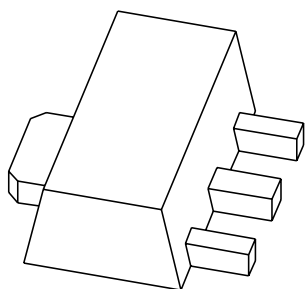


DATA SHEET



PBSS5540X

40 V, 5 A

PNP low V_{CEsat} (BISS) transistor

Product specification
Supersedes data of 2004 Jan 15

2004 Nov 04

40 V, 5 A PNP low V_{CEsat} (BISS) transistor

PBSS5540X

FEATURES

- Low collector-emitter saturation voltage V_{CEsat}
- High collector current capability: I_C and I_{CM}
- High efficiency leading to less heat generation.

APPLICATIONS

- Supply line switching circuits
- Battery management applications
- DC/DC converter applications
- Strobe flash units
- Medium power driver (e.g. relays, buzzers and motors).

DESCRIPTION

PNP low V_{CEsat} transistor in a medium power SOT89 (SC-62) package.

NPN complement: PBSS4540X.

MARKING

| TYPE NUMBER | MARKING CODE ⁽¹⁾ |
|-------------|-----------------------------|
| PBSS5540X | *1G |

Note

- * = p: Made in Hong Kong.
 * = t: Made in Malaysia.
 * = W: Made in China.

QUICK REFERENCE DATA

| SYMBOL | PARAMETER | MAX. | UNIT |
|-------------|-----------------------------------|------|------------|
| V_{CEO} | collector-emitter voltage | -40 | V |
| I_C | collector current (DC) | -4 | A |
| I_{CRP} | repetitive peak collector current | -5 | A |
| R_{CEsat} | equivalent on-resistance | 75 | m Ω |

PINNING

| PIN | DESCRIPTION |
|-----|-------------|
| 1 | emitter |
| 2 | collector |
| 3 | base |

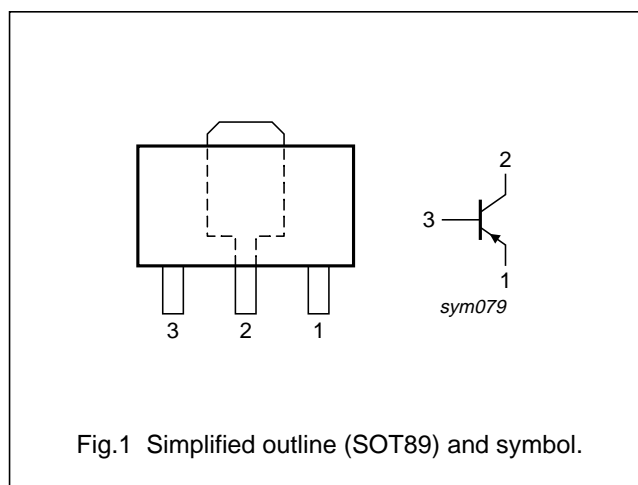


Fig.1 Simplified outline (SOT89) and symbol.

ORDERING INFORMATION

| TYPE NUMBER | PACKAGE | | |
|-------------|---------|--|---------|
| | NAME | DESCRIPTION | VERSION |
| PBSS5540X | SC-62 | plastic surface mounted package; collector pad for good heat transfer; 3 leads | SOT89 |

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PBSS5540X

LIMITING VALUES

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

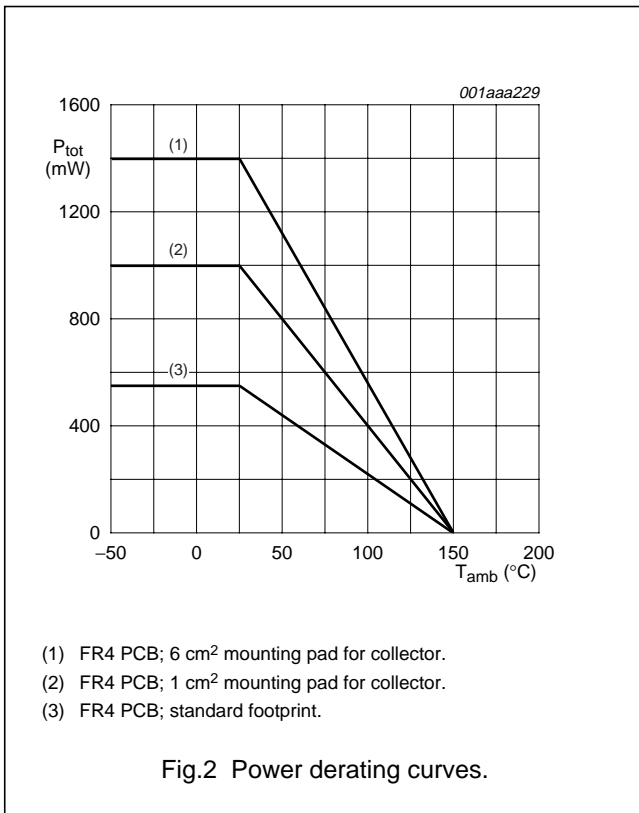
| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|-----------|-----------------------------------|--|------|------|------|
| V_{CBO} | collector-base voltage | open emitter | – | –40 | V |
| V_{CEO} | collector-emitter voltage | open base | – | –40 | V |
| V_{EBO} | emitter-base voltage | open collector | – | –6 | V |
| I_{CM} | peak collector current | $t_p \leq 1$ ms | – | –10 | A |
| I_{CRP} | repetitive peak collector current | $t_p \leq 10$ ms; $\delta \leq 0.2$ | – | –5 | A |
| I_C | collector current (DC) | | – | –4 | A |
| I_{BM} | peak base current | $t_p \leq 1$ ms | – | –2 | A |
| I_B | base current (DC) | | – | –1 | A |
| P_{tot} | total power dissipation | $T_{amb} \leq 25$ °C | – | 2.5 | W |
| | | $t_p \leq 10$ ms; $\delta \leq 0.2$; note 1 | – | 0.55 | W |
| | | note 1 | – | 1 | W |
| | | note 2 | – | 1.4 | W |
| | | note 3 | – | 1.6 | W |
| T_{stg} | storage temperature | | –65 | +150 | °C |
| T_j | junction temperature | | – | 150 | °C |
| T_{amb} | ambient temperature | | –65 | +150 | °C |

