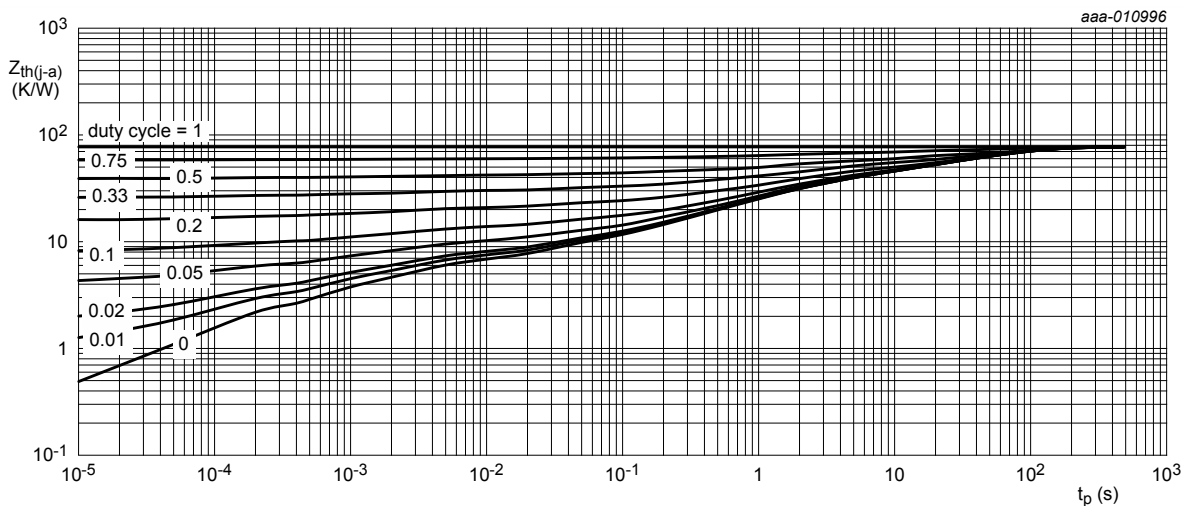
- [1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
- [2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm<sup>2</sup>.
- [3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm<sup>2</sup>.





FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm<sup>2</sup>.

Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm<sup>2</sup>.

Fig. 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

## 10. Characteristics

Table 7. Characteristics

| Symbol      | Parameter                               | Conditions                                                                                                                 | Min | Typ | Max  | Unit |
|-------------|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------|-----|-----|------|------|
| $I_{CBO}$   | collector-base cut-off current          | $V_{CB} = -48\text{ V}; I_E = 0\text{ A}; T_{amb} = 25\text{ °C}$                                                          | -   | -   | -100 | nA   |
|             |                                         | $V_{CB} = -48\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ °C}$                                                             | -   | -   | -50  | μA   |
| $I_{CES}$   | collector-emitter cut-off current       | $V_{CE} = -48\text{ V}; V_{BE} = 0\text{ V}; T_{amb} = 25\text{ °C}$                                                       | -   | -   | -100 | nA   |
| $I_{EBO}$   | emitter-base cut-off current            | $V_{EB} = -5\text{ V}; I_C = 0\text{ A}; T_{amb} = 25\text{ °C}$                                                           | -   | -   | -100 | nA   |
| $h_{FE}$    | DC current gain                         | $V_{CE} = -5\text{ V}; I_C = -50\text{ mA}; T_{amb} = 25\text{ °C}$                                                        | 150 | -   | -    |      |
|             |                                         | $V_{CE} = -5\text{ V}; I_C = -500\text{ mA}; T_{amb} = 25\text{ °C}$                                                       | 130 | -   | -    |      |
|             |                                         | $V_{CE} = -5\text{ V}; I_C = -1\text{ A}; T_{amb} = 25\text{ °C}$                                                          | 120 | -   | -    |      |
|             |                                         | $V_{CE} = -5\text{ V}; I_C = -2\text{ A}; t_p \leq 300\text{ μs}; \delta \leq 0.02; T_{amb} = 25\text{ °C}; \text{pulsed}$ | 100 | -   | -    |      |
|             |                                         | $V_{CE} = -5\text{ V}; I_C = -3\text{ A}; t_p \leq 300\text{ μs}; \delta \leq 0.02; T_{amb} = 25\text{ °C}; \text{pulsed}$ | 80  | -   | -    |      |
| $V_{CEsat}$ | collector-emitter saturation voltage    | $I_C = -500\text{ mA}; I_B = -50\text{ mA}; T_{amb} = 25\text{ °C}$                                                        | -   | -   | -150 | mV   |
|             |                                         | $I_C = -1\text{ A}; I_B = -100\text{ mA}; t_p \leq 300\text{ μs}; \delta \leq 0.02; T_{amb} = 25\text{ °C}; \text{pulsed}$ | -   | -   | -200 | mV   |
|             |                                         | $I_C = -2\text{ A}; I_B = -200\text{ mA}; \text{pulsed}; t_p \leq 300\text{ μs}; \delta \leq 0.02; T_{amb} = 25\text{ °C}$ | -   | -   | -450 | mV   |
|             |                                         | $I_C = -3\text{ A}; I_B = -300\text{ mA}; \text{pulsed}; t_p \leq 300\text{ μs}; \delta \leq 0.02; T_{amb} = 25\text{ °C}$ | -   | -   | -550 | mV   |
| $R_{CEsat}$ | collector-emitter saturation resistance | $I_C = -2\text{ A}; I_B = -200\text{ mA}; \text{pulsed}; t_p \leq 300\text{ μs}; \delta \leq 0.02; T_{amb} = 25\text{ °C}$ | -   | -   | 225  | mΩ   |
| $V_{BEsat}$ | base-emitter saturation voltage         | $I_C = -1\text{ A}; I_B = -100\text{ mA}; \text{pulsed}; t_p \leq 300\text{ μs}; \delta \leq 0.02; T_{amb} = 25\text{ °C}$ | -   | -   | -1.2 | V    |
| $V_{BEon}$  | base-emitter turn-on voltage            | $V_{CE} = -5\text{ V}; I_C = -1\text{ A}; \text{pulsed}; t_p \leq 300\text{ μs}; \delta \leq 0.02; T_{amb} = 25\text{ °C}$ | -   | -   | -1.1 | V    |
| $f_T$       | transition frequency                    | $V_{CE} = -10\text{ V}; I_C = -50\text{ mA}; f = 100\text{ MHz}; T_{amb} = 25\text{ °C}$                                   | 65  | 130 | -    | MHz  |
| $C_c$       | collector capacitance                   | $V_{CB} = -10\text{ V}; I_E = 0\text{ A}; i_e = 0\text{ A}; f = 1\text{ MHz}; T_{amb} = 25\text{ °C}$                      | -   | 28  | 32   | pF   |

