1. General description

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

2. Features and benefits

- High voltage
- Low collector-emitter saturation voltage $V_{CE\text{sat}}$
- High collector current capability $I_C$
- High collector current gain $h_{FE}$ at high $I_C$
- AEC-Q101 qualified

3. Applications

- Electronic ballast for fluorescent lighting
- LED driver for LED chain module
- LCD backlighting
- HID front lighting
- Automotive motor management
- Hook switch for wired telecom
- Switch Mode Power Supply (SMPS)

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>-600</td>
<td>V</td>
</tr>
<tr>
<td>$I_C$</td>
<td>collector current</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-0.1</td>
<td>A</td>
</tr>
<tr>
<td>$h_{FE}$</td>
<td>DC current gain</td>
<td>$V_{CE} = -10 \text{ V}; I_C = -10 \text{ mA}; T_{amb} = 25 \degree \text{ C}$</td>
<td>70</td>
<td>130</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>
5. 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>B</td>
<td>base</td>
<td><img src="image" alt="Simplified outline" /></td>
<td><img src="image" alt="Graphic symbol" /></td>
</tr>
<tr>
<td>2</td>
<td>C</td>
<td>collector</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>E</td>
<td>emitter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>C</td>
<td>collector</td>
<td></td>
<td></td>
</tr>
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</table>

6. Ordering information

Table 3. Ordering information

<table>
<thead>
<tr>
<th>Type number</th>
<th>Package</th>
<th>Name</th>
<th>Description</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>PBHV3160Z</td>
<td>SC-73</td>
<td>plastic surface-mounted package with increased heatsink; 4 leads</td>
<td>SOT223</td>
<td></td>
</tr>
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</table>

7. Marking

Table 4. Marking codes

<table>
<thead>
<tr>
<th>Type number</th>
<th>Marking code</th>
</tr>
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<tbody>
<tr>
<td>PBHV3160Z</td>
<td>HV316Z</td>
</tr>
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</table>
8. 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>-600</td>
<td>V</td>
</tr>
<tr>
<td>V_{CEO}</td>
<td>collector-emitter voltage</td>
<td>open base</td>
<td>-</td>
<td>-600</td>
<td>V</td>
</tr>
<tr>
<td>V_{CESM}</td>
<td>collector-emitter peak voltage</td>
<td>V_{BE} = 0 V</td>
<td>-</td>
<td>-600</td>
<td>V</td>
</tr>
<tr>
<td>V_{EBO}</td>
<td>emitter-base voltage</td>
<td>open collector</td>
<td>-</td>
<td>-6</td>
<td>V</td>
</tr>
<tr>
<td>I_{C}</td>
<td>collector current</td>
<td></td>
<td>-</td>
<td>-0.1</td>
<td>A</td>
</tr>
<tr>
<td>P_{tot}</td>
<td>total power dissipation</td>
<td>T_{amb} ≤ 25 °C</td>
<td>[1]</td>
<td></td>
<td>W</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[2]</td>
<td></td>
<td>0.65</td>
<td>W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.4</td>
<td>W</td>
</tr>
<tr>
<td>T_{j}</td>
<td>junction temperature</td>
<td>-</td>
<td></td>
<td>150</td>
<td>°C</td>
</tr>
<tr>
<td>T_{amb}</td>
<td>ambient temperature</td>
<td>-55</td>
<td></td>
<td>150</td>
<td>°C</td>
</tr>
<tr>
<td>T_{stg}</td>
<td>storage temperature</td>
<td>-65</td>
<td></td>
<td>150</td>
<td>°C</td>
</tr>
</tbody>
</table>


Fig. 1. Power derating curves

(1) FR4 PCB, mounting pad for collector 6 cm²
(2) FR4 PCB, standard footprint
9. 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</td>
<td>in free air</td>
<td>[1]</td>
<td>-</td>
<td>-</td>
<td>190  K/W</td>
</tr>
<tr>
<td></td>
<td>from junction to ambient</td>
<td></td>
<td>[2]</td>
<td>-</td>
<td>-</td>
<td>89   K/W</td>
</tr>
<tr>
<td>$R_{th(j-sp)}$</td>
<td>thermal resistance</td>
<td></td>
<td></td>
<td></td>
<td>20</td>
<td>K/W</td>
</tr>
<tr>
<td></td>
<td>from junction to solder point</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


![Transistor thermal impedance](aaa-013426)

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

![Transistor thermal impedance](aaa-013427)