Notes

1. Device mounted on a printed-circuit board, single-sided copper, tin-plated and standard footprint.
2. Device mounted on a printed-circuit board, single-sided copper, tin-plated and mounting pad for collector 1 cm².
3. Device mounted on a printed-circuit board, single-sided copper, tin-plated and mounting pad for collector 6 cm².
4. Device mounted on a 7 cm² ceramic printed-circuit board, 1 cm² single-sided copper and tin-plated.

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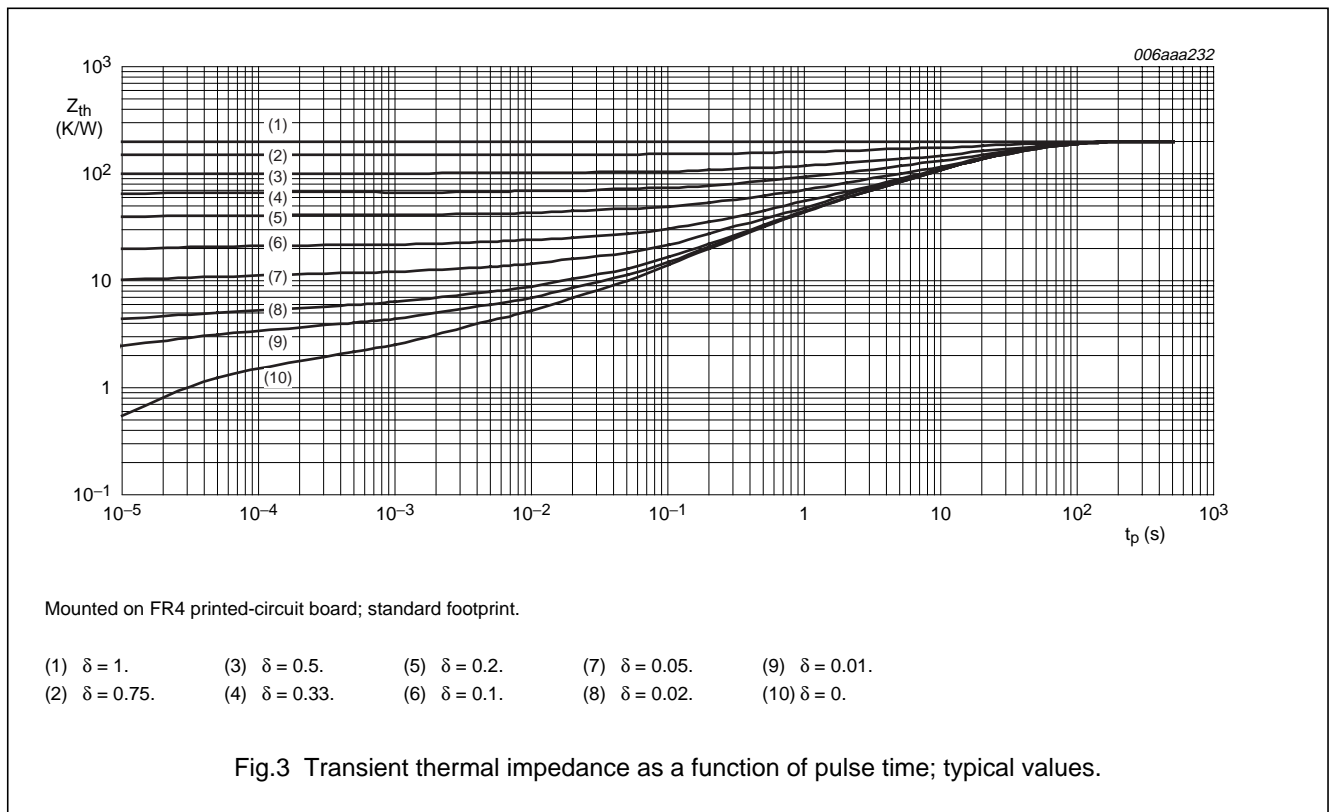
PBSS5540X

THERMAL CHARACTERISTICS

| SYMBOL | PARAMETER | CONDITIONS | VALUE | UNIT |
|---------------|---|---------------|-------|------|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | | |
| | | notes 1 and 2 | 50 | K/W |
| | | note 2 | 225 | K/W |
| | | note 3 | 125 | K/W |
| | | note 4 | 90 | K/W |
| | note 5 | 80 | K/W | |
| $R_{th(j-s)}$ | thermal resistance from junction to soldering point | | 16 | K/W |

