1. General description

NPN/PNP low \( V_{C\text{E}\text{Sat}} \) transistor pair in a SOT363 (SC-88) very small Surface-Mounted Device (SMD) plastic package.

2. Features and benefits

- Low collector-emitter saturation voltage
- High current capability
- Replaces two SC-70 packaged low \( V_{C\text{E}\text{Sat}} \) transistors on same PCB area
- Reduces required PCB area
- Reduced pick and place costs.
- Qualified according to AEC-Q101 and recommended for use in automotive applications

3. Applications

- General purpose switching and muting
- Low frequency driver circuits
- LCD backlighting
- Supply line switching circuits
- Battery driven equipment (mobile phones, video cameras and hand-held devices).

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></td>
<td>Per transistor unless otherwise specified; for the PNP transistor with negative polarity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( V_{\text{CEO}} )</td>
<td>collector-emitter voltage open base</td>
<td>-</td>
<td>-</td>
<td>15</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>( I_{\text{CM}} )</td>
<td>peak collector current single pulse; ( t_p \leq 1 \text{ ms} )</td>
<td>-</td>
<td>1</td>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TR1 (NPN)</td>
<td>( R_{\text{CESat}} ) collector-emitter saturation resistance ( I_C = 500 \text{ mA}; I_B = 50 \text{ mA}; \text{pulsed}; t_p \leq 300 \mu\text{s}; \delta \leq 0.02; T_{\text{amb}} = 25 \text{ °C} )</td>
<td>-</td>
<td>300</td>
<td>500</td>
<td>mΩ</td>
<td></td>
</tr>
<tr>
<td>TR2 (PNP)</td>
<td>( R_{\text{CESat}} ) collector-emitter saturation resistance ( I_C = -500 \text{ mA}; I_B = -50 \text{ mA}; \text{pulsed}; t_p \leq 300 \mu\text{s}; \delta \leq 0.02; T_{\text{amb}} = 25 \text{ °C} )</td>
<td>-</td>
<td>300</td>
<td>500</td>
<td>mΩ</td>
<td></td>
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</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>
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<tr>
<td>1</td>
<td>E1</td>
<td>emitter TR1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>B1</td>
<td>base TR1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>C2</td>
<td>collector TR2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>E2</td>
<td>emitter TR2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>B2</td>
<td>base TR2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>C1</td>
<td>collector TR1</td>
<td></td>
<td></td>
</tr>
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6. Ordering information

Table 3. Ordering information

<table>
<thead>
<tr>
<th>Type number</th>
<th>Package</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PBSS2515YPN-Q</td>
<td>TSSOP6</td>
<td>plastic, surface-mounted package; 6 leads; 0.65 mm pitch; 2.1 mm x 1.25 mm x 0.95 mm body</td>
<td></td>
</tr>
</tbody>
</table>

7. Marking

Table 4. Marking codes

<table>
<thead>
<tr>
<th>Type number</th>
<th>Marking code[1]</th>
</tr>
</thead>
<tbody>
<tr>
<td>PBSS2515YPN-Q</td>
<td>N8%</td>
</tr>
</tbody>
</table>

[1] % = placeholder for manufacturing site code

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>15</td>
<td>V</td>
</tr>
<tr>
<td>V_CEO</td>
<td>collector-emitter voltage</td>
<td>open base</td>
<td>-</td>
<td>15</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>500</td>
<td>mA</td>
</tr>
<tr>
<td>I_CM</td>
<td>peak collector current</td>
<td>single pulse; t_p \leq 1 ms</td>
<td>-</td>
<td>1</td>
<td>A</td>
</tr>
<tr>
<td>I_BM</td>
<td>peak base current</td>
<td></td>
<td>-</td>
<td>100</td>
<td>mA</td>
</tr>
<tr>
<td>P_tot</td>
<td>total power dissipation</td>
<td>T_amb \leq 25 °C</td>
<td>-</td>
<td>200</td>
<td>mW</td>
</tr>
</tbody>
</table>

Per device

| P_tot  | total power dissipation | T_amb \leq 25 °C | [1] | -   | 300  | mW |
| T_j    | junction temperature    |                   |     | -   | 150  | °C |
| T_amb  | ambient temperature     |                   |     | -65 | 150  | °C |
| T_stg  | storage temperature     |                   |     | -65 | 150  | °C |

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></td>
<td>Per transistor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<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>416 K/W</td>
</tr>
</tbody>
</table>


