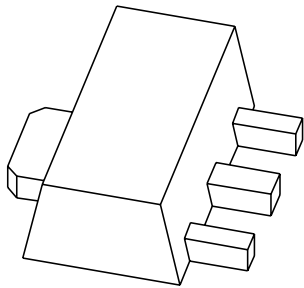


DATA SHEET



PBSS4540X

40 V, 5 A

NPN low V_{CEsat} (BISS) transistor

Product specification
Supersedes data of 2004 Jun 11

2004 Nov 04

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

PBSS4540X

FEATURES

- High h_{FE} and low V_{CEsat} at high current operation
- High collector current capability: I_C maximum 4 A
- High efficiency leading to less heat generation.

APPLICATIONS

- Medium power peripheral drivers (e.g. fan and motor)
- Strobe flash units for DSC and mobile phones
- Inverter applications (e.g. TFT displays)
- Power switch for LAN and ADSL systems
- Medium power DC-to-DC conversion
- Battery chargers.

DESCRIPTION

NPN low V_{CEsat} transistor in a medium power SOT89 (SC-62) package.
PNP complement: PBSS5540X.

MARKING

| TYPE NUMBER | MARKING CODE ⁽¹⁾ |
|-------------|-----------------------------|
| PBSS4540X | *1B |

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_{CM} | peak collector current | 10 | A |
| R_{CEsat} | equivalent on-resistance | 71 | m Ω |

PINNING

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

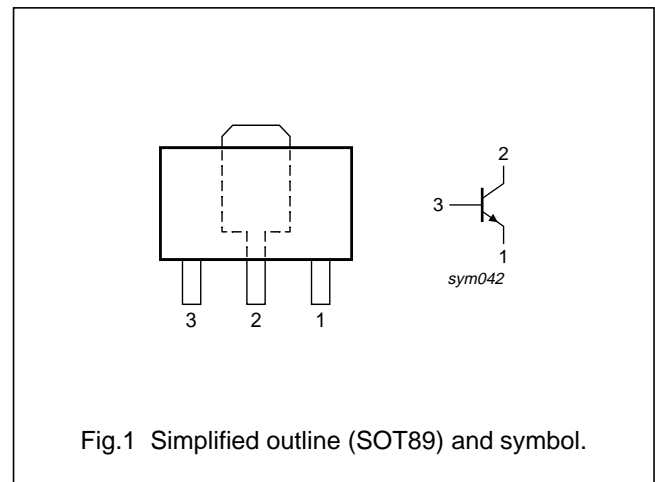


Fig.1 Simplified outline (SOT89) and symbol.

ORDERING INFORMATION

| TYPE NUMBER | PACKAGE | | |
|-------------|---------|--|---------|
| | NAME | DESCRIPTION | VERSION |
| PBSS4540X | SC-62 | plastic surface mounted package; collector pad for good heat transfer; 3 leads | SOT89 |

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

PBSS4540X

LIMITING VALUES

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

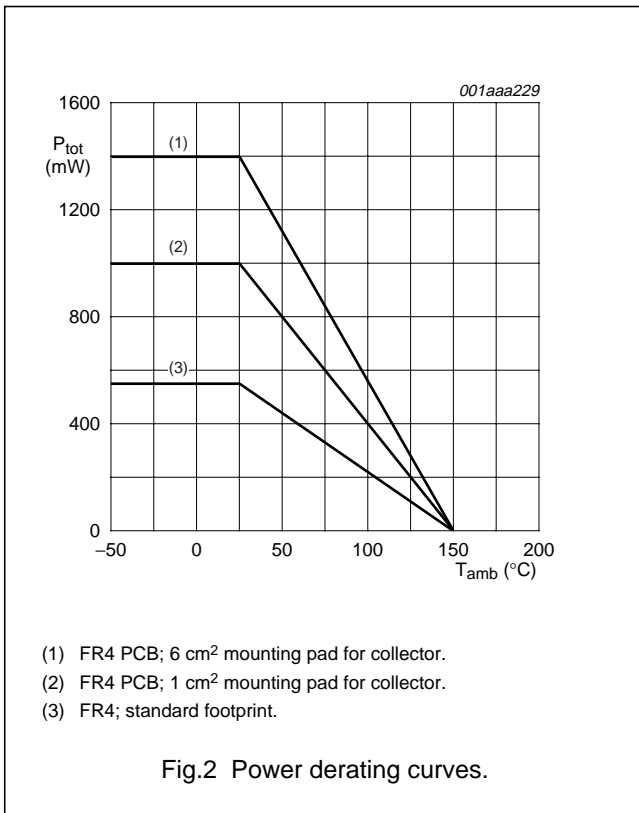
| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|-----------|--------------------------------------|----------------------|------|------|------|
| V_{CBO} | collector-base voltage | open emitter | – | 40 | V |
| V_{CEO} | collector-emitter voltage | open base | – | 40 | V |
| V_{EBO} | emitter-base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

Notes

1. Operated under pulsed conditions; pulse width $t_p \leq 10$ ms; duty cycle $\delta \leq 0.2$.
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. For other mounting conditions, see "Thermal considerations for SOT89 in the General Part of associated Handbook".