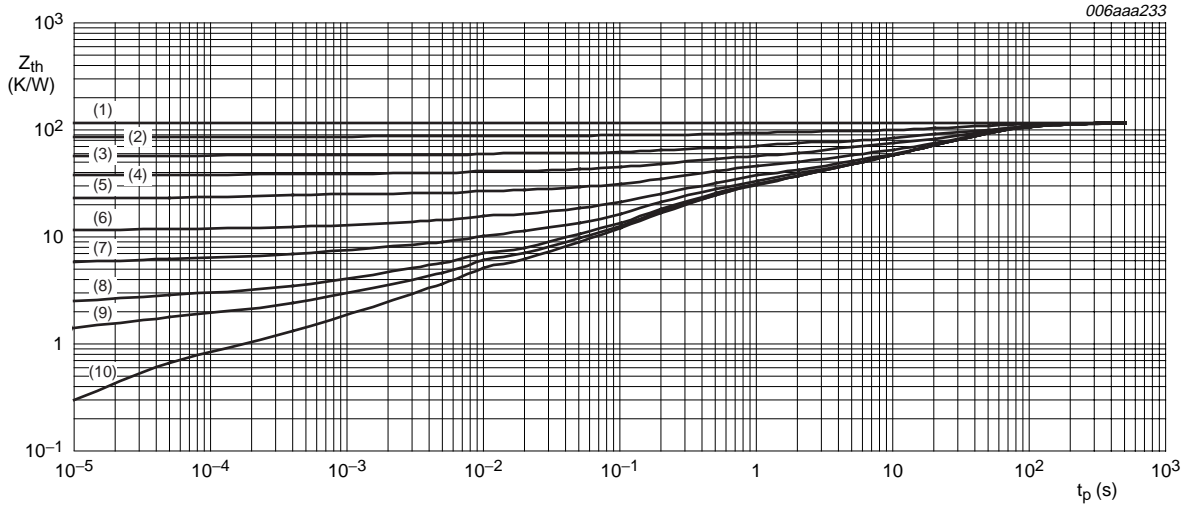
Notes

1. Pulse test: $t_p \leq 10$ ms; $\delta \leq 0.2$.
2. Device mounted on a printed-circuit board, single-sided copper, tin-plated and standard footprint.
3. Device mounted on a printed-circuit board, single-sided copper, tin-plated and mounting pad for collector 1 cm².
4. Device mounted on a printed-circuit board, single-sided copper, tin-plated and mounting pad for collector 6 cm².
5. Device mounted on a 7 cm² ceramic printed-circuit board, 1 cm² single-sided copper and tin-plated.



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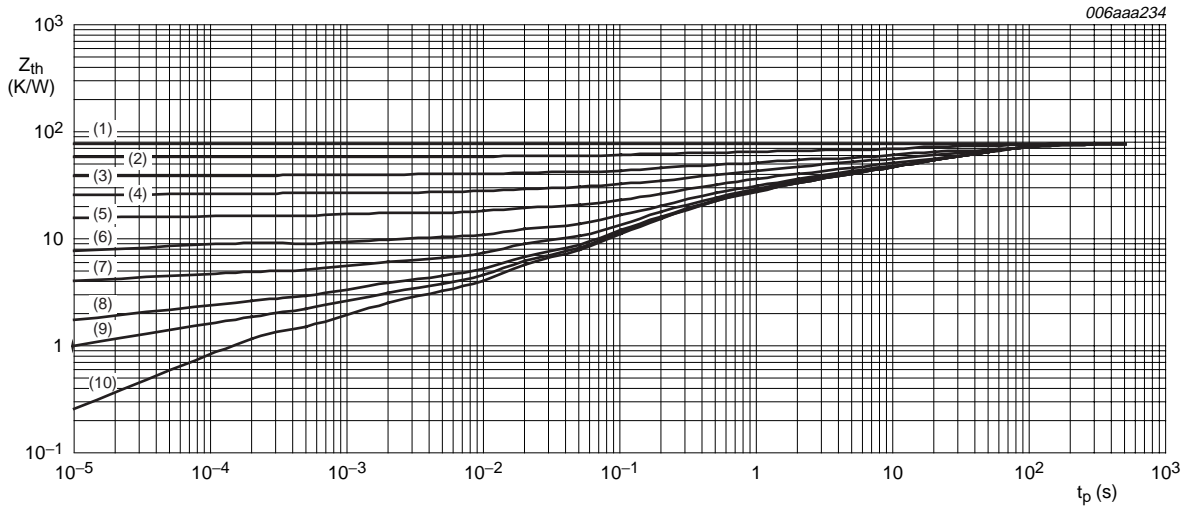
PBSS5540X



Mounted on FR4 printed-circuit board; mounting pad for collector 1 cm².

- | | | | | |
|----------------------|----------------------|---------------------|----------------------|----------------------|
| (1) $\delta = 1.$ | (3) $\delta = 0.5.$ | (5) $\delta = 0.2.$ | (7) $\delta = 0.05.$ | (9) $\delta = 0.01.$ |
| (2) $\delta = 0.75.$ | (4) $\delta = 0.33.$ | (6) $\delta = 0.1.$ | (8) $\delta = 0.02.$ | (10) $\delta = 0.$ |

Fig.4 Transient thermal impedance as a function of pulse time; typical values.



