



# PBSS2540MB

40 V, 0.5 A NPN low  $V_{CEsat}$  (BISS) transistor

Rev. 1 — 4 April 2012

Product data sheet

## 1. Product profile

### 1.1 General description

NPN low  $V_{CEsat}$  Breakthrough In Small Signal (BISS) transistor in a leadless ultra small DFN1006B-3 (SOT883B) Surface-Mounted Device (SMD) plastic package.

PNP complement: PBSS3540MB.

### 1.2 Features and benefits

- Leadless ultra small SMD plastic package
- Low package height of 0.37 mm
- Low collector-emitter saturation voltage  $V_{CEsat}$
- High collector current capability  $I_C$  and  $I_{CM}$
- High efficiency due to less heat generation
- AEC-Q101 qualified
- Reduced Printed-Circuit Board (PCB) requirements

### 1.3 Applications

- DC-to-DC conversion
- Supply line switching
- Battery charger
- LCD backlighting
- Drivers in low supply voltage applications (e.g. lamps and LEDs)

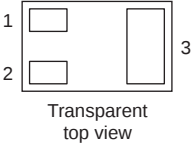
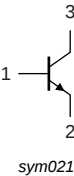
### 1.4 Quick reference data

Table 1. Quick reference data

| Symbol      | Parameter                               | Conditions                                                                                            | Min | Typ | Max | Unit       |
|-------------|-----------------------------------------|-------------------------------------------------------------------------------------------------------|-----|-----|-----|------------|
| $V_{CEO}$   | collector-emitter voltage               | open base                                                                                             | -   | -   | 40  | V          |
| $I_C$       | collector current                       |                                                                                                       | -   | -   | 500 | mA         |
| $I_{CM}$    | peak collector current                  | single pulse; $t_p \leq 1$ ms                                                                         | -   | -   | 1   | A          |
| $R_{CEsat}$ | collector-emitter saturation resistance | $I_C = 500$ mA; $I_B = 50$ mA; pulsed; $t_p \leq 300$ $\mu$ s; $\delta \leq 0.02$ ; $T_{amb} = 25$ °C | -   | 380 | 500 | m $\Omega$ |

2. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline                                                                                            | Graphic symbol                                                                      |
|-----|--------|-------------|---------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 1   | B      | base        |  <p>SOT883B (DFN1006B-3)</p> |  |
| 2   | E      | emitter     |                                                                                                               |                                                                                     |
| 3   | C      | collector   |                                                                                                               |                                                                                     |

3. Ordering information

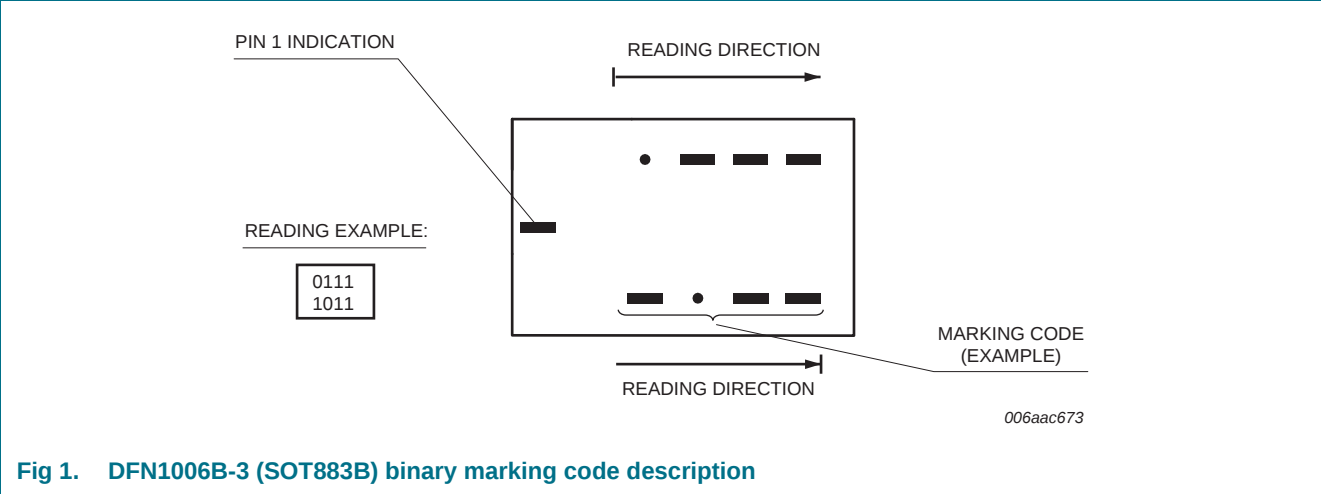
Table 3. Ordering information

| Type number | Package    |                                                                                |         |
|-------------|------------|--------------------------------------------------------------------------------|---------|
|             | Name       | Description                                                                    | Version |
| PBSS2540MB  | DFN1006B-3 | Leadless ultra small plastic package; 3 solder lands; body 1.0 x 0.6 x 0.37 mm | SOT883B |

4. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| PBSS2540MB  | 0001 0010    |



## 5. 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                  | -                                       | 40  | V    |
| $V_{CEO}$ | collector-emitter voltage | open base                     | -                                       | 40  | V    |
| $V_{EBO}$ | emitter-base voltage      | open collector                | -                                       | 6   | V    |
| $I_C$     | collector current         |                               | -                                       | 500 | mA   |
| $I_{CM}$  | peak collector current    | single pulse; $t_p \leq 1$ ms | -                                       | 1   | A    |
| $I_{BM}$  | peak base current         | single pulse; $t_p \leq 1$ ms | -                                       | 100 | mA   |
| $P_{tot}$ | total power dissipation   | $T_{amb} \leq 25$ °C          | <a href="#">[1]</a> <a href="#">[2]</a> | 250 | mW   |
|           |                           |                               | <a href="#">[3]</a> <a href="#">[2]</a> | 590 | mW   |
| $T_j$     | junction temperature      |                               | -                                       | 150 | °C   |
| $T_{amb}$ | ambient temperature       |                               | -55                                     | 150 | °C   |
| $T_{stg}$ | storage temperature       |                               | -65                                     | 150 | °C   |

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

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

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

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][2] | -   | 500 | K/W  |
|               |                                             |             | [3][2] | -   | 212 | 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.  
[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm<sup>2</sup>.

