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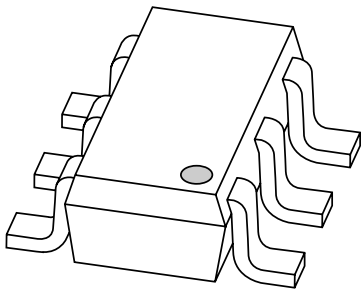
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Kind regards,

Team Nexperia

# DATA SHEET



## **PBSS4240DPN**

40 V low  $V_{CEsat}$  NPN/PNP  
transistor

Product data sheet

2003 Feb 20

40 V low  $V_{CEsat}$  NPN/PNP transistor

PBSS4240DPN

- FEATURES**
- Low collector-emitter saturation voltage  $V_{CEsat}$
  - High collector current capability  $I_C$  and  $I_{CM}$
  - High collector current gain  $h_{FE}$  at high  $I_C$
  - High efficiency leading to reduced heat generation
  - Reduced printed-circuit board area requirements.

- APPLICATIONS**
- Power management:
    - Complementary MOSFET driver
    - Dual supply line switching.
  - Peripheral driver:
    - Half and full bridge motor drivers
    - Multi-phase stepper motor driver.

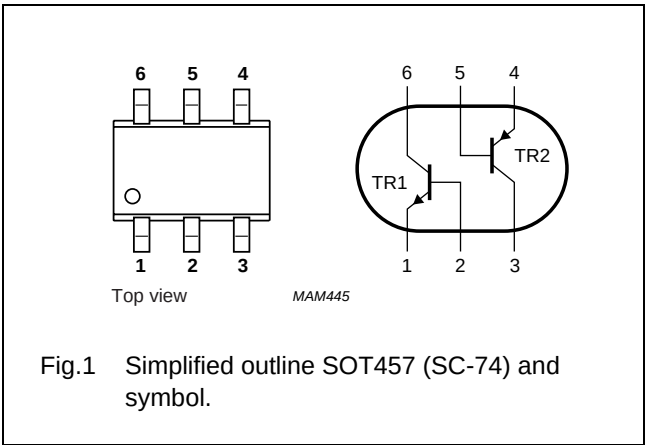
**DESCRIPTION**

NPN/PNP low  $V_{CEsat}$  transistor pair in a SOT457 (SC-74) plastic package.

| TYPE NUMBER | MARKING CODE |
|-------------|--------------|
| PBSS4240DPN | M3           |

| SYMBOL      | PARAMETER                         | MAX. |      | UNIT |
|-------------|-----------------------------------|------|------|------|
|             |                                   | NPN  | PNP  |      |
| $V_{CEO}$   | emitter-collector voltage         | 40   | −40  | V    |
| $I_C$       | collector current (DC)            | 1.35 | −1.1 | A    |
| $I_{CRP}$   | repetitive peak collector current | 2    | −2   | A    |
| $I_{CM}$    | peak collector current            | 3    | −3   | A    |
| $R_{CEsat}$ | equivalent on-resistance          | 200  | 260  | mΩ   |

| PIN  | DESCRIPTION        |
|------|--------------------|
| 1, 4 | emitter TR1; TR2   |
| 2, 5 | base TR1; TR2      |
| 6, 3 | collector TR1; TR2 |



