1. General description

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

NPN complement: PBHV8115Z-Q

2. Features and benefits

- High voltage
- Low collector-emitter saturation voltage V_{CEsat}
- High collector current capability I_{C} and I_{CM}
- High collector current gain h_{FE} at high I_{C}
- Medium power SMD plastic package
- Qualified according to AEC-Q101 and recommended for use in automotive applications

3. Applications

- 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

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>
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<tbody>
<tr>
<td>$V_{CEO}$</td>
<td>collector-emitter voltage</td>
<td>open base</td>
<td>-</td>
<td>-</td>
<td>-150</td>
<td>V</td>
</tr>
<tr>
<td>$I_{C}$</td>
<td>collector current</td>
<td>-</td>
<td>-</td>
<td>-1</td>
<td>A</td>
<td></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>100</td>
<td>220</td>
<td>-</td>
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5. Pinning information

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<th>Symbol</th>
<th>Description</th>
<th>Simplified outline</th>
<th>Graphic symbol</th>
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<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>SC-73 (SOT223)</td>
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6. Ordering information

Table 3. Ordering information

<table>
<thead>
<tr>
<th>Type number</th>
<th>Package Name</th>
<th>Description</th>
<th>Version</th>
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<tr>
<td>PBHV9115Z-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>
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7. Marking

Table 4. Marking codes

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<th>Marking code</th>
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<td>PBHV9115Z-Q</td>
<td>V9115Z</td>
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8. Limiting values

Table 5. Limiting values

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

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<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>-200</td>
<td>V</td>
</tr>
<tr>
<td>V_{CEO}</td>
<td>collector-emitter voltage</td>
<td>open base</td>
<td>-</td>
<td>-150</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>-1</td>
<td>A</td>
</tr>
<tr>
<td>I_{CM}</td>
<td>peak collector current</td>
<td>single pulse; t_p ≤ 1 ms</td>
<td>-</td>
<td>-2</td>
<td>A</td>
</tr>
<tr>
<td>I_{BM}</td>
<td>peak base current</td>
<td></td>
<td>-400</td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td>P_{tot}</td>
<td>total power dissipation</td>
<td>T_{amb} ≤ 25 °C</td>
<td>[1]</td>
<td>0.7</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>
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</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></td>
<td></td>
<td>175</td>
<td>K/W</td>
</tr>
<tr>
<td>$R_{th(j-sp)}$</td>
<td>thermal resistance from junction to solder point</td>
<td>-</td>
<td>89</td>
<td></td>
<td></td>
<td>K/W</td>
</tr>
</tbody>
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Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values
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>ICBO</td>
<td>collector-base cut-off current</td>
<td>V_{CB} = -120 V; I_{E} = 0 A; T_{amb} = 25 °C</td>
<td>-</td>
<td>-</td>
<td>-100</td>
<td>nA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_{CB} = -120 V; I_{E} = 0 A; T_{j} = 150 °C</td>
<td>-</td>
<td>-</td>
<td>-10</td>
<td>µA</td>
</tr>
<tr>
<td>IEBO</td>
<td>emitter-base cut-off current</td>
<td>V_{EB} = -4 V; I_{C} = 0 A; T_{amb} = 25 °C</td>
<td>-</td>
<td>-</td>
<td>-100</td>
<td>nA</td>
</tr>
<tr>
<td>ICES</td>
<td>collector-emitter cut-off current</td>
<td>V_{CE} = -120 V; V_{BE} = 0 V; T_{amb} = 25 °C</td>
<td>-</td>
<td>-</td>
<td>-100</td>
<td>nA</td>
</tr>
<tr>
<td>hFE</td>
<td>DC current gain</td>
<td>V_{CE} = -10 V; I_{C} = -50 mA; T_{amb} = 25 °C</td>
<td>100</td>
<td>220</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_{CE} = -10 V; I_{C} = -100 mA; T_{amb} = 25 °C</td>
<td>100</td>
<td>220</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_{CE} = -10 V; I_{C} = -1 A; T_{amb} = 25 °C</td>
<td>10</td>
<td>30</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>VCEsat</td>
<td>collector-emitter saturation voltage</td>
<td>I_{C} = -100 mA; I_{B} = -10 mA; T_{amb} = 25 °C</td>
<td>-</td>
<td>-60</td>
<td>-120</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I_{C} = -100 mA; I_{B} = -20 mA; T_{amb} = 25 °C</td>
<td>-</td>
<td>-50</td>
<td>-100</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I_{C} = 500 mA; I_{B} = -100 mA; T_{amb} = 25 °C</td>
<td>-</td>
<td>-150</td>
<td>-300</td>
<td>mV</td>
</tr>
<tr>
<td>VBEsat</td>
<td>base-emitter saturation voltage</td>
<td>I_{C} = -1 A; I_{E} = -200 mA; T_{amb} = 25 °C</td>
<td>-</td>
<td>-1.05</td>
<td>-1.2</td>
<td>V</td>
</tr>
<tr>
<td>td</td>
<td>delay time</td>
<td>V_{CC} = -6 V; I_{C} = -0.5 A; I_{B(off)} = -0.1 A; T_{amb} = 25 °C</td>
<td>-</td>
<td>8</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>tr</td>
<td>rise time</td>
<td>-</td>
<td>-</td>
<td>282</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>ton</td>
<td>turn-on time</td>
<td>-</td>
<td>-</td>
<td>290</td>
<td>-</td>
<td>ns</td>
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<tr>
<td>ts</td>
<td>storage time</td>
<td>-</td>
<td>-</td>
<td>430</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>tf</td>
<td>fall time</td>
<td>-</td>
<td>-</td>
<td>300</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>toff</td>
<td>turn-off time</td>
<td>-</td>
<td>-</td>
<td>730</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>fT</td>
<td>transition frequency</td>
<td>V_{CE} = -10 V; I_{C} = -10 mA; f = 100 MHz; T_{amb} = 25 °C</td>
<td>-</td>
<td>115</td>
<td>-</td>
<td>MHz</td>
</tr>
<tr>
<td>CC</td>
<td>collector capacitance</td>
<td>V_{GB} = -20 V; I_{E} = 0 A; I_{B} = 0 A; f = 1 MHz; T_{amb} = 25 °C</td>
<td>-</td>
<td>10</td>
<td>-</td>
<td>pF</td>
</tr>
<tr>
<td>Ce</td>
<td>emitter capacitance</td>
<td>V_{BE} = -0.5 V; I_{C} = 0 A; I_{E} = 0 A; f = 1 MHz; T_{amb} = 25 °C</td>
<td>-</td>
<td>150</td>
<td>-</td>
<td>pF</td>
</tr>
</tbody>
</table>
**Nexperia**