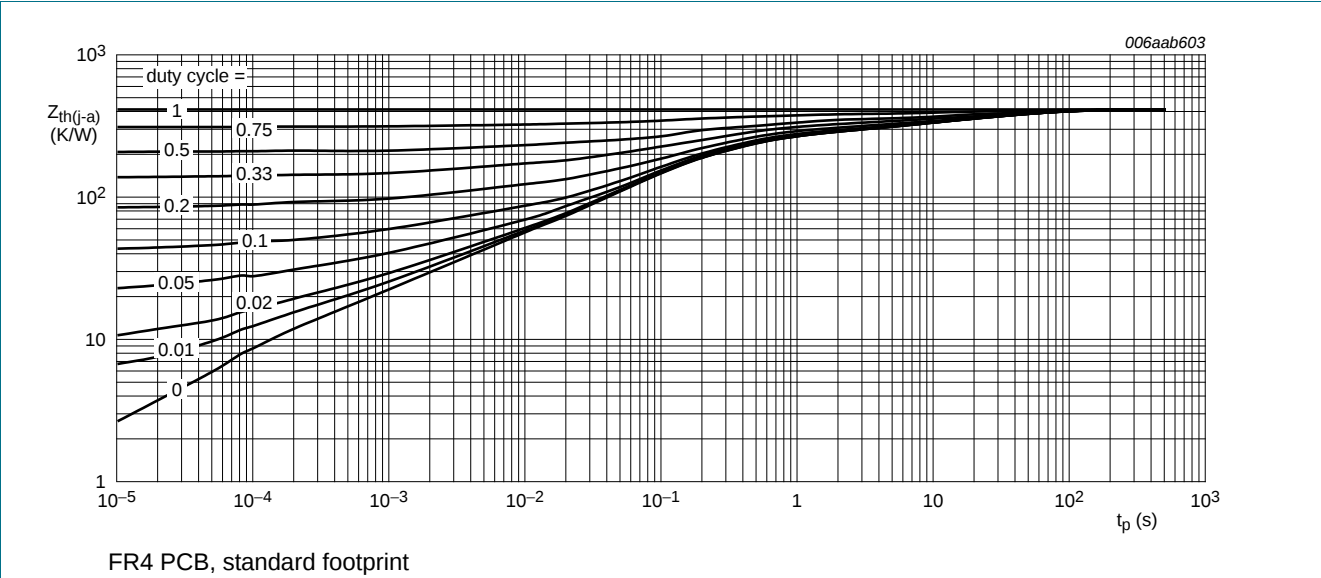


Fig 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

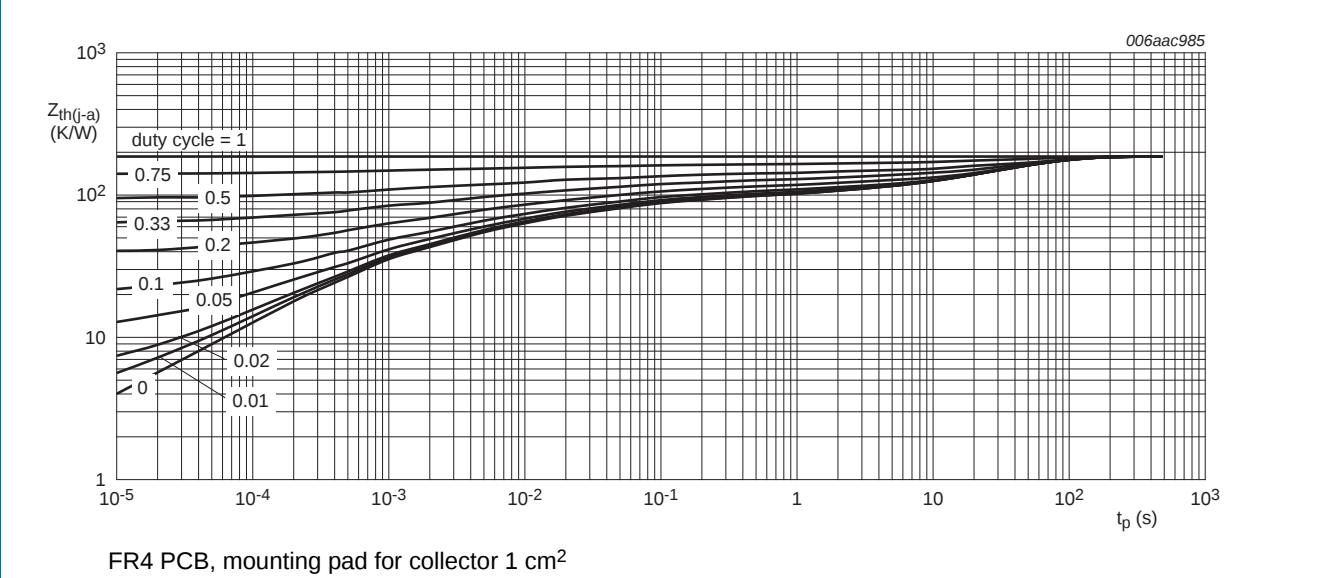


Fig 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

## 7. Characteristics

**Table 7. Characteristics**

| Symbol      | Parameter                               | Conditions                                                                                                                | Min | Typ | Max | Unit |
|-------------|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------|-----|-----|-----|------|
| $I_{CBO}$   | collector-base cut-off current          | $V_{CB} = 30\text{ V}; I_E = 0\text{ A}; T_{amb} = 25\text{ °C}$                                                          | -   | -   | 100 | nA   |
|             |                                         | $V_{CB} = 30\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ °C}$                                                             | -   | -   | 50  | μA   |
| $I_{EBO}$   | 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                         | $V_{CE} = 2\text{ V}; I_C = 10\text{ mA}; T_{amb} = 25\text{ °C}$                                                         | 200 | -   | -   |      |
|             |                                         | $V_{CE} = 2\text{ V}; I_C = 100\text{ mA};$ pulsed;<br>$t_p \leq 300\text{ μs}; \delta \leq 0.02; T_{amb} = 25\text{ °C}$ | 150 | -   | -   |      |
|             |                                         | $V_{CE} = 2\text{ V}; I_C = 500\text{ mA};$ pulsed;<br>$t_p \leq 300\text{ μs}; \delta \leq 0.02; T_{amb} = 25\text{ °C}$ | 50  | -   | -   |      |
| $V_{CEsat}$ | collector-emitter saturation voltage    | $I_C = 10\text{ mA}; I_B = 0.5\text{ mA}; T_{amb} = 25\text{ °C}$                                                         | -   | -   | 50  | mV   |
|             |                                         | $I_C = 100\text{ mA}; I_B = 5\text{ mA};$ pulsed;<br>$t_p \leq 300\text{ μs}; \delta \leq 0.02; T_{amb} = 25\text{ °C}$   | -   | -   | 100 | mV   |
|             |                                         | $I_C = 200\text{ mA}; I_B = 10\text{ mA};$ pulsed;<br>$t_p \leq 300\text{ μs}; \delta \leq 0.02; T_{amb} = 25\text{ °C}$  | -   | -   | 200 | mV   |
|             |                                         | $I_C = 500\text{ mA}; I_B = 50\text{ mA};$ pulsed;<br>$t_p \leq 300\text{ μs}; \delta \leq 0.02; T_{amb} = 25\text{ °C}$  | -   | -   | 250 | mV   |
| $R_{CEsat}$ | collector-emitter saturation resistance | $I_C = 500\text{ mA}; I_B = 50\text{ mA};$ pulsed;<br>$t_p \leq 300\text{ μs}; \delta \leq 0.02; T_{amb} = 25\text{ °C}$  | -   | 380 | 500 | mΩ   |
| $V_{BEsat}$ | base-emitter saturation voltage         | $I_C = 500\text{ mA}; I_B = 50\text{ mA};$ pulsed;<br>$t_p \leq 300\text{ μs}; \delta \leq 0.02; T_{amb} = 25\text{ °C}$  | -   | -   | 1.2 | V    |
| $V_{BEon}$  | base-emitter turn-on voltage            | $V_{CE} = 2\text{ V}; I_C = 100\text{ mA};$ pulsed;<br>$t_p \leq 300\text{ μs}; \delta \leq 0.02; T_{amb} = 25\text{ °C}$ | -   | -   | 1.1 | V    |
| $f_T$       | transition frequency                    | $V_{CE} = 5\text{ V}; I_C = 100\text{ mA}; f = 100\text{ MHz};$<br>$T_{amb} = 25\text{ °C}$                               | 250 | 450 | -   | MHz  |
| $C_c$       | collector capacitance                   | $V_{CB} = 10\text{ V}; I_E = 0\text{ A}; i_e = 0\text{ A};$<br>$f = 1\text{ MHz}; T_{amb} = 25\text{ °C}$                 | -   | -   | 6   | pF   |