Mounted on FR4 printed-circuit board; mounting pad for collector 6 cm².

- | | | | | |
|----------------------|----------------------|---------------------|----------------------|----------------------|
| (1) $\delta = 1.$ | (3) $\delta = 0.5.$ | (5) $\delta = 0.2.$ | (7) $\delta = 0.05.$ | (9) $\delta = 0.01.$ |
| (2) $\delta = 0.75.$ | (4) $\delta = 0.33.$ | (6) $\delta = 0.1.$ | (8) $\delta = 0.02.$ | (10) $\delta = 0.$ |

Fig.5 Transient thermal impedance as a function of pulse time; typical values.

40 V, 5 A
PNP low V_{CEsat} (BISS) transistor

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CHARACTERISTICS $T_{amb} = 25\text{ °C}$ unless otherwise specified.

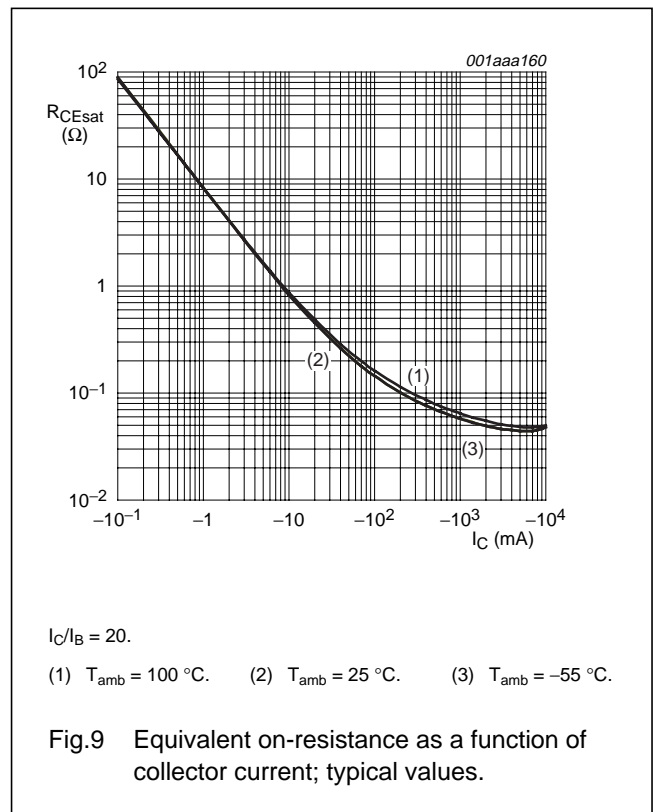
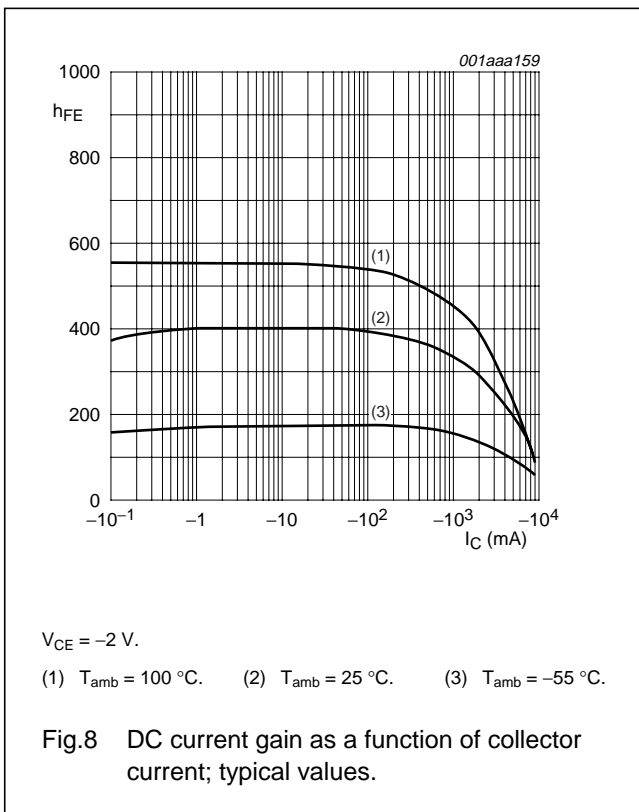
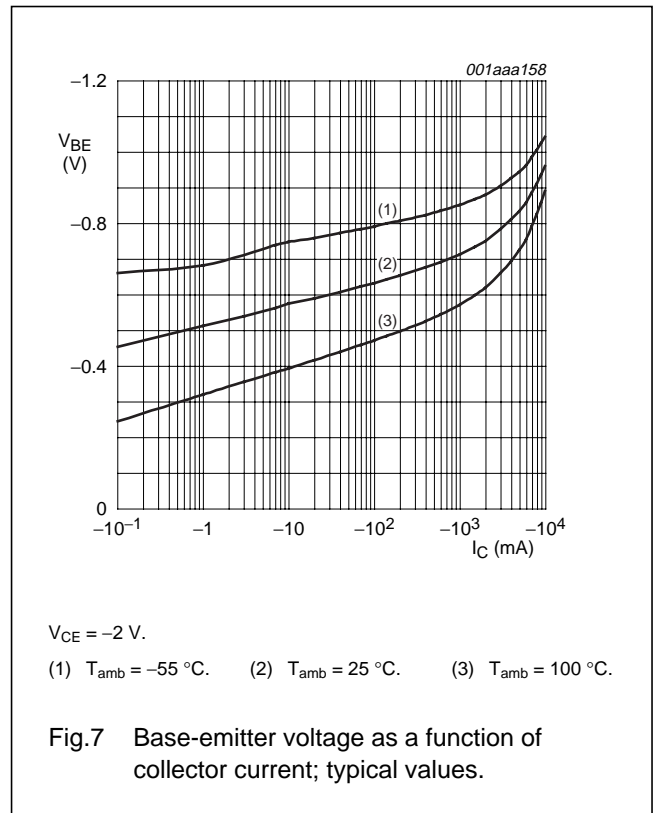
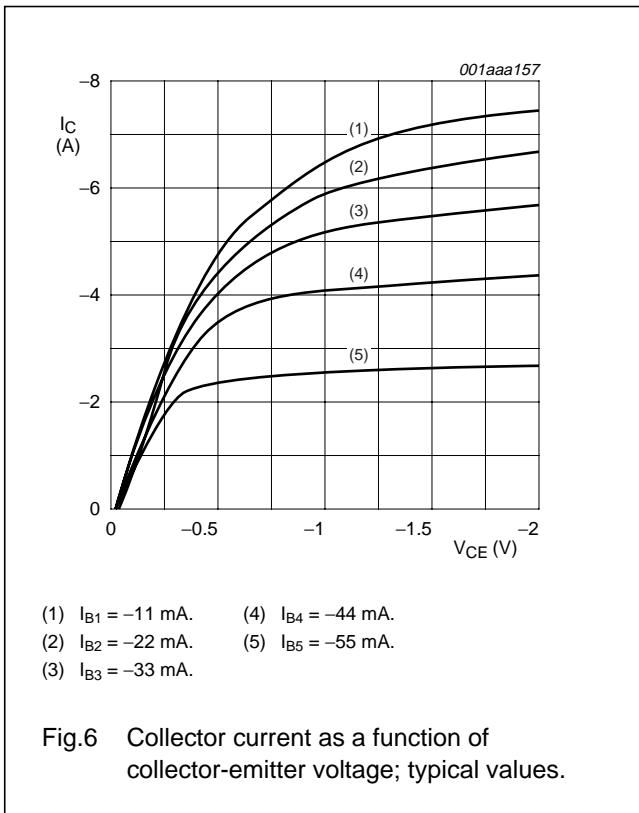
| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|-------------|--------------------------------------|--|------|------|------|------------------|
| I_{CBO} | collector-base cut-off current | $V_{CB} = -30\text{ V}; I_E = 0\text{ A}$ | – | – | –100 | nA |
| | | $V_{CB} = -30\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ °C}$ | – | – | –50 | μA |
| I_{EBO} | emitter-base cut-off current | $V_{EB} = -5\text{ V}; I_C = 0\text{ A}$ | – | – | –100 | nA |