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PBSS4540X



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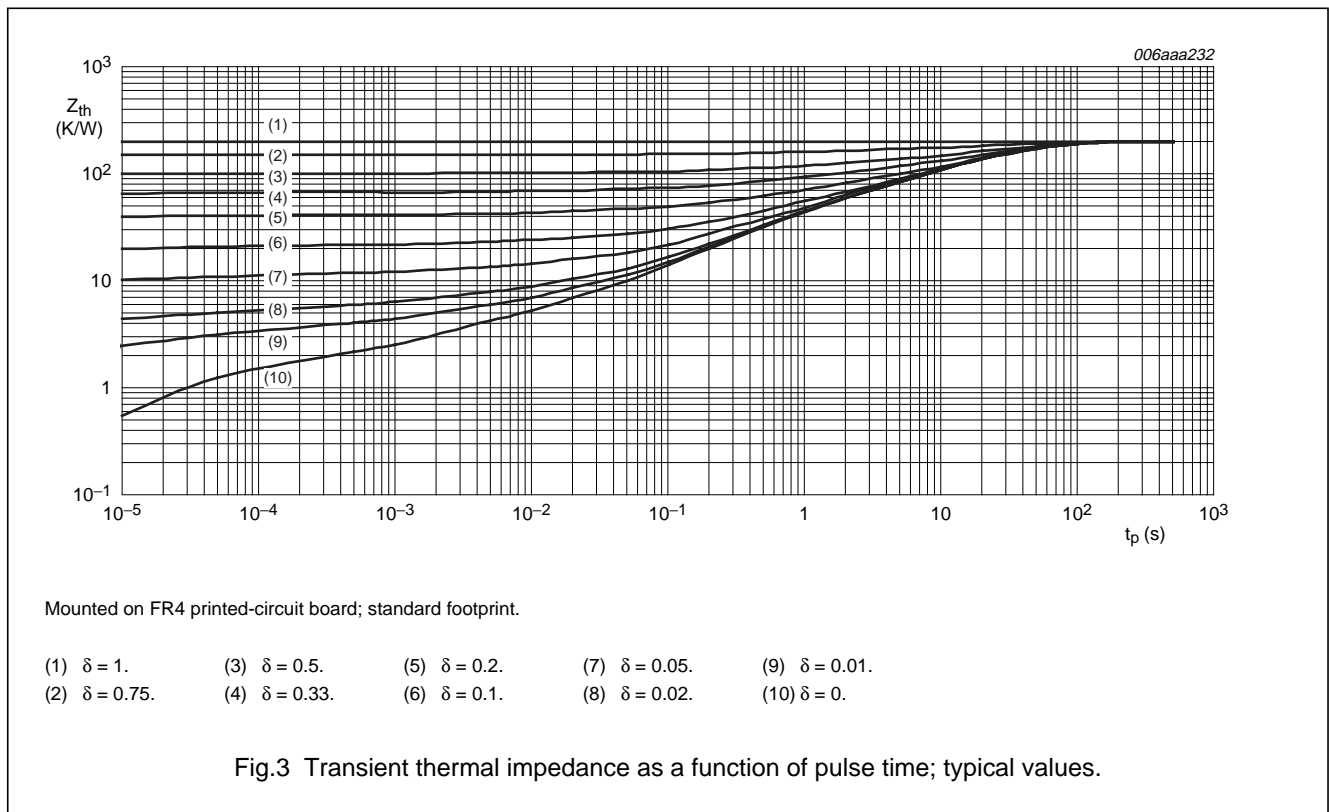
PBSS4540X

THERMAL CHARACTERISTICS

| SYMBOL | PARAMETER | CONDITIONS | VALUE | UNIT |
|---------------|----------------------------------|---------------|-------|------|
| $R_{th(j-a)}$ | 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 | |
| $R_{th(j-s)}$ | from junction to soldering point | | 16 | K/W |