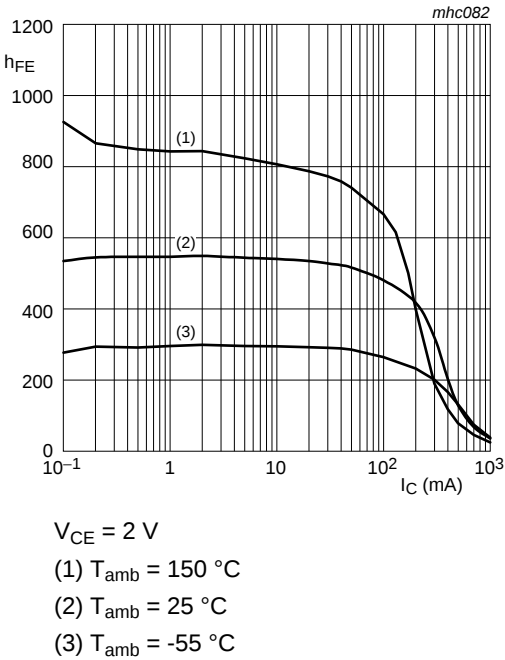


Fig 4. DC current gain as a function of collector current; typical values

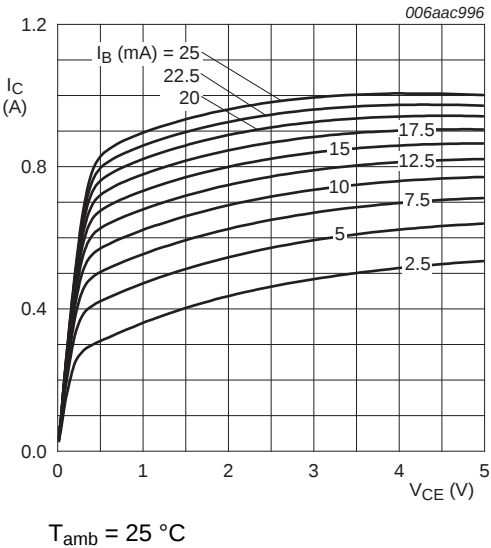


Fig 5. Collector current as a function of collector-emitter voltage; typical values