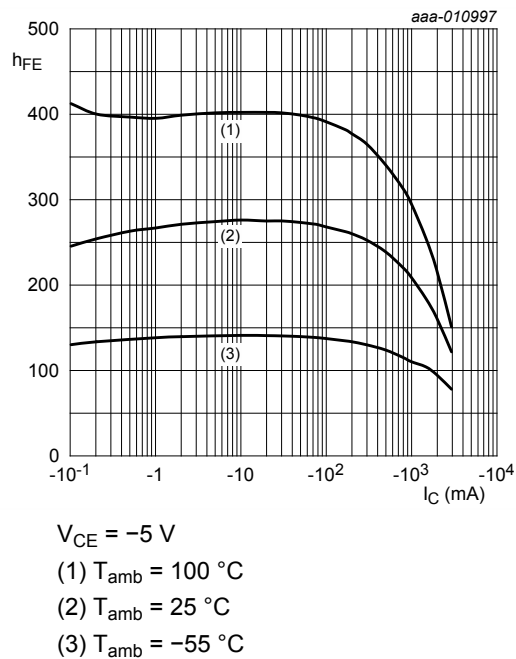


Fig. 5. DC current gain as a function of collector current; typical values

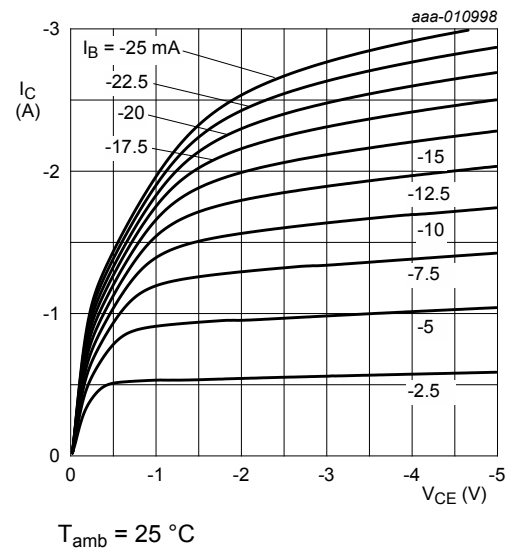


Fig. 6. Collector current as a function of collector-emitter voltage; typical values

