1. General description

NPN high-voltage low $V_{CESat}$ transistor in a SOT223 (SC-73) medium power Surface-Mounted Device (SMD) plastic package.
PNP complement: PBHV9560Z-Q

2. Features and benefits

- Low collector-emitter saturation voltage $V_{CESat}$
- High collector current capability
- High collector current gain $h_{FE}$ at high $I_C$
- Qualified according to AEC-Q101 and recommended for use in automotive applications

3. Applications

- Electronic ballast for fluorescent lighting
- LED driver for LED chain module
- LCD backlighting
- High Intensity Discharge (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>Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{CESM}$</td>
<td>collector-emitter peak voltage</td>
<td>$V_{BE} = 0$ V</td>
<td></td>
<td></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></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></td>
<td>0.5</td>
<td>A</td>
</tr>
<tr>
<td>$h_{FE}$</td>
<td>DC current gain</td>
<td>$V_{CE} = 10$ V; $I_C = 50$ mA; $T_{amb} = 25$ °C</td>
<td></td>
<td>70</td>
<td>135</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></td>
<td></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>
</tbody>
</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>PBHV8560Z-Q</td>
<td>SC-73</td>
<td>plastic, surface-mounted package with increased heatsink; 4 leads; 2.3 mm pitch; 6.5 mm x 3.5 mm x 1.65 mm body</td>
<td>SOT223</td>
<td></td>
</tr>
</tbody>
</table>

7. Marking

Table 4. Marking codes

<table>
<thead>
<tr>
<th>Type number</th>
<th>Marking code</th>
</tr>
</thead>
<tbody>
<tr>
<td>PBHV8560Z-Q</td>
<td>HV856Z</td>
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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>0.5</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>0.65</td>
<td>W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[2]</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></td>
<td>-55</td>
<td>150</td>
<td>°C</td>
</tr>
<tr>
<td>T_{stg}</td>
<td>storage temperature</td>
<td></td>
<td>-65</td>
<td>150</td>
<td>°C</td>
</tr>
</tbody>
</table>

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 from junction to ambient</td>
<td>in free air</td>
<td>[1]</td>
<td>-</td>
<td>-</td>
<td>190 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>89 K/W</td>
</tr>
</tbody>
</table>


![Power derating curves](aaa-013425)

(1) FR4 PCB, mounting pad for collector 6 cm$^2$
(2) FR4 PCB, standard footprint

Fig. 1. Power derating curves

![Transient thermal impedance](aaa-013426)

FR4 PCB, single-sided copper, tin-plated and standard footprint.

Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values
**10. 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>$V_{CB} = 400 , V; I_E = 0 , A; T_{amb} = 25 , ^\circ C$</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>$V_{EB} = 4 , V; I_C = 0 , A; T_{amb} = 25 , ^\circ C$</td>
<td>-</td>
<td>-</td>
<td>100</td>
<td>nA</td>
</tr>
<tr>
<td>$I_{CES}$</td>
<td>collector-emitter cut-off current</td>
<td>$V_{CE} = 400 , V; V_{BE} = 0 , V; T_{amb} = 25 , ^\circ C$</td>
<td>-</td>
<td>-</td>
<td>100</td>
<td>nA</td>
</tr>
<tr>
<td>$h_{FE}$</td>
<td>DC current gain</td>
<td>$V_{CE} = 10 , V; I_C = 50 , mA; T_{amb} = 25 , ^\circ C$</td>
<td>70</td>
<td>135</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_{CE} = 10 , V; I_C = 100 , mA; t_p \leq 300 , \mu s; \delta \leq 0.02; T_{amb} = 25 , ^\circ C$; pulsed</td>
<td>70</td>
<td>135</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>$V_{CEsat}$</td>
<td>collector-emitter saturation voltage</td>
<td>$I_C = 50 , mA; I_B = 5 , mA; T_{amb} = 25 , ^\circ C$</td>
<td>-</td>
<td>50</td>
<td>100</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_C = 100 , mA; I_B = 20 , mA; t_p \leq 300 , \mu s; \delta \leq 0.02; T_{amb} = 25 , ^\circ C$; pulsed</td>
<td>-</td>
<td>50</td>
<td>100</td>
<td>mV</td>
</tr>
<tr>
<td>$V_{BEsat}$</td>
<td>base-emitter saturation voltage</td>
<td>$I_C = 50 , mA; I_B = 5 , mA$; pulsed; $t_p \leq 300 , \mu s; \delta \leq 0.02; T_{amb} = 25 , ^\circ C$</td>
<td>-</td>
<td>-</td>
<td>950</td>
<td>mV</td>
</tr>
<tr>
<td>$C_c$</td>
<td>collector capacitance</td>
<td>$V_{CE} = 20 , V; I_E = 0 , A; i_e = 0 , A; f = 1 , MHz; T_{amb} = 25 , ^\circ C$</td>
<td>-</td>
<td>7.5</td>
<td>-</td>
<td>pF</td>
</tr>
<tr>
<td>$C_e$</td>
<td>emitter capacitance</td>
<td>$V_{EB} = 0.5 , V; I_C = 0 , A; i_C = 0 , A; f = 1 , MHz; T_{amb} = 25 , ^\circ C$</td>
<td>-</td>
<td>710</td>
<td>-</td>
<td>pF</td>
</tr>
</tbody>
</table>

FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm².

**Fig. 3.** Transient thermal impedance from junction to ambient as a function of pulse duration; typical values
**PBHV8560Z-Q**

600 V, 0.5 A NPN high-voltage low VCEsat transistor

---

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

- $V_{CE} = 10$ V
- (1) $T_{amb} = 100$ °C
- (2) $T_{amb} = 25$ °C
- (3) $T_{amb} = −55$ °C

---

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

- $T_{amb} = 25$ °C
- (1) $V_{CE} = 50$ V
- (2) $V_{CE} = 25$ V
- (3) $V_{CE} = 10$ V

---

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

- $T_{amb} = 25$ °C

---

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

- $V_{CE} = 10$ V
- (1) $T_{amb} = −55$ °C
- (2) $T_{amb} = 25$ °C
- (3) $T_{amb} = 100$ °C

---

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Product data sheet 17 July 2023
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

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

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

**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**

![Package outline SC-73 (SOT223)](image_url)

*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 8. 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>PBHV8560Z-Q v.1</td>
<td>20230717</td>
<td>Product data sheet</td>
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Data sheet status

<table>
<thead>
<tr>
<th>Document status</th>
<th>Product status</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<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>

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[2] The term "short data sheet" is explained in section "Definitions". 
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PBHV8560Z-Q

600 V, 0.5 A NPN high-voltage low VCEsat transistor

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