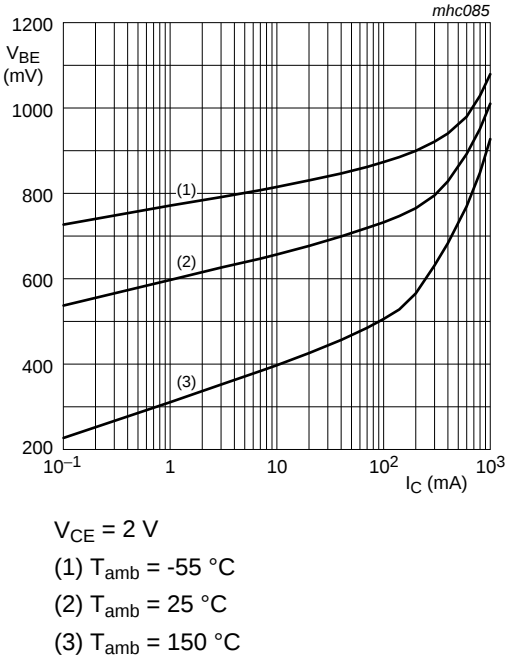


Fig 6. Base-emitter voltage as a function of collector current; typical values

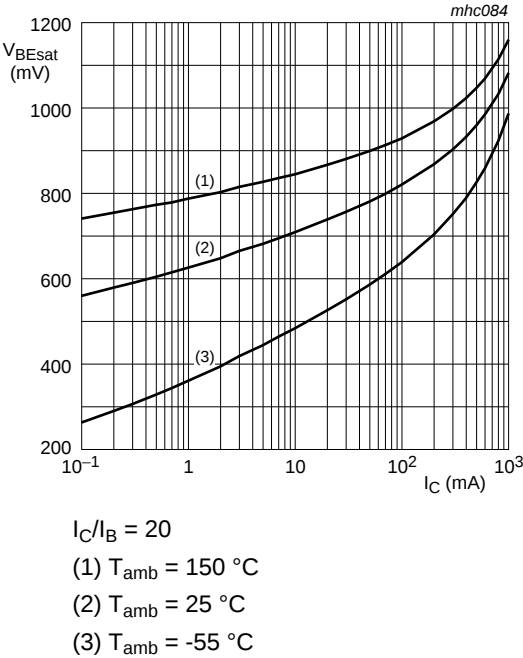
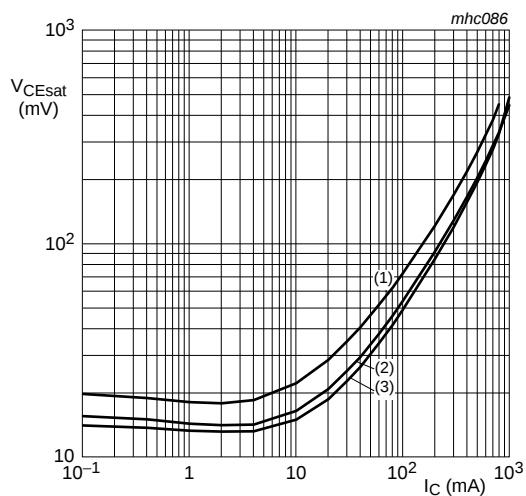


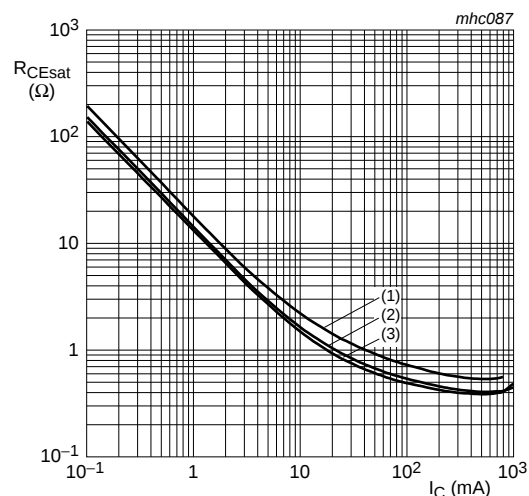
Fig 7. Base-emitter saturation voltage as a function of collector current; typical values



$$I_C/I_B = 20$$

- (1)  $T_{amb} = 150\text{ }^{\circ}\text{C}$
- (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$
- (3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

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



$$I_C/I_B = 20$$

- (1)  $T_{amb} = 150\text{ }^{\circ}\text{C}$
- (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$
- (3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

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

## 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.



## 11. Revision history

Table 8. Revision history

| Document ID    | Release date | Data sheet status  | Change notice | Supersedes |
|----------------|--------------|--------------------|---------------|------------|
| PBSS2540MB v.1 | 20120404     | Product data sheet | -             | -          |

## 12. Legal information

### 12.1 Data sheet status

| Document status <sup>[1] [2]</sup> | Product status <sup>[3]</sup> | 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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