| h_{FE} | DC current gain | $V_{CE} = -2\text{ V}; I_C = -0.5\text{ A}$ | 250 | – | – | |
| | | $V_{CE} = -2\text{ V}; I_C = -1\text{ A};$ note 1 | 200 | – | – | |
| | | $V_{CE} = -2\text{ V}; I_C = -2\text{ A};$ note 1 | 150 | – | – | |
| | | $V_{CE} = -2\text{ V}; I_C = -5\text{ A};$ note 1 | 50 | – | – | |
| V_{CEsat} | collector-emitter saturation voltage | $I_C = -0.5\text{ A}; I_B = -5\text{ mA}$ | – | – | 120 | mV |
| | | $I_C = -1\text{ A}; I_B = -10\text{ mA}$ | – | – | 170 | mV |
| | | $I_C = -2\text{ A}; I_B = -200\text{ mA}$ | – | – | 160 | mV |
| | | $I_C = -4\text{ A}; I_B = -200\text{ mA};$ note 1 | – | – | 340 | mV |
| | | $I_C = -5\text{ A}; I_B = -500\text{ mA};$ note 1 | – | – | 375 | mV |
| R_{CEsat} | equivalent on-resistance | $I_C = -5\text{ A}; I_B = -500\text{ mA};$ note 1 | – | 45 | 75 | $\text{m}\Omega$ |
| V_{BEsat} | base-emitter saturation voltage | $I_C = -4\text{ A}; I_B = -200\text{ mA};$ note 1 | – | – | –1.1 | V |
| | | $I_C = -5\text{ A}; I_B = -500\text{ mA};$ note 1 | – | – | –1.2 | V |
| V_{BEon} | base-emitter turn-on voltage | $V_{CE} = -2\text{ V}; I_C = -2\text{ A}$ | – | – | –1.0 | V |
| f_T | transition frequency | $V_{CE} = -10\text{ V}; I_C = -0.1\text{ A};$ $f = 100\text{ MHz}$ | 60 | – | – | MHz |
| C_c | collector capacitance | $V_{CB} = -10\text{ V}; I_E = I_e = 0\text{ A};$ $f = 1\text{ MHz}$ | – | – | 105 | pF |