40 V low  $V_{CEsat}$  NPN/PNP transistor

## PBSS4240DPN

## LIMITING VALUES

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

| SYMBOL                                                                                          | PARAMETER                            | CONDITIONS                           | MIN. | MAX. | UNIT |
|-------------------------------------------------------------------------------------------------|--------------------------------------|--------------------------------------|------|------|------|
| <b>Per transistor unless otherwise specified; for the PNP transistor with negative polarity</b> |                                      |                                      |      |      |      |
| $V_{CBO}$                                                                                       | collector-base voltage               | open emitter                         | –    | 40   | V    |
| $V_{CEO}$                                                                                       | collector-emitter voltage            | open base                            | –    | 40   | V    |
| $V_{EBO}$                                                                                       | emitter-base voltage                 | open collector                       | –    | 5    | V    |
| $I_C$                                                                                           | collector current (DC)<br>NPN<br>PNP |                                      | –    |      |      |
|                                                                                                 |                                      |                                      | –    | 1.35 | A    |
|                                                                                                 |                                      |                                      | –    | –1.1 | A    |
| $I_{CRP}$                                                                                       | repetitive peak collector current    | note 1                               | –    | 2    | A    |
| $I_{CM}$                                                                                        | peak collector current               | single peak                          | –    | 3    | A    |
| $I_B$                                                                                           | base current (DC)                    |                                      | –    | 300  | mA   |
| $I_{BM}$                                                                                        | peak base current                    |                                      | –    | 1    | A    |
| $P_{tot}$                                                                                       | total power dissipation              | $T_{amb} \leq 25\text{ °C}$ ; note 2 | –    | 370  | mW   |
|                                                                                                 |                                      | $T_{amb} \leq 25\text{ °C}$ ; note 3 | –    | 310  | mW   |
|                                                                                                 |                                      | $T_{amb} \leq 25\text{ °C}$ ; note 1 | –    | 1.1  | W    |
| $T_{stg}$                                                                                       | storage temperature                  |                                      | –65  | +150 | °C   |
| $T_j$                                                                                           | junction temperature                 |                                      | –    | 150  | °C   |
| $T_{amb}$                                                                                       | operating ambient temperature        |                                      | –65  | +150 | °C   |
| <b>Per device</b>                                                                               |                                      |                                      |      |      |      |
| $P_{tot}$                                                                                       | total power dissipation              | $T_{amb} \leq 25\text{ °C}$ ; note 2 | –    | 600  | mW   |

## Notes

1. Operated under pulsed conditions: duty cycle  $\delta \leq 20\%$ ; pulse width  $t_p \leq 10\text{ ms}$ ; mounting pad for collector standard footprint.
2. Device mounted on a printed-circuit board; single-sided copper; tinplated; mounting pad for collector  $1\text{ cm}^2$ .
3. Device mounted on a printed-circuit board; single-sided copper; tinplated; standard footprint.

## THERMAL CHARACTERISTICS

| SYMBOL                | PARAMETER                                   | CONDITIONS          | VALUE | UNIT |
|-----------------------|---------------------------------------------|---------------------|-------|------|
| <b>Per transistor</b> |                                             |                     |       |      |
| $R_{th\ j-a}$         | thermal resistance from junction to ambient | in free air; note 1 | 340   | K/W  |
|                       |                                             | in free air; note 2 | 110   | K/W  |

## Notes

1. Device mounted on a printed-circuit board, single-sided copper, tinplated, mounting pad for collector  $1\text{ cm}^2$ .
2. Operated under pulsed conditions: pulse width  $t_p \leq 10\text{ ms}$ ; duty cycle  $\delta \leq 0.20$ ; mounting pad for collector standard footprint.