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></td>
<td>Per transistor unless otherwise specified; for the PNP transistor with negative polarity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I_{CBO}</td>
<td>collector-base cut-off current</td>
<td>V_{CB} = 15 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} = 15 V; I_{E} = 0 A; T_{j} = 150 °C</td>
<td>-</td>
<td>-</td>
<td>50</td>
<td>µA</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>100</td>
<td>nA</td>
</tr>
<tr>
<td>h_{FE}</td>
<td>DC current gain</td>
<td>V_{CE} = 2 V; I_{C} = 10 mA; T_{amb} = 25 °C</td>
<td>200</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_{CE} = 2 V; I_{C} = 100 mA; pulsed; t_{p} ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C</td>
<td>150</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_{CE} = 2 V; I_{C} = 500 mA; pulsed; t_{p} ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C</td>
<td>90</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>V_{CEsat}</td>
<td>collector-emitter saturation voltage</td>
<td>I_{C} = 10 mA; I_{B} = 0.5 mA; T_{amb} = 25 °C</td>
<td>-</td>
<td>-</td>
<td>25</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I_{C} = 200 mA; I_{B} = 10 mA; T_{amb} = 25 °C</td>
<td>-</td>
<td>-</td>
<td>150</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I_{C} = 500 mA; I_{B} = 50 mA; pulsed; t_{p} ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C</td>
<td>-</td>
<td>-</td>
<td>250</td>
<td>mV</td>
</tr>
<tr>
<td>R_{CEsat}</td>
<td>collector-emitter saturation resistance</td>
<td>-</td>
<td>300</td>
<td>500</td>
<td>mΩ</td>
<td></td>
</tr>
<tr>
<td>V_{BEsat}</td>
<td>base-emitter saturation voltage</td>
<td>-</td>
<td>-</td>
<td></td>
<td>1.1</td>
<td>V</td>
</tr>
<tr>
<td>V_{BEon}</td>
<td>base-emitter turn-on voltage</td>
<td>V_{CE} = 2 V; I_{C} = 100 mA; pulsed; t_{p} ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C</td>
<td>-</td>
<td>-</td>
<td>0.9</td>
<td>V</td>
</tr>
<tr>
<td>f_T</td>
<td>transition frequency</td>
<td>V_{CE} = 5 V; I_{C} = 100 mA; f = 100 MHz; T_{amb} = 25 °C</td>
<td>250</td>
<td>420</td>
<td>-</td>
<td>MHz</td>
</tr>
<tr>
<td>C_c</td>
<td>collector capacitance</td>
<td>V_{CE} = 10 V; I_{E} = 0 A; i_{e} = 0 A; f = 1 MHz; T_{amb} = 25 °C</td>
<td>-</td>
<td>4.4</td>
<td>6</td>
<td>pF</td>
</tr>
</tbody>
</table>

TR2 (PNP)

<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>h_{FE}</td>
<td>DC current gain</td>
<td>V_{CE} = -2 V; I_{C} = -10 mA; T_{amb} = 25 °C</td>
<td>200</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_{CE} = -2 V; I_{C} = -100 mA; pulsed; t_{p} ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C</td>
<td>150</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_{CE} = -2 V; I_{C} = -500 mA; pulsed; t_{p} ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C</td>
<td>90</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>
### Symbol | Parameter | Conditions | Min | Typ | Max | Unit
---|---|---|---|---|---|---
$V_{CE\text{sat}}$ | collector-emitter saturation voltage | $I_C = -10 \text{ mA}; I_B = -0.5 \text{ mA}; T_{\text{amb}} = 25 ^\circ \text{C}$ | - | - | -25 | mV
 | | $I_C = -200 \text{ mA}; I_B = -10 \text{ mA}; T_{\text{amb}} = 25 ^\circ \text{C}$ | - | - | -150 | mV
 | | $I_C = -500 \text{ mA}; I_B = -50 \text{ mA};$ pulsed; $t_p \leq 300 \mu\text{s}; 5 \leq 0.02; T_{\text{amb}} = 25 ^\circ \text{C}$ | - | - | -250 | mV
$R_{CE\text{sat}}$ | collector-emitter saturation resistance | | | | 300 | 500 | mΩ
$V_{BE\text{sat}}$ | base-emitter saturation voltage | | | | - | -1.1 | V
$V_{BE\text{on}}$ | base-emitter turn-on voltage | $V_{CE} = -2 \text{ V}; I_C = -100 \text{ mA};$ pulsed; $t_p \leq 300 \mu\text{s}; 5 \leq 0.02; T_{\text{amb}} = 25 ^\circ \text{C}$ | - | - | -0.9 | V
$f_T$ | transition frequency | $V_{CE} = -5 \text{ V}; I_C = -100 \text{ mA}; f = 100 \text{ MHz}; T_{\text{amb}} = 25 ^\circ \text{C}$ | 100 | 280 | - | MHz
$C_C$ | collector capacitance | $V_{CB} = -10 \text{ V}; I_E = 0 \text{ A}; I_E = 0 \text{ A}; f = 1 \text{ MHz}; T_{\text{amb}} = 25 ^\circ \text{C}$ | - | - | 10 | pF