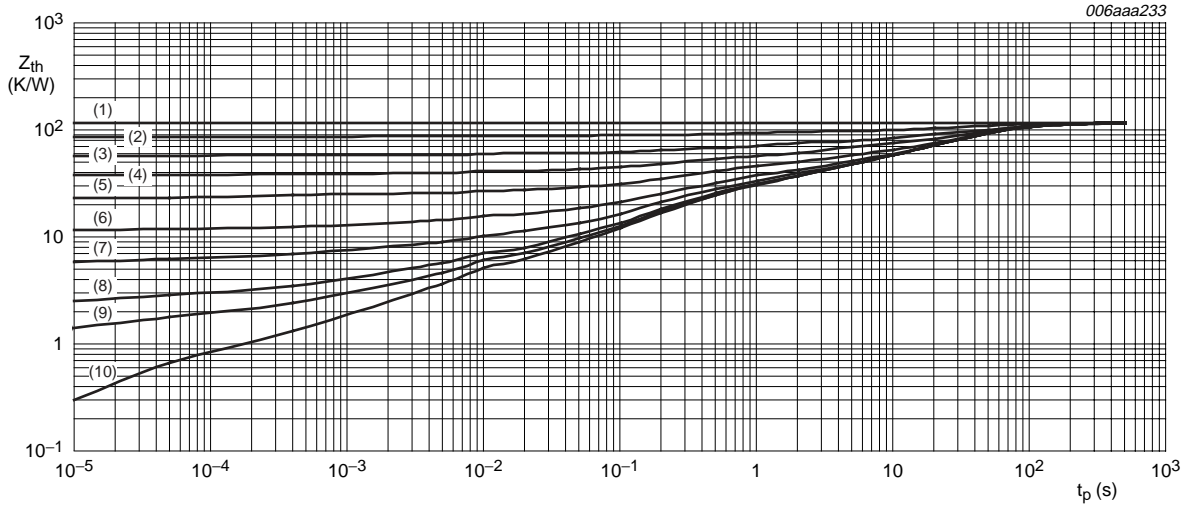
Notes

1. Operated under pulsed conditions; pulse width $t_p \leq 10$ ms; duty cycle $\delta \leq 0.2$.
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. For other mounting conditions, see "Thermal considerations for SOT89 in the General Part of associated Handbook".



40 V, 5 A
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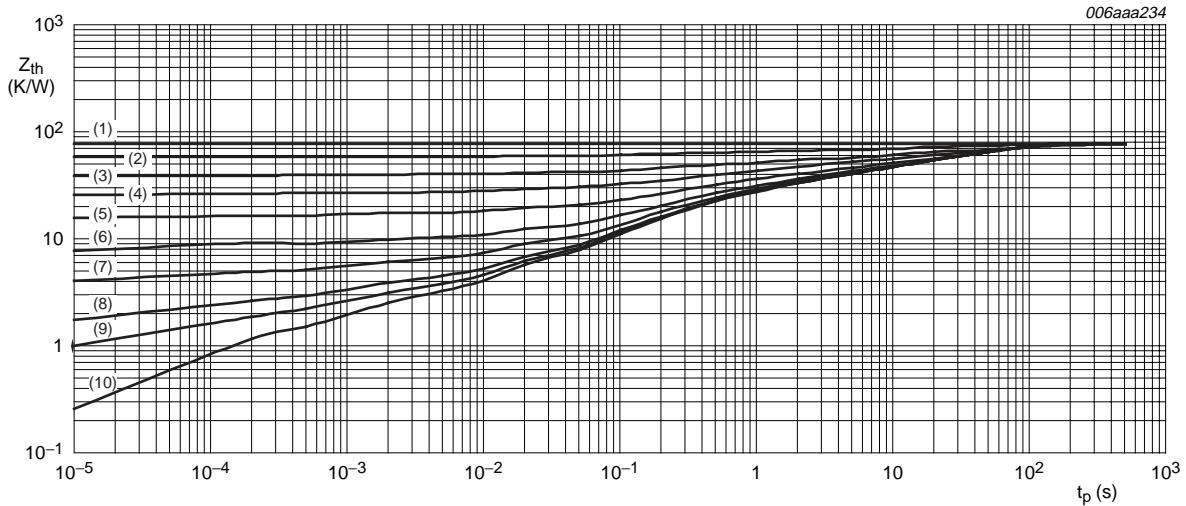
PBSS4540X



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
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PBSS4540X