Note

1. Pulse test: $t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02$.

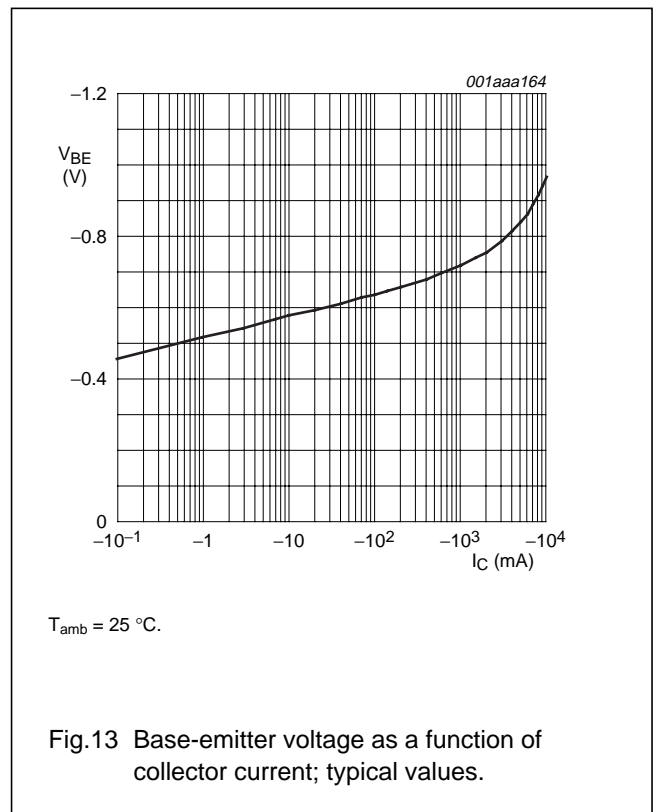
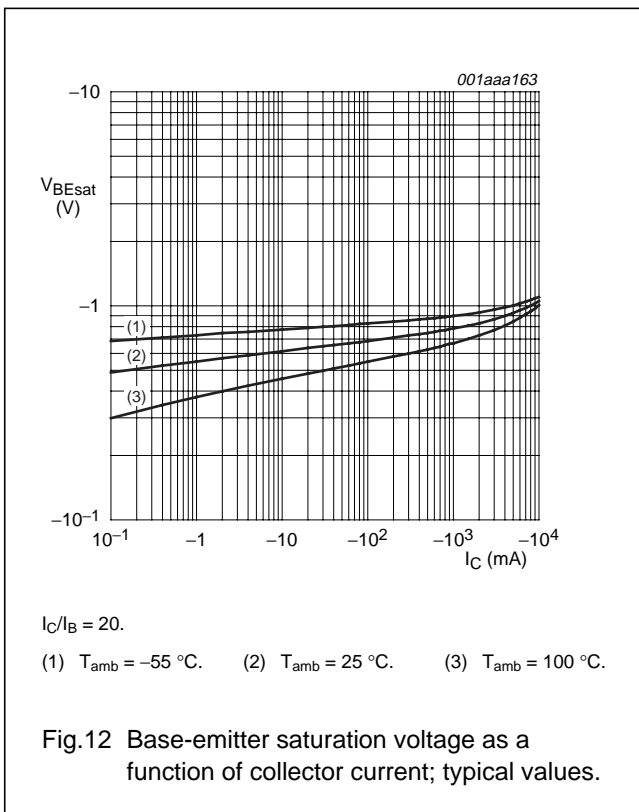
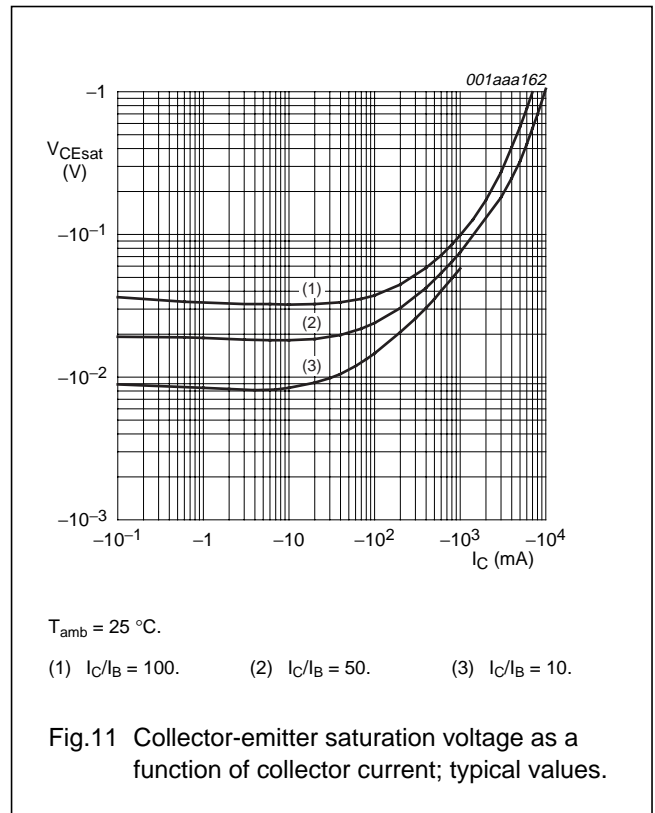
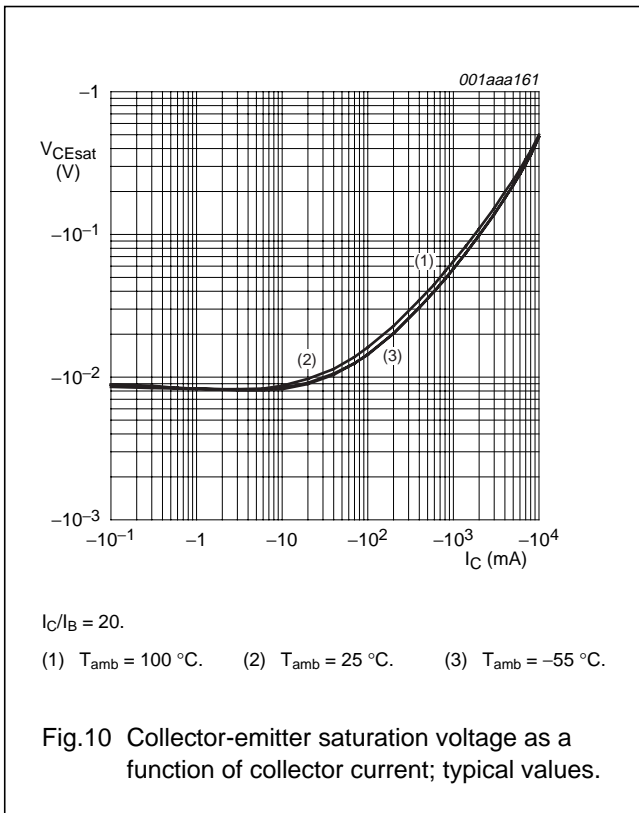