**Fig. 1.** TR1 (NPN): DC current gain as a function of collector current; typical values

**Fig. 2.** TR1 (NPN): Base-emitter voltage as a function of collector current; typical values
Fig. 3. TR1 (NPN): Collector-emitter saturation voltage as a function of collector current; typical values

\[ V_{CE_{sat}} (mV) \]

\[ 10^2 \]

\[ I_C (mA) \]

\[ 10^3 \]

\[ 10^4 \]

\[ 10^5 \]

- \( I_C/I_B = 20 \)
- \( T_{amb} = 150 ^\circ C \)
- \( T_{amb} = 25 ^\circ C \)
- \( T_{amb} = -55 ^\circ C \)

Fig. 4. TR1 (NPN): Base-emitter saturation voltage as a function of collector current; typical values

\[ V_{BE_{sat}} (mV) \]

\[ 10^2 \]

\[ I_C (mA) \]

\[ 10^3 \]

\[ 10^4 \]

\[ 10^5 \]

- \( I_C/I_B = 20 \)
- \( T_{amb} = 150 ^\circ C \)
- \( T_{amb} = 25 ^\circ C \)
- \( T_{amb} = -55 ^\circ C \)

Fig. 5. TR1 (NPN): Equivalent on-resistance as a function of collector current; typical values

\[ R_{CE_{sat}} (\Omega) \]

\[ 10^2 \]

\[ I_C (mA) \]

\[ 10^3 \]

- \( I_C/I_B = 20 \)
- \( T_{amb} = 150 ^\circ C \)
- \( T_{amb} = 25 ^\circ C \)
- \( T_{amb} = -55 ^\circ C \)

Fig. 6. TR1 (NPN): Collector current as a function of collector-emitter voltage; typical values

\[ I_C (mA) \]

\[ V_{CE} (V) \]

- \( T_{amb} = 25 ^\circ C \)
- \( I_B = 4.6 mA \)
- \( I_B = 4.14 mA \)
- \( I_B = 3.68 mA \)
- \( I_B = 3.22 mA \)
- \( I_B = 2.76 mA \)
- \( I_B = 2.3 mA \)
- \( I_B = 1.84 mA \)
- \( I_B = 1.38 mA \)
- \( I_B = 0.92 mA \)
- \( I_B = 0.46 mA \)
Fig. 7. TR2 (PNP): DC current gain as a function of collector current; typical values

V_{CE} = −2 V
(1) T_{amb} = 150 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = −55 °C

Fig. 8. TR2 (PNP): Base-emitter voltage as a function of collector current; typical values

V_{CE} = −2 V
(1) T_{amb} = −55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 150 °C

Fig. 9. TR2 (PNP): Collector-emitter saturation voltage as a function of collector current; typical values

I_{C}/I_B = 20
(1) T_{amb} = 150 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = −55 °C

Fig. 10. TR2 (PNP): Base-emitter saturation voltage as a function of collector current; typical values

I_{C}/I_B = 20
(1) T_{amb} = 150 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = −55 °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

![Package outline TSSOP6 (SOT363)](image_url)
13. Soldering

Fig. 14. Reflow soldering footprint for TSSOP6 (SOT363)

Fig. 15. Wave soldering footprint for TSSOP6 (SOT363)
## 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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<td>20220217</td>
<td>Product data sheet</td>
<td>-</td>
<td>-</td>
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</tbody>
</table>
15. Legal information

Data sheet status

<table>
<thead>
<tr>
<th>Document status</th>
<th>Product status</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>[1][2]</td>
<td>[3]</td>
<td></td>
</tr>
</tbody>
</table>

**Objective [short] data sheet** Development

This document contains data from the objective specification for product development.

**Preliminary [short] data sheet** Qualification

This document contains data from the preliminary specification.

**Product [short] data sheet** Production

This document contains the product specification.

[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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