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

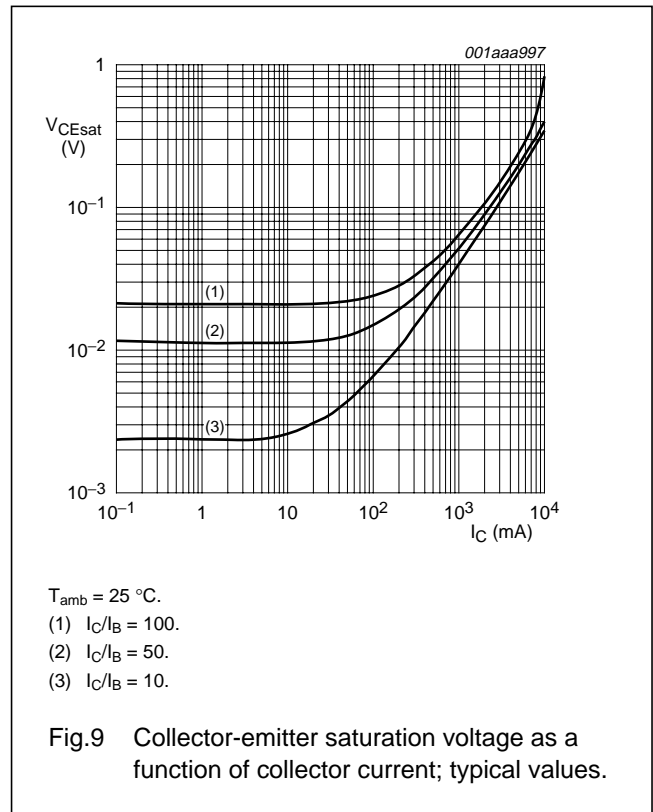
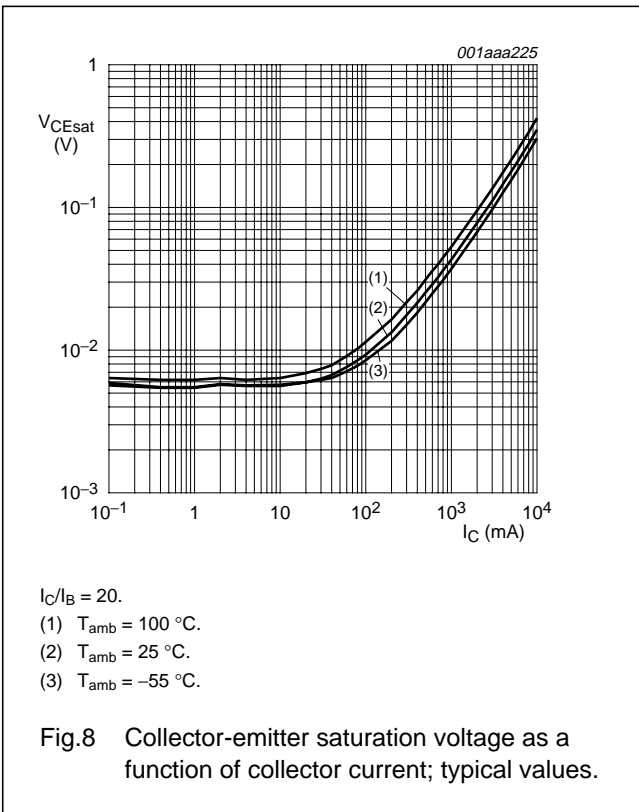
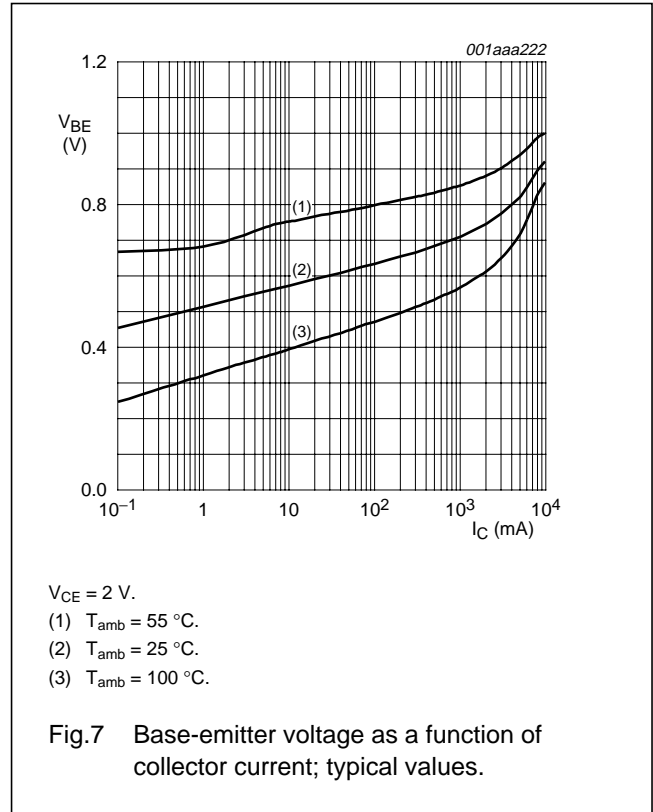
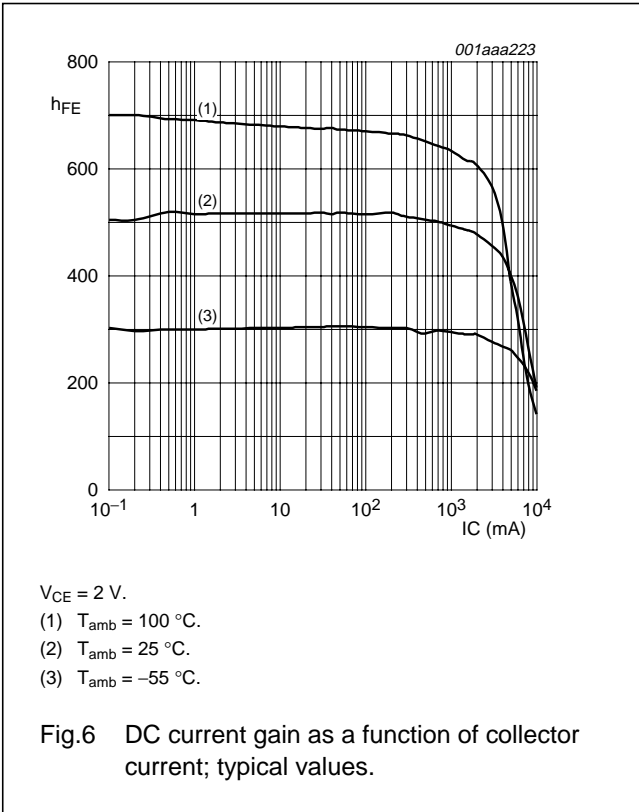
| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|-------------|--------------------------------------|---|------|------|------|------------------|
| I_{CBO} | collector-base cut-off current | $V_{CB} = 30\text{ V}; I_E = 0\text{ A}$ | – | – | 100 | nA |
| | | $V_{CB} = 30\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ °C}$ | – | – | 50 | μA |
| I_{CES} | collector-emitter cut-off current | $V_{CE} = 30\text{ V}; V_{BE} = 0\text{ V}$ | – | – | 0.1 | 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 | $V_{CE} = 2\text{ V}; I_C = 0.5\text{ A}$ | 300 | – | – | |
| | | $V_{CE} = 2\text{ V}; I_C = 1\text{ A};$ note 1 | 300 | – | – | |
| | | $V_{CE} = 2\text{ V}; I_C = 2\text{ A};$ note 1 | 250 | – | – | |
