1. Product profile

1.1 General description
PNP low $V_{CE\text{sat}}$ Breakthrough In Small Signal (BISS) transistor in a medium power and flat lead SOT89 Surface-Mounted Device (SMD) plastic package. NPN complement: PBSS4240X.

1.2 Features and benefits
- Low collector-emitter saturation voltage $V_{CE\text{sat}}$
- High collector current capability $I_C$ and $I_{CM}$
- High efficiency due to less heat generation

1.3 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)

1.4 Quick reference data

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{CEO}$</td>
<td>collector-emitter voltage</td>
<td>open base</td>
<td>-</td>
<td>-</td>
<td>-40</td>
<td>V</td>
</tr>
<tr>
<td>$I_C$</td>
<td>collector current</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-2</td>
<td>A</td>
</tr>
<tr>
<td>$I_{CM}$</td>
<td>peak collector current</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-3</td>
<td>A</td>
</tr>
<tr>
<td>$R_{CE\text{sat}}$</td>
<td>collector-emitter saturation resistance</td>
<td>$I_C = -1$ A; $I_B = -100$ mA; pulsed; $t_p \leq 300$ µs; $\delta \leq 0.02$; $T_{amb} = 25$ °C</td>
<td>-</td>
<td>-</td>
<td>310</td>
<td>mΩ</td>
</tr>
<tr>
<td>$I_{CRM}$</td>
<td>repetitive peak collector current</td>
<td>$t_p \leq 20$ ms; $\delta \leq 0.33$; pulsed</td>
<td>-</td>
<td>-</td>
<td>-2.5</td>
<td>A</td>
</tr>
</tbody>
</table>
2. Pinning information

Table 2. Pinning information

<table>
<thead>
<tr>
<th>Pin</th>
<th>Symbol</th>
<th>Description</th>
<th>Simplified outline</th>
<th>Graphic symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>E</td>
<td>emitter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>C</td>
<td>collector</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>B</td>
<td>base</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Ordering information

Table 3. Ordering information

<table>
<thead>
<tr>
<th>Type number</th>
<th>Package Name</th>
<th>Description</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>PBSS5240X</td>
<td>SOT89</td>
<td>plastic surface-mounted package; die pad for good heat transfer; 3 leads</td>
<td>SOT89</td>
</tr>
</tbody>
</table>

4. Marking

Table 4. Marking codes

<table>
<thead>
<tr>
<th>Type number</th>
<th>Marking code</th>
</tr>
</thead>
<tbody>
<tr>
<td>PBSS5240X</td>
<td>S48</td>
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5. Limiting values

Table 5. Limiting values

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

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>V_{CBO}</td>
<td>collector-base voltage</td>
<td>open emitter</td>
<td>-</td>
<td>-40</td>
<td>V</td>
</tr>
<tr>
<td>V_{CEO}</td>
<td>collector-emitter voltage</td>
<td>open base</td>
<td>-</td>
<td>-40</td>
<td>V</td>
</tr>
<tr>
<td>V_{EBO}</td>
<td>emitter-base voltage</td>
<td>open collector</td>
<td>-</td>
<td>-5</td>
<td>V</td>
</tr>
<tr>
<td>I_{C}</td>
<td>collector current</td>
<td></td>
<td>-</td>
<td>-2</td>
<td>A</td>
</tr>
<tr>
<td>I_{CRM}</td>
<td>repetitive peak collector current</td>
<td>$\delta \leq 0.33$; $t_p \leq 20$ ms; pulsed</td>
<td>-</td>
<td>-2.5</td>
<td>A</td>
</tr>
<tr>
<td>I_{CM}</td>
<td>peak collector current</td>
<td></td>
<td>-</td>
<td>-3</td>
<td>A</td>
</tr>
<tr>
<td>I_{B}</td>
<td>base current</td>
<td></td>
<td>-</td>
<td>-300</td>
<td>mA</td>
</tr>
<tr>
<td>I_{BM}</td>
<td>peak base current</td>
<td></td>
<td>-</td>
<td>-1</td>
<td>A</td>
</tr>
<tr>
<td>P_{tot}</td>
<td>total power dissipation</td>
<td></td>
<td>[1]</td>
<td>0.5</td>
<td>W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[2]</td>
<td>0.95</td>
<td>W</td>
</tr>
</tbody>
</table>
6. Thermal characteristics

Table 6. Thermal characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R_{th(j-a)}$</td>
<td>thermal resistance from junction to ambient</td>
<td>in free air</td>
<td>[1]</td>
<td>-</td>
<td>-</td>
<td>250 K/W</td>
</tr>
<tr>
<td>$R_{th(j-sp)}$</td>
<td>thermal resistance from junction to solder point</td>
<td></td>
<td>[2]</td>
<td>-</td>
<td>-</td>
<td>132 K/W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[3]</td>
<td>-</td>
<td>-</td>
<td>93 K/W</td>
</tr>
</tbody>
</table>


