1. General description

PNP low $V_{CESat}$ transistor in a SOT223 plastic package.
NPN complement: PBSS4540Z-Q

2. Features and benefits

- Low collector-emitter saturation voltage
- High current capability
- Improved device reliability due to reduced heat generation
- Qualified according to AEC-Q101 and recommended for use in automotive applications

3. Applications

- Supply line switching circuits
- Battery management applications
- DC/DC converter applications
- Strobe flash units
- Heavy duty battery powered equipment (motor and lamp drivers)
- MOSFET driver applications.

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>-5</td>
<td>A</td>
</tr>
<tr>
<td>$I_{CM}$</td>
<td>peak collector current</td>
<td>single pulse; $t_p \leq 1$ ms</td>
<td>-</td>
<td>-</td>
<td>-10</td>
<td>A</td>
</tr>
<tr>
<td>$R_{CESat}$</td>
<td>collector-emitter saturation resistance</td>
<td>$I_C = -2$ A; $I_B = -200$ mA; pulsed; $t_p \leq 300$ μs; $\delta \leq 0.02$; $T_{amb} = 25$ °C</td>
<td>-</td>
<td>55</td>
<td>80</td>
<td>mΩ</td>
</tr>
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</table>

5. 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>sym132</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>
<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>PBSS5540Z-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>
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</thead>
<tbody>
<tr>
<td>PBSS5540Z-Q</td>
<td>PB5540</td>
</tr>
</tbody>
</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>-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>-6</td>
<td>V</td>
</tr>
<tr>
<td>( I_C )</td>
<td>collector current</td>
<td></td>
<td>-5</td>
<td>-</td>
<td>A</td>
</tr>
<tr>
<td>( I_{CM} )</td>
<td>peak collector current</td>
<td>single pulse; ( t_p \leq 1 \text{ ms} )</td>
<td>-10</td>
<td>-</td>
<td>A</td>
</tr>
<tr>
<td>( I_{BM} )</td>
<td>peak base current</td>
<td></td>
<td>-2</td>
<td>-</td>
<td>A</td>
</tr>
<tr>
<td>( P_{tot} )</td>
<td>total power dissipation</td>
<td>( T_{amb} \leq 25 \text{ °C} )</td>
<td>1.35</td>
<td>W</td>
<td></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>-65</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>

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm².

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_{thj-a} )</td>
<td>thermal resistance from junction to ambient</td>
<td>in free air</td>
<td>[1]</td>
<td>-</td>
<td>92</td>
<td>K/W</td>
</tr>
</tbody>
</table>

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 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>$V_{(BR)CBO}$</td>
<td>collector-base breakdown voltage</td>
<td>$I_C = -100 \mu A; I_E = 0 A$</td>
<td>-40</td>
<td>-</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>$V_{(BR)CEO}$</td>
<td>collector-emitter breakdown voltage</td>
<td>$I_C = -10 mA; I_B = 0 A; T_{amb} = 25 °C</td>
<td>-40</td>
<td>-</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>$V_{(BR)EBO}$</td>
<td>emitter-base breakdown voltage (collector open)</td>
<td>$I_E = -100 \mu A; I_B = 0 mA; T_{amb} = 25 °C</td>
<td>-6</td>
<td>-</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>$I_{CBO}$</td>
<td>collector-base cut-off current</td>
<td>$V_{CB} = -30 V; I_E = 0 A; T_{amb} = 25 °C</td>
<td>-</td>
<td>-</td>
<td>-100</td>
<td>nA</td>
</tr>
<tr>
<td>$I_{EBO}$</td>
<td>emitter-base cut-off current</td>
<td>$V_{EB} = -5 V; I_C = 0 A; T_{amb} = 25 °C</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>nA</td>
</tr>
<tr>
<td>$h_{FE}$</td>
<td>DC current gain</td>
<td>$V_{CE} = -2 V; I_C = -500 mA; T_{amb} = 25 °C</td>
<td>250</td>
<td>350</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_{CE} = -2 V; I_C = -1 A; pulsed; $t_p \leq 300 \mu s; 5 \leq 0.02; T_{amb} = 25 °C$</td>
<td>200</td>
<td>300</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_{CE} = -2 V; I_C = -2 A; pulsed; $t_p \leq 300 \mu s; 5 \leq 0.02; T_{amb} = 25 °C$</td>
<td>150</td>
<td>250</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_{CE} = -2 V; I_C = -5 A; pulsed; $t_p \leq 300 \mu s; 5 \leq 0.02; T_{amb} = 25 °C$</td>
<td>50</td>
<td>150</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>$V_{CEsat}$</td>
<td>collector-emitter saturation voltage</td>
<td>$I_C = -500 mA; I_B = -5 mA; T_{amb} = 25 °C</td>
<td>-</td>
<td>-80</td>
<td>-120</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_C = -1 A; I_B = -10 mA; T_{amb} = 25 °C</td>
<td>-</td>
<td>-120</td>
<td>-170</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_C = -2 A; I_B = -200 mA; T_{amb} = 25 °C</td>
<td>-</td>
<td>-110</td>
<td>-160</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_C = -5 A; I_B = -500 mA; T_{amb} = 25 °C</td>
<td>-</td>
<td>-250</td>
<td>-375</td>
<td>mV</td>
</tr>
<tr>
<td>$R_{CEsat}$</td>
<td>collector-emitter saturation resistance</td>
<td>$I_C = -2 A; I_B = -200 mA; pulsed; $t_p \leq 300 \mu s; 5 \leq 0.02; T_{amb} = 25 °C$</td>
<td>-</td>
<td>55</td>
<td>80</td>
<td>mΩ</td>
</tr>
<tr>
<td>$V_{BEsat}$</td>
<td>base-emitter saturation voltage</td>
<td>$I_C = -5 A; I_B = -500 mA; T_{amb} = 25 °C</td>
<td>-</td>
<td>-</td>
<td>-1.3</td>
<td>V</td>
</tr>
<tr>
<td>$V_{BEon}$</td>
<td>base-emitter turn-on voltage</td>
<td>$V_{CE} = -2 V; I_C = -2 A; T_{amb} = 25 °C</td>
<td>-</td>
<td>-0.8</td>
<td>-1.25</td>
<td>V</td>
</tr>
<tr>
<td>$f_T$</td>
<td>transition frequency</td>
<td>$V_{CE} = -10 V; I_C = -100 mA; f = 100 MHz; $T_{amb} = 25 °C$</td>
<td>60</td>
<td>120</td>
<td>-</td>
<td>MHz</td>
</tr>
<tr>
<td>$C_c$</td>
<td>collector capacitance</td>
<td>$V_{CB} = -10 V; I_E = 0 A; I_B = 0 A; f = 1 MHz; T_{amb} = 25 °C</td>
<td>-</td>
<td>90</td>
<td>105</td>
<td>pF</td>
</tr>
</tbody>
</table>
Fig. 1. DC current gain as a function of collector current; typical values