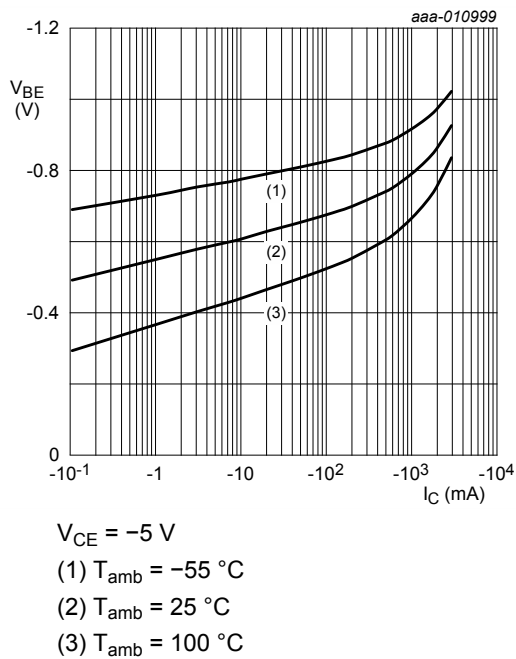


Fig. 7. Base-emitter voltage as a function of collector current; typical values

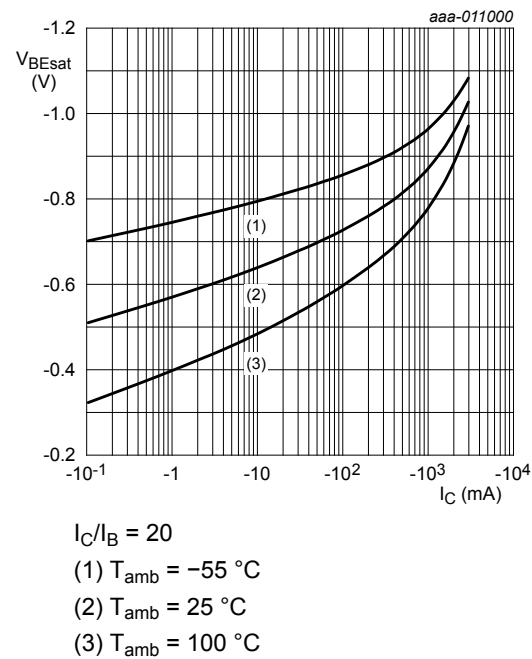
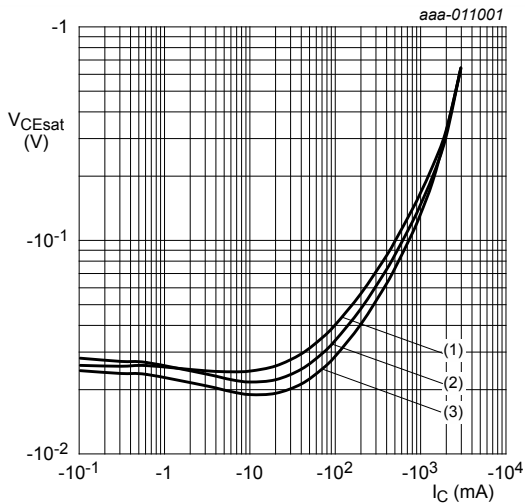
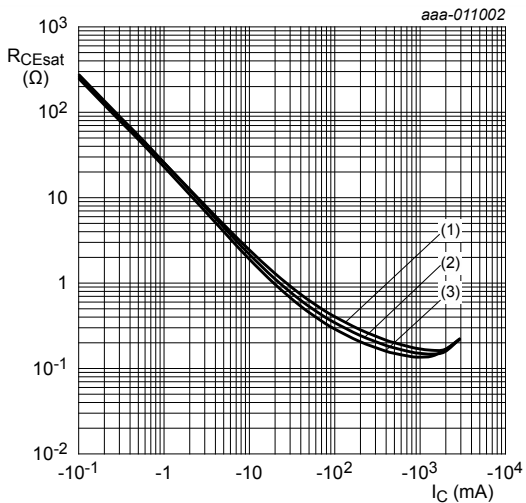


Fig. 8. Base-emitter saturation voltage as a function of collector current; typical values



$I_C/I_B = 20$   
(1)  $T_{amb} = 100\text{ }^{\circ}\text{C}$   
(2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
(3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

Fig. 9. Collector-emitter saturation voltage as a function of collector current; typical values



$I_C/I_B = 20$   
(1)  $T_{amb} = 100\text{ }^{\circ}\text{C}$   
(2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
(3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

Fig. 10. Collector-emitter saturation resistance as a function of collector current; typical values