Fig. 1. Power derating curves
FR4 PCB, standard footprint

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

---

FR4 PCB, mounting pad for collector 1 cm²

**Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values**
Fig. 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

7. Characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$I_{CBO}$</td>
<td>collector-base cut-off current</td>
<td>$V_{CB} = -40 \text{ V}; I_E = 0 \text{ A}; T_{amb} = 25 ^\circ \text{C}$</td>
<td>-</td>
<td>-</td>
<td>-100</td>
<td>nA</td>
</tr>
<tr>
<td>$V_{CE}$</td>
<td>collector-emitter saturation voltage</td>
<td>$I_C = -100 \text{ mA}; I_B = -5 \text{ mA}; T_{amb} = 25 ^\circ \text{C}$</td>
<td>-</td>
<td>-</td>
<td>-140</td>
<td>mV</td>
</tr>
<tr>
<td>$R_{CE}$</td>
<td>collector-emitter saturation resistance</td>
<td>$I_C = -1 \text{ A}; I_B = -100 \text{ mA}; T_{amb} = 25 ^\circ \text{C}$</td>
<td>-</td>
<td>-</td>
<td>310</td>
<td>mΩ</td>
</tr>
</tbody>
</table>
### Symbol

#### Parameter

- **V\text{BE\text{sat}}**
  - **base-emitter saturation voltage**
  - **Conditions**: $I_C = -1 \ A; I_B = -100 \ mA; \text{pulsed}; t_p \leq 300 \ \mu s; \delta \leq 0.02 ; T_{amb} = 25 ^\circ C$
  - **Min**: -
  - **Typ**: -
  - **Max**: -1.2
  - **Unit**: V

- **V\text{BE\text{on}}**
  - **base-emitter turn-on voltage**
  - **Conditions**: $V_C = -5 \ V; I_C = -1 \ A; \text{pulsed}; t_p \leq 300 \ \mu s; \delta \leq 0.02 ; T_{amb} = 25 ^\circ C$
  - **Min**: -
  - **Typ**: -
  - **Max**: -1.1
  - **Unit**: V

- **f\text{T}**
  - **transition frequency**
  - **Conditions**: $V_C = -10 \ V; I_C = -50 \ mA; f = 100 \ MHz; T_{amb} = 25 ^\circ C$
  - **Min**: 150
  - **Typ**: -
  - **Max**: -
  - **Unit**: MHz

- **C\text{C}**
  - **collector capacitance**
  - **Conditions**: $V_{CB} = -10 \ V; I_C = 0 \ A; I_B = 0 \ A; f = 1 \ MHz; T_{amb} = 25 ^\circ C$
  - **Min**: -
  - **Typ**: -
  - **Max**: 12
  - **Unit**: pF

### Fig. 5

**DC current gain as a function of collector current; typical values**

- $V_{CE} = -5 \ V$
- (1) $T_{amb} = 100 ^\circ C$
- (2) $T_{amb} = 25 ^\circ C$
- (3) $T_{amb} = -55 ^\circ C$

### Fig. 6

**Collector current as a function of collector-emitter voltage; typical values**

- $T_{amb} = 25 ^\circ C$
V_{CE} = -5 \, \text{V} \\
(1) \, T_{\text{amb}} = -55 ^\circ \text{C} \\
(2) \, T_{\text{amb}} = 25 ^\circ \text{C} \\
(3) \, T_{\text{amb}} = 100 ^\circ \text{C}

I_{C} / I_{B} = 20 \\
(1) \, T_{\text{amb}} = 100 ^\circ \text{C} \\
(2) \, T_{\text{amb}} = 25 ^\circ \text{C} \\
(3) \, T_{\text{amb}} = -55 ^\circ \text{C}

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

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

Fig. 10. Package outline SOT89

9. Soldering

Fig. 11. Reflow soldering footprint for SOT89
Fig. 12. Wave soldering footprint for SOT89

10. Revision history

<table>
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<tr>
<th>Data sheet ID</th>
<th>Release date</th>
<th>Data sheet status</th>
<th>Change notice</th>
<th>Supersedes</th>
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<tr>
<td>PBSS5240X v.1</td>
<td>20121019</td>
<td>Product data sheet</td>
<td>-</td>
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</table>
11. Legal information

11.1 Data sheet status

<table>
<thead>
<tr>
<th>Document status</th>
<th>Product status</th>
<th>Definition</th>
</tr>
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<tbody>
<tr>
<td>Objective [short] data sheet</td>
<td>Development</td>
<td>This document contains data from the objective specification for product development.</td>
</tr>
<tr>
<td>Preliminary [short] data sheet</td>
<td>Qualification</td>
<td>This document contains data from the preliminary specification.</td>
</tr>
<tr>
<td>Product [short] data sheet</td>
<td>Production</td>
<td>This document contains the product specification.</td>
</tr>
</tbody>
</table>

[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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