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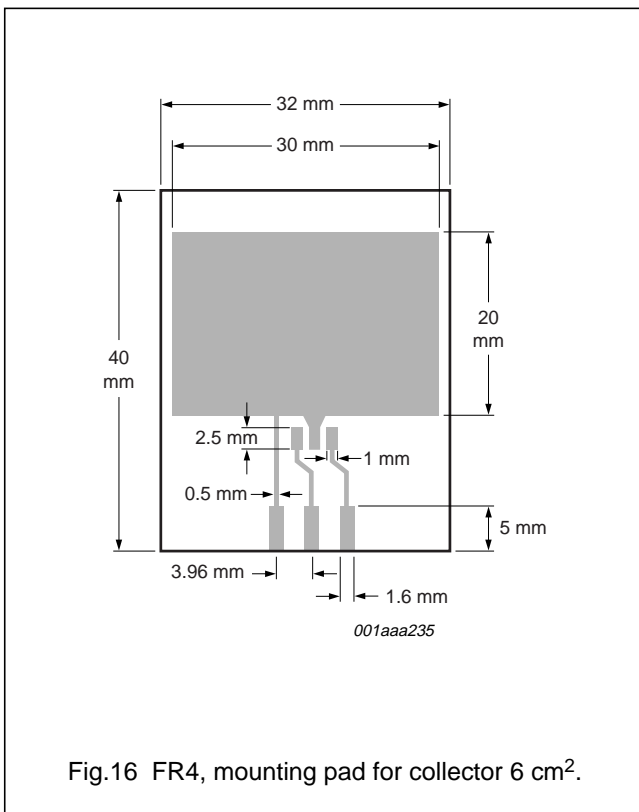
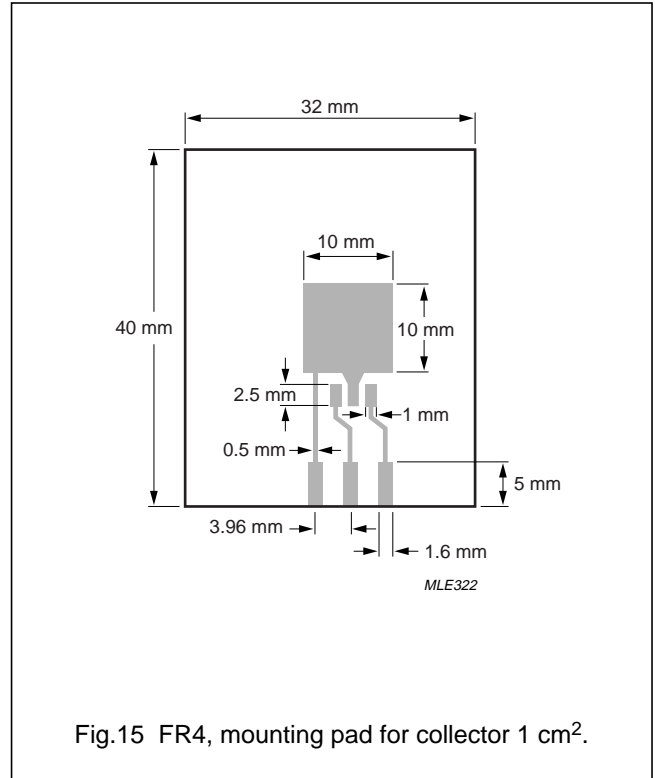
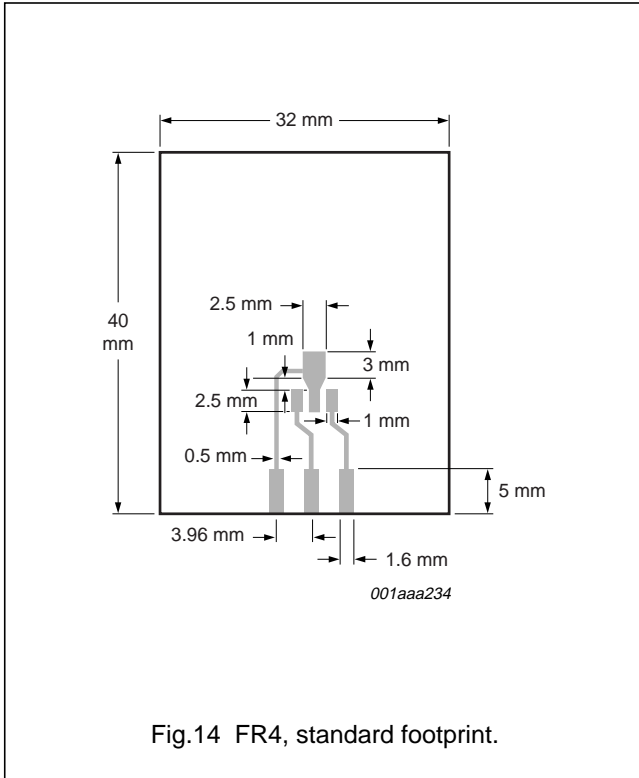
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Reference mounting conditions