| | | $V_{CE} = 2\text{ V}; I_C = 5\text{ A};$ note 1 | 100 | – | – | |
| V_{CEsat} | collector-emitter saturation voltage | $I_C = 0.5\text{ A}; I_B = 5\text{ mA}$ | – | – | 90 | mV |
| | | $I_C = 1\text{ A}; I_B = 10\text{ mA}$ | – | – | 120 | mV |
| | | $I_C = 2\text{ A}; I_B = 200\text{ mA};$ note 1 | – | – | 150 | mV |
| | | $I_C = 4\text{ A}; I_B = 200\text{ mA};$ note 1 | – | – | 290 | mV |
| | | $I_C = 5\text{ A}; I_B = 500\text{ mA};$ note 1 | – | – | 355 | mV |
| R_{CEsat} | equivalent on-resistance | $I_C = 5\text{ A}; I_B = 500\text{ mA};$ note 1 | – | 40 | 71 | $\text{m}\Omega$ |
| 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 | $V_{CE} = 2\text{ V}; I_C = 2\text{ A}$ | – | – | 1.1 | V |
| f_T | transition frequency | $V_{CE} = 10\text{ V}; I_C = 0.1\text{ A};$ $f = 100\text{ MHz}$ | 70 | – | – | MHz |
| C_c | collector capacitance | $V_{CB} = 10\text{ V}; I_E = I_C = 0\text{ A};$ $f = 1\text{ MHz}$ | – | – | 75 | pF |