**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 cm².
10. Characteristics

Table 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>$V_{CB} = -400 \text{ V}; I_{E} = 0 \text{ A}; T_{amb} = 25 \degree \text{ C}$</td>
<td>-</td>
<td>-</td>
<td>-100</td>
<td>nA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_{CB} = -400 \text{ V}; I_{E} = 0 \text{ A}; T_{j} = 150 \degree \text{ C}$</td>
<td>-</td>
<td>-</td>
<td>-10</td>
<td>µA</td>
</tr>
<tr>
<td>I_{CES}</td>
<td>collector-emitter cut-off current</td>
<td>$V_{CE} = -400 \text{ V}; V_{BE} = 0 \text{ V}; T_{amb} = 25 \degree \text{ C}$</td>
<td>-</td>
<td>-</td>
<td>-100</td>
<td>nA</td>
</tr>
<tr>
<td>I_{EBO}</td>
<td>emitter-base cut-off current</td>
<td>$V_{EB} = -5 \text{ V}; I_{C} = 0 \text{ A}; T_{amb} = 25 \degree \text{ C}$</td>
<td>-</td>
<td>-</td>
<td>-100</td>
<td>nA</td>
</tr>
<tr>
<td>h_{FE}</td>
<td>DC current gain</td>
<td>$V_{CE} = -10 \text{ V}; I_{C} = -10 \text{ mA}; T_{amb} = 25 \degree \text{ C}$</td>
<td>70</td>
<td>130</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>V_{CESat}</td>
<td>collector-emitter saturation voltage</td>
<td>$I_{C} = -30 \text{ mA}; I_{B} = -6 \text{ mA}; T_{amb} = 25 \degree \text{ C}$</td>
<td>-</td>
<td>-150</td>
<td>-250</td>
<td>mV</td>
</tr>
<tr>
<td>V_{BEsat}</td>
<td>base-emitter saturation voltage</td>
<td>$I_{C} = -50 \text{ mA}; I_{B} = -5 \text{ mA};$ pulsed; $t_{p} \leq 300 \mu\text{ s}; \delta \leq 0.02; T_{amb} = 25 \degree \text{ C}$</td>
<td>-</td>
<td>-</td>
<td>-950</td>
<td>mV</td>
</tr>
<tr>
<td>f_{T}</td>
<td>transition frequency</td>
<td>$V_{CE} = -10 \text{ V}; I_{C} = -5 \text{ mA}; f = 100 \text{ MHz}$</td>
<td>-</td>
<td>38</td>
<td>-</td>
<td>MHz</td>
</tr>
<tr>
<td>C_{C}</td>
<td>collector capacitance</td>
<td>$V_{CB} = -20 \text{ V}; I_{E} = 0 \text{ A}; I_{C} = 0 \text{ A}; f = 1 \text{ MHz}; T_{amb} = 25 \degree \text{ C}$</td>
<td>-</td>
<td>6</td>
<td>-</td>
<td>pF</td>
</tr>
<tr>
<td>C_{E}</td>
<td>emitter capacitance</td>
<td>$V_{EB} = -0.5 \text{ V}; I_{C} = 0 \text{ A}; I_{E} = 0 \text{ A}; f = 1 \text{ MHz}; T_{amb} = 25 \degree \text{ C}$</td>
<td>-</td>
<td>76</td>
<td>-</td>
<td>pF</td>
</tr>
</tbody>
</table>

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

Fig. 5. DC current gain as a function of collector current; typical values
PBHV3160Z
600 V, 0.1 A PNP high-voltage low VCEsat (BISS) transistor

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

![Graph](aaa-013916)

\[ T_{\text{amb}} = 25 ^\circ\text{C} \]

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

![Graph](aaa-013917)

\[ V_{CE} = -10 \text{ V} \]

(1) \( T_{\text{amb}} = -55 ^\circ\text{C} \)
(2) \( T_{\text{amb}} = 25 ^\circ\text{C} \)
(3) \( T_{\text{amb}} = 100 ^\circ\text{C} \)

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

![Graph](aaa-013918)

\[ I_C/I_B = 5 \]

(1) \( T_{\text{amb}} = -55 ^\circ\text{C} \)
(2) \( T_{\text{amb}} = 25 ^\circ\text{C} \)
(3) \( T_{\text{amb}} = 100 ^\circ\text{C} \)

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

![Graph](aaa-013919)

\[ I_C/I_B = 5 \]

(1) \( T_{\text{amb}} = 100 ^\circ\text{C} \)
(2) \( T_{\text{amb}} = 25 ^\circ\text{C} \)
(3) \( T_{\text{amb}} = -55 ^\circ\text{C} \)
**PBHV3160Z**

600 V, 0.1 A PNP high-voltage low VCEsat (BISS) transistor

---

### 11. Test information

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

- \( T_{\text{amb}} = 25 \, ^\circ\text{C} \)
  - (1) \( I_C/I_B = 10.0 \)
  - (2) \( I_C/I_B = 5.0 \)
  - (3) \( I_C/I_B = 2.5 \)

**Fig. 11.** Collector-emitter saturation resistance as a function of collector current; typical values

- \( T_{\text{amb}} = 25 \, ^\circ\text{C} \)
  - (1) \( I_C/I_B = 5 \)
  - (2) \( T_{\text{amb}} = 100 \, ^\circ\text{C} \)
  - (3) \( T_{\text{amb}} = -55 \, ^\circ\text{C} \)

**Fig. 12.** Collector-emitter saturation resistance as a function of collector current; typical values

- \( T_{\text{amb}} = 25 \, ^\circ\text{C} \)
  - (1) \( I_C/I_B = 10.0 \)
  - (2) \( I_C/I_B = 5.0 \)
  - (3) \( I_C/I_B = 2.5 \)
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

Plastic surface-mounted package with increased heatsink; 4 leads  
SOT223

Fig. 13. Package outline SC-73 (SOT223)
13. Soldering

Fig. 14. Reflow soldering footprint for SC-73 (SOT223)

Fig. 15. Wave soldering footprint for SC-73 (SOT223)
## 14. Revision history

<table>
<thead>
<tr>
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<th>Release date</th>
<th>Data sheet status</th>
<th>Change notice</th>
<th>Supersedes</th>
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<td>20140818</td>
<td>Product data sheet</td>
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15. Legal information

15.1 Data sheet status

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<th>Document status</th>
<th>Product status</th>
<th>Definition</th>
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<tbody>
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<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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