\[ V_{CE} = -2 \text{ V} \]
(1) \( T_{\text{amb}} = 150 ^\circ \text{C} \)
(2) \( T_{\text{amb}} = 25 ^\circ \text{C} \)
(3) \( T_{\text{amb}} = -55 ^\circ \text{C} \)

Fig. 2. Base-emitter voltage as a function of collector current; typical values

\[ V_{CE} = -2 \text{ V} \]
(1) \( T_{\text{amb}} = 150 ^\circ \text{C} \)
(2) \( T_{\text{amb}} = 25 ^\circ \text{C} \)
(3) \( T_{\text{amb}} = -55 ^\circ \text{C} \)

Fig. 3. Collector-emitter saturation voltage as a function of collector current; typical values

\[ I_{C}/I_{B} = 20 \]
(1) \( T_{\text{amb}} = 150 ^\circ \text{C} \)
(2) \( T_{\text{amb}} = 25 ^\circ \text{C} \)
(3) \( T_{\text{amb}} = -55 ^\circ \text{C} \)

Fig. 4. Base-emitter saturation voltage as a function of collector current; typical values

\[ I_{C}/I_{B} = 20 \]
(1) \( T_{\text{amb}} = 150 ^\circ \text{C} \)
(2) \( T_{\text{amb}} = 25 ^\circ \text{C} \)
(3) \( T_{\text{amb}} = -55 ^\circ \text{C} \)
**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

Plastic surface-mounted package with increased heatsink; 4 leads

**DIMENSIONS (mm are the original dimensions)**

<table>
<thead>
<tr>
<th>UNIT</th>
<th>A</th>
<th>A₁</th>
<th>bₚ</th>
<th>b₁</th>
<th>c</th>
<th>D</th>
<th>E</th>
<th>e</th>
<th>e₁</th>
<th>Hₑ</th>
<th>Lₚ</th>
<th>Q</th>
<th>v</th>
<th>w</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>mm</td>
<td>1.8</td>
<td>1.5</td>
<td>0.10</td>
<td>0.80</td>
<td>3.1</td>
<td>0.32</td>
<td>6.7</td>
<td>3.7</td>
<td>4.6</td>
<td>2.3</td>
<td>7.3</td>
<td>6.7</td>
<td>0.95</td>
<td>0.85</td>
<td>0.2</td>
</tr>
</tbody>
</table>

Fig. 7. Package outline SC-73 (SOT223)
13. Soldering

Fig. 8. Reflow soldering footprint for SC-73 (SOT223)

Fig. 9. Wave soldering footprint for SC-73 (SOT223)
# 14. Revision history

<table>
<thead>
<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>PBSS5540Z-Q v.1</td>
<td>20211130</td>
<td>Product data sheet</td>
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15. Legal information

Data sheet status

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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 https://www.nexperia.com.

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