Note

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

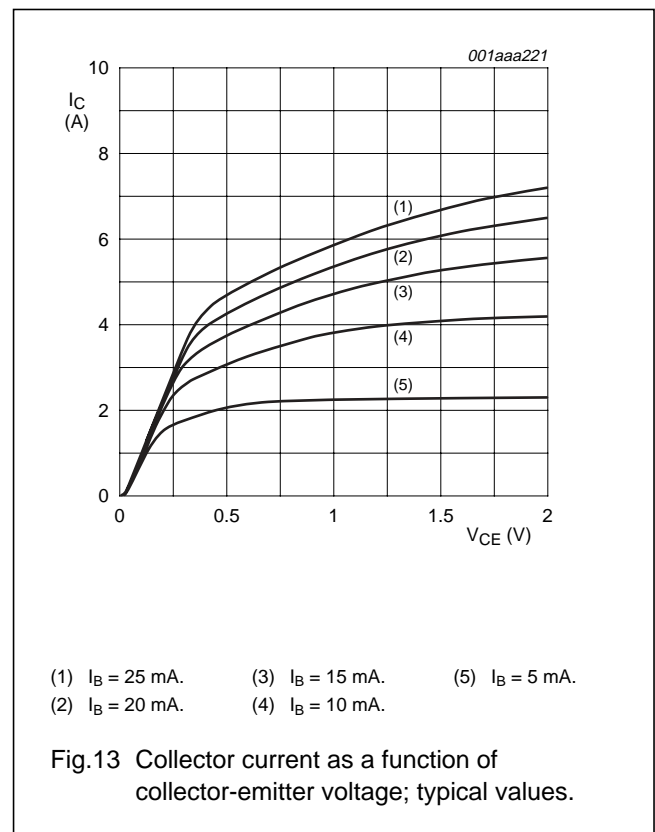
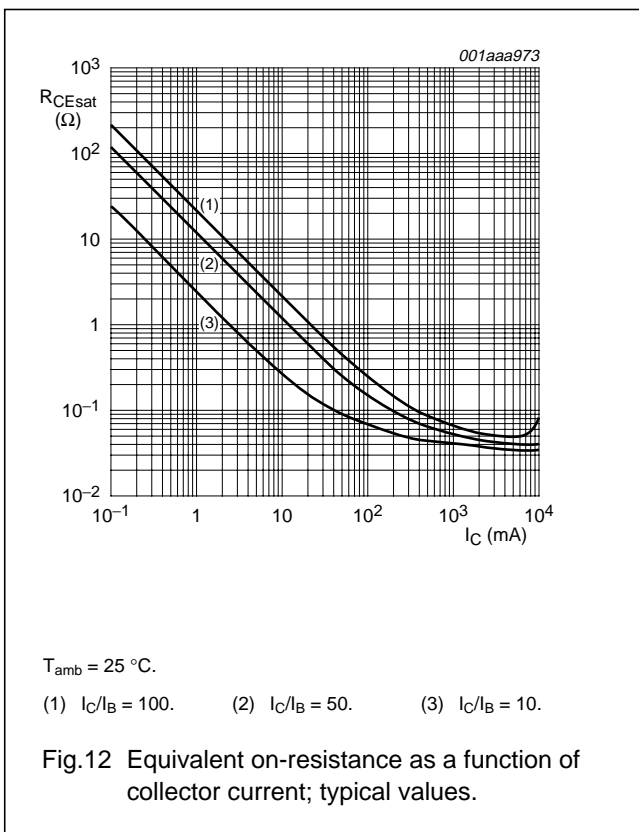
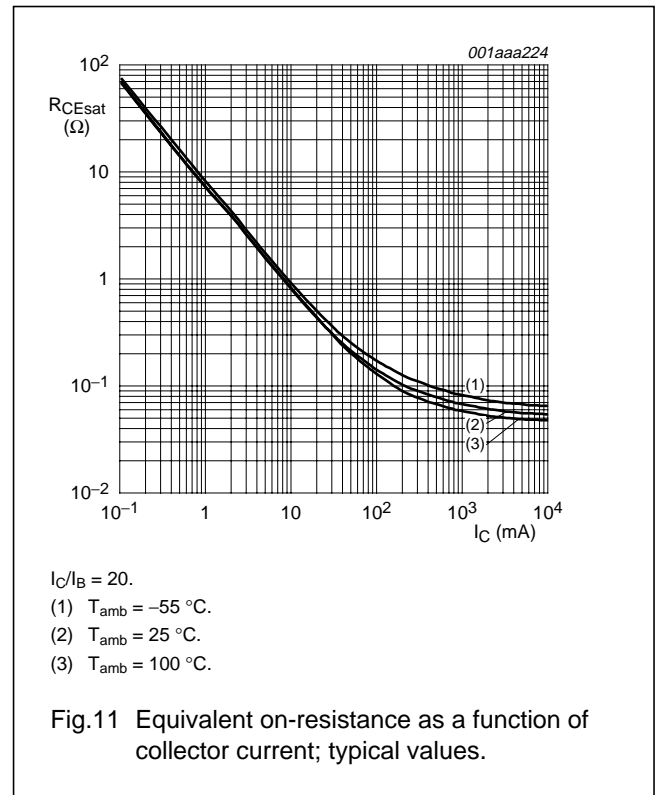
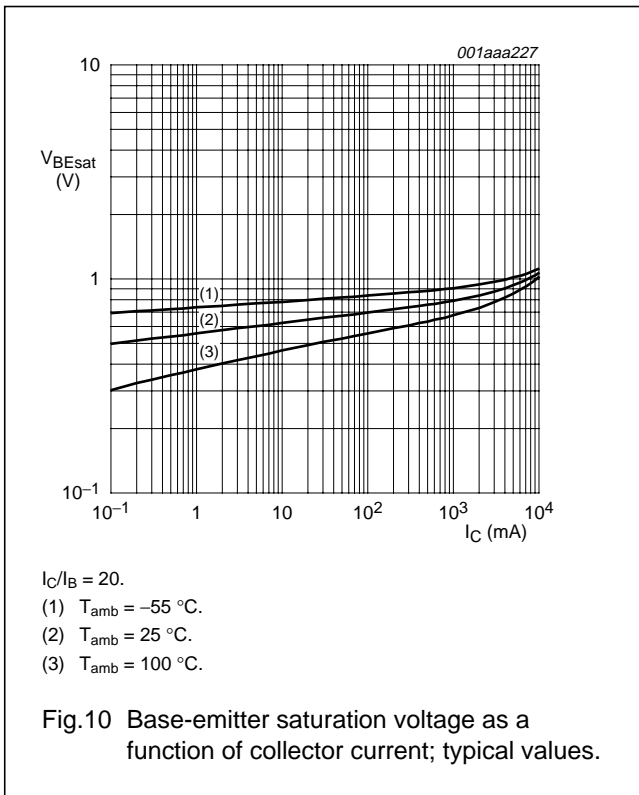
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PBSS4540X