**PBHV9115Z-Q**

150 V, 1 A PNP high-voltage low VCEsat transistor

---

**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

---

**V_CEA = -10 V**

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

**T_{\text{amb}} = 25 \, ^\circ \text{C}**

---

**V_CEB = -10 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 = 5**

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

---

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

\[
\begin{align*}
V_{CE\text{sat}} (\text{V}) & \quad \text{I}_C (\text{mA}) \\
10^{-2} & \quad -10^{-1} -1 -10 -10^2 -10^3 -10^4 \\
10^{-1} & \quad -1 -10 -10^2 -10^3 -10^4 \\
10^0 & \quad -1 -10 -10^2 -10^3 -10^4 \\
10^1 & \quad -1 -10 -10^2 -10^3 -10^4 \\
\end{align*}
\]

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

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

\[
\begin{align*}
V_{CE\text{sat}} (\text{V}) & \quad \text{I}_C (\text{mA}) \\
10^{-2} & \quad -10^{-1} -1 -10 -10^2 -10^3 -10^4 \\
10^{-1} & \quad -1 -10 -10^2 -10^3 -10^4 \\
10^0 & \quad -1 -10 -10^2 -10^3 -10^4 \\
10^1 & \quad -1 -10 -10^2 -10^3 -10^4 \\
\end{align*}
\]

- \(T_{\text{amb}} = 25 \, ^\circ\text{C}\)
- (1) \(I_C/I_B = 20\)
- (2) \(I_C/I_B = 10\)
- (3) \(I_C/I_B = 5\)

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

\[
\begin{align*}
R_{CE\text{sat}} (\Omega) & \quad \text{I}_C (\text{mA}) \\
10^{-1} & \quad -1 -10 -10^2 -10^3 -10^4 \\
10^0 & \quad -1 -10 -10^2 -10^3 -10^4 \\
10^1 & \quad -1 -10 -10^2 -10^3 -10^4 \\
10^2 & \quad -1 -10 -10^2 -10^3 -10^4 \\
10^3 & \quad -1 -10 -10^2 -10^3 -10^4 \\
\end{align*}
\]

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

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

\[
\begin{align*}
R_{CE\text{sat}} (\Omega) & \quad \text{I}_C (\text{mA}) \\
10^{-1} & \quad -1 -10 -10^2 -10^3 -10^4 \\
10^0 & \quad -1 -10 -10^2 -10^3 -10^4 \\
10^1 & \quad -1 -10 -10^2 -10^3 -10^4 \\
10^2 & \quad -1 -10 -10^2 -10^3 -10^4 \\
10^3 & \quad -1 -10 -10^2 -10^3 -10^4 \\
\end{align*}
\]

- \(T_{\text{amb}} = 25 \, ^\circ\text{C}\)
- (1) \(I_C/I_B = 20\)
- (2) \(I_C/I_B = 10\)
- (3) \(I_C/I_B = 5\)
11. Test information

Fig. 12. Test circuit for switching times

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. 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

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<th>Release date</th>
<th>Data sheet status</th>
<th>Change notice</th>
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<td>20230717</td>
<td>Product data sheet</td>
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15. Legal information

Data sheet status

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<th>Product status</th>
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<td>Objective [short] data sheet</td>
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<td>This document contains data from the objective specification for product development.</td>
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[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 https://www.nexperia.com.

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