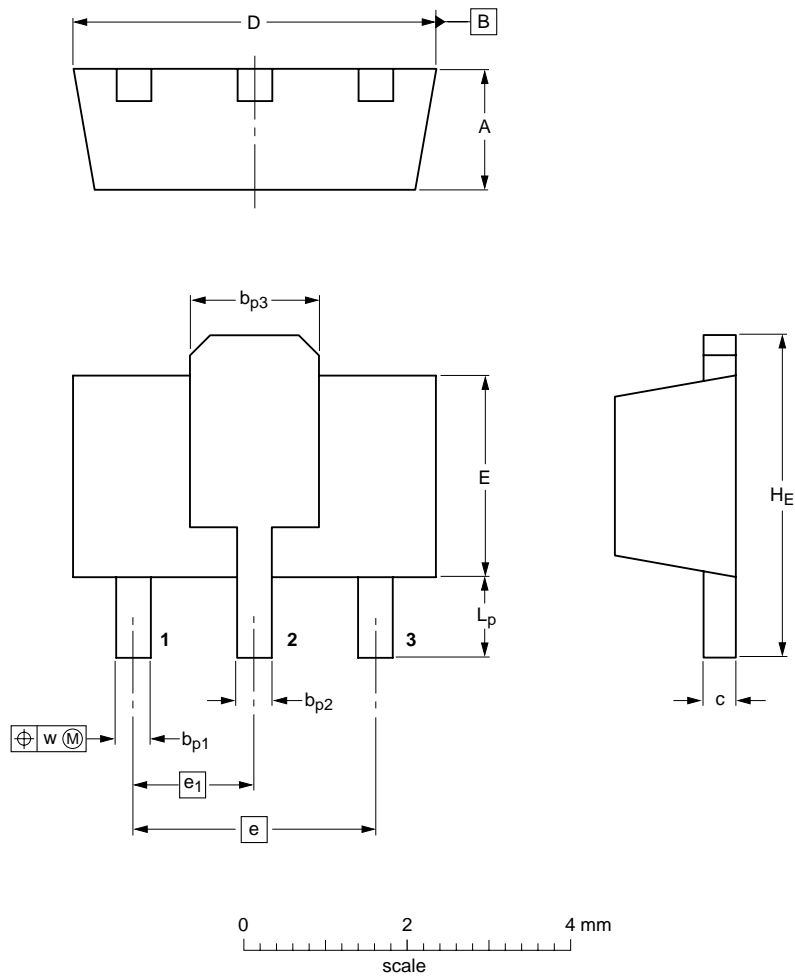
40 V, 5 A
PNP low V_{CEsat} (BISS) transistor

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PACKAGE OUTLINE

Plastic surface mounted package; collector pad for good heat transfer; 3 leads

SOT89



DIMENSIONS (mm are the original dimensions)

| UNIT | A | bp1 | bp2 | bp3 | c | D | E | e | e1 | HE | Lp | w |
|------|------------|--------------|--------------|------------|--------------|------------|------------|-----|-----|--------------|------------|------|
| mm | 1.6 1.4 | 0.48 0.35 | 0.53 0.40 | 1.8 1.4 | 0.44 0.23 | 4.6 4.4 | 2.6 2.4 | 3.0 | 1.5 | 4.25 3.75 | 1.2 0.8 | 0.13 |

| OUTLINE VERSION | REFERENCES | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|--------|-------|---------------------|----------------------|
| | IEC | JEDEC | JEITA | | |
| SOT89 | | TO-243 | SC-62 | | 99-09-13 04-08-03 |

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PNP low V_{CEsat} (BISS) transistor

PBSS5540X

DATA SHEET STATUS

| LEVEL | DATA SHEET STATUS ⁽¹⁾ | PRODUCT STATUS ⁽²⁾⁽³⁾ | DEFINITION |
|-------|----------------------------------|----------------------------------|--|
| I | Objective data | Development | This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice. |
| II | Preliminary data | Qualification | This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product. |
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Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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