Reference mounting conditions

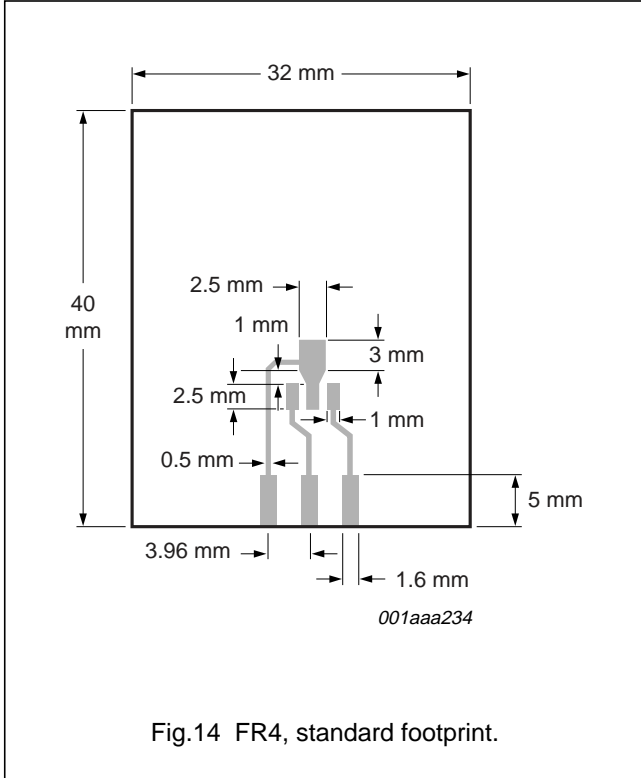


Fig.14 FR4, standard footprint.

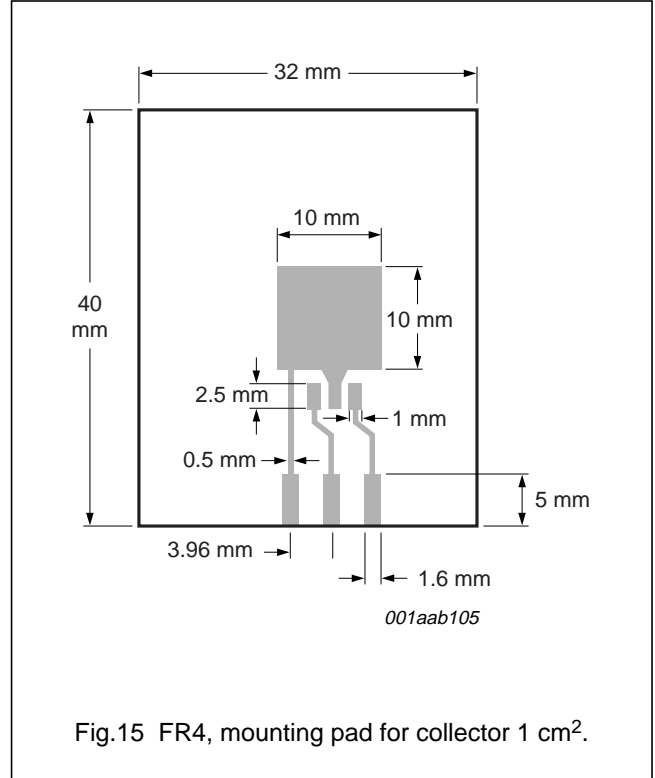


Fig.15 FR4, mounting pad for collector 1 cm².