## 11. Test information

### 11.1 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.

## 12. Package outline

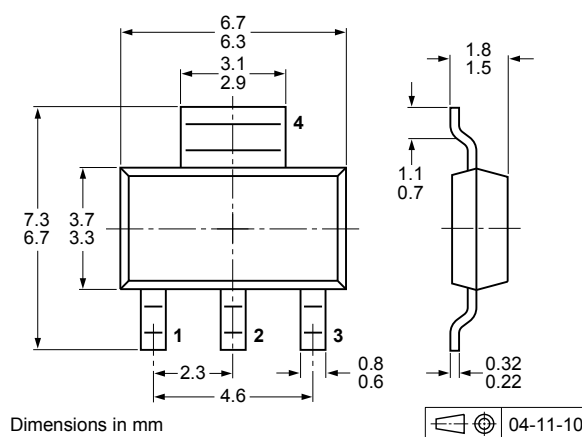


Fig. 11. Package outline SC-73 (SOT223)

13. Soldering



Fig. 12. Reflow soldering footprint for SC-73 (SOT223)

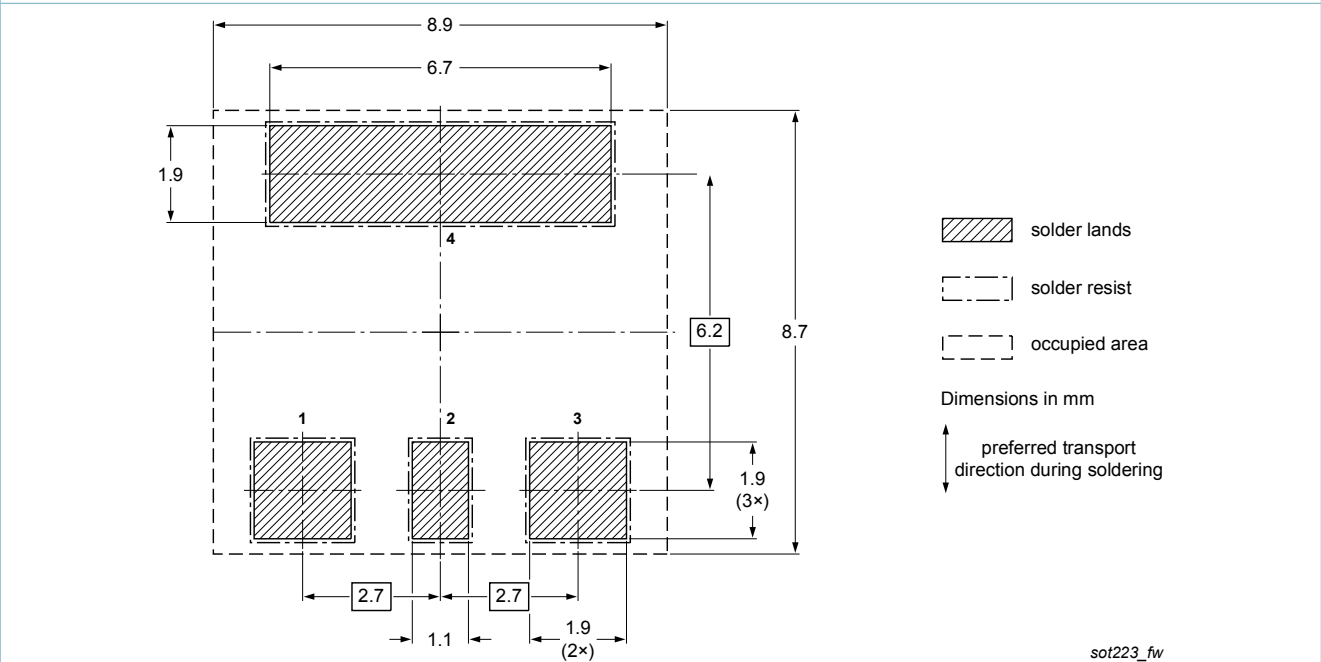


Fig. 13. Wave soldering footprint for SC-73 (SOT223)

14. Revision history

Table 8. Revision history

| Data sheet ID | Release date | Data sheet status  | Change notice | Supersedes |
|---------------|--------------|--------------------|---------------|------------|
| PBSS5360Z v.1 | 20140219     | Product data sheet | -             | -          |

## 15. Legal information

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| 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.                                     |

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16. Contents

1 General description ..... 1

2 Features and benefits ..... 1

3 Applications ..... 1

4 Quick reference data ..... 1

5 Pinning information ..... 2

6 Ordering information ..... 2

7 Marking ..... 2

8 Limiting values ..... 2

9 Thermal characteristics ..... 4

10 Characteristics ..... 6

11 Test information ..... 9

11.1 Quality information ..... 9

12 Package outline ..... 9

13 Soldering ..... 10

14 Revision history ..... 11

15 Legal information ..... 12

15.1 Data sheet status ..... 12

15.2 Definitions ..... 12

15.3 Disclaimers ..... 12

15.4 Trademarks ..... 13

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Date of release: 19 February 2014

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