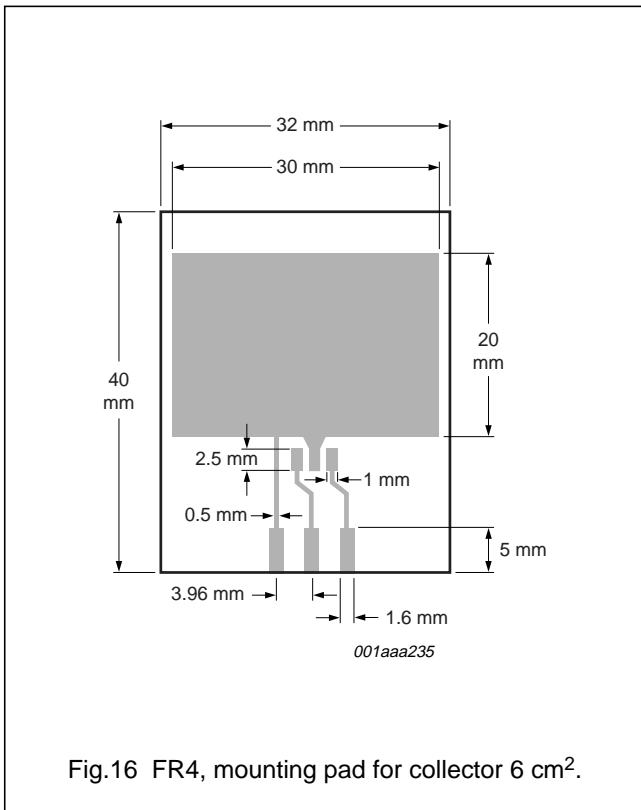


Fig.16 FR4, mounting pad for collector 6 cm².

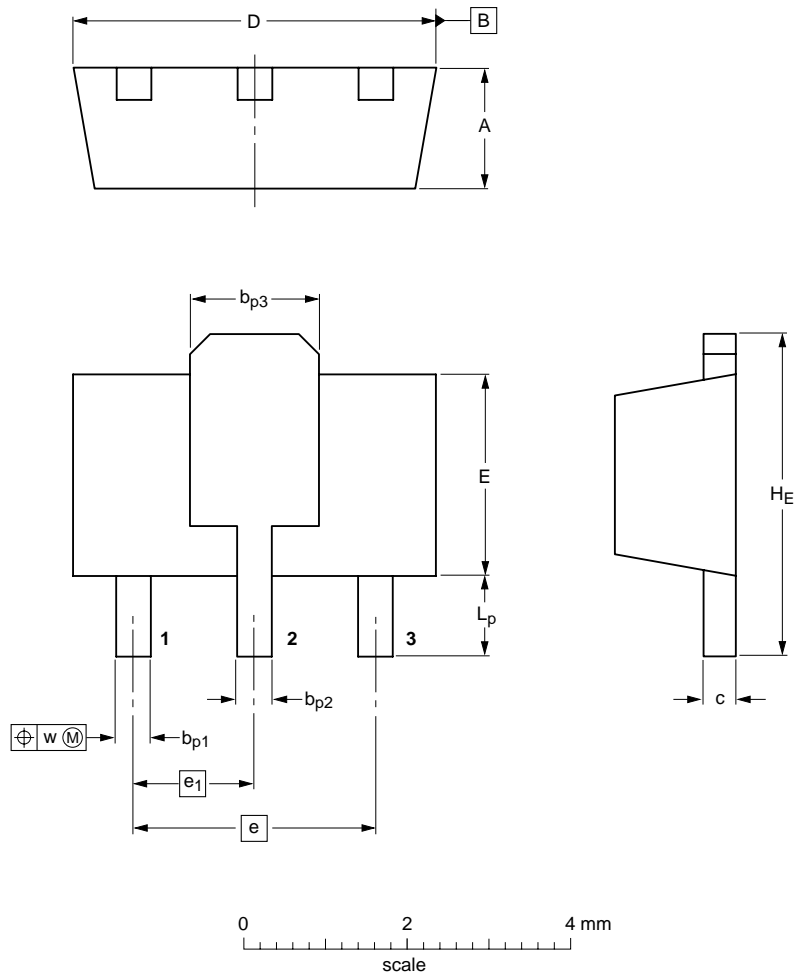
40 V, 5 A
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PBSS4540X

PACKAGE OUTLINE

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

SOT89



DIMENSIONS (mm are the original dimensions)

| UNIT | A | b _{p1} | b _{p2} | b _{p3} | c | D | E | e | e ₁ | H _E | L _p | 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 |

40 V, 5 A
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PBSS4540X

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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