40 V low  $V_{CEsat}$  NPN/PNP transistor

## PBSS4240DPN

## CHARACTERISTICS

$T_{amb} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

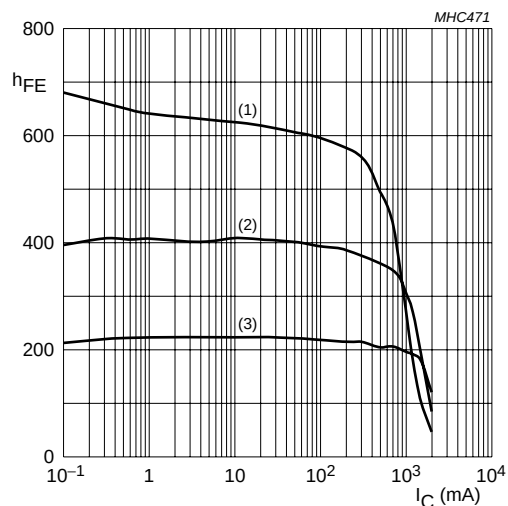
| SYMBOL                                                                                          | PARAMETER                            | CONDITIONS                                                          | MIN. | TYP. | MAX. | UNIT             |
|-------------------------------------------------------------------------------------------------|--------------------------------------|---------------------------------------------------------------------|------|------|------|------------------|
| <b>Per transistor unless otherwise specified; for the PNP transistor with negative polarity</b> |                                      |                                                                     |      |      |      |                  |
| $I_{CBO}$                                                                                       | collector-base cut-off current       | $V_{CB} = 40\text{ V}; I_E = 0$                                     | –    | –    | 100  | nA               |
|                                                                                                 |                                      | $V_{CB} = 40\text{ V}; I_E = 0; T_j = 150\text{ }^{\circ}\text{C}$  | –    | –    | 50   | $\mu\text{A}$    |
| $I_{CEO}$                                                                                       | collector-emitter cut-off current    | $V_{CE} = 30\text{ V}; I_B = 0$                                     | –    | –    | 100  | nA               |
| $I_{EBO}$                                                                                       | emitter-base cut-off current         | $V_{EB} = 5\text{ V}; I_C = 0$                                      | –    | –    | 100  | nA               |
| $h_{FE}$                                                                                        | DC current gain                      | $V_{CE} = 5\text{ V}; I_C = 1\text{ mA}$                            | 300  | –    | –    |                  |
| $f_T$                                                                                           | transition frequency                 | $I_C = 50\text{ mA}; V_{CE} = 10\text{ V};$<br>$f = 100\text{ MHz}$ | 150  | –    | –    | MHz              |
| $C_c$                                                                                           | collector capacitance                | $V_{CB} = 10\text{ V}; I_E = I_e = 0;$<br>$f = 1\text{ MHz}$        | –    | –    | 12   | pF               |
| <b>TR1 (NPN)</b>                                                                                |                                      |                                                                     |      |      |      |                  |
| $h_{FE}$                                                                                        | DC current gain                      | $V_{CE} = 5\text{ V}; I_C = 500\text{ mA}$                          | 300  | –    | 900  |                  |
|                                                                                                 |                                      | $V_{CE} = 5\text{ V}; I_C = 1\text{ A}$                             | 200  | –    | –    |                  |
|                                                                                                 |                                      | $V_{CE} = 5\text{ V}; I_C = 2\text{ A}; \text{note 1}$              | 75   | –    | –    |                  |
| $V_{CEsat}$                                                                                     | collector-emitter saturation voltage | $I_C = 100\text{ mA}; I_B = 1\text{ mA}$                            | –    | 60   | 75   | mV               |
|                                                                                                 |                                      | $I_C = 500\text{ mA}; I_B = 50\text{ mA}$                           | –    | 80   | 100  | mV               |
|                                                                                                 |                                      | $I_C = 1\text{ A}; I_B = 100\text{ mA}$                             | –    | 150  | 200  | mV               |
|                                                                                                 |                                      | $I_C = 2\text{ A}; I_B = 200\text{ mA}; \text{note 1}$              | –    | 300  | 400  | mV               |
| $V_{BEsat}$                                                                                     | base-emitter saturation voltage      | $I_C = 1\text{ A}; I_B = 100\text{ mA}$                             | –    | –    | 1.2  | V                |
| $V_{BEon}$                                                                                      | base-emitter turn-on voltage         | $V_{CE} = 5\text{ V}; I_C = 1\text{ A}$                             | –    | –    | 1.1  | V                |
| $R_{CEsat}$                                                                                     | equivalent on-resistance             | $I_C = 1\text{ A}; I_B = 100\text{ mA}$                             | –    | –    | 200  | $\text{m}\Omega$ |
| <b>TR2 (PNP)</b>                                                                                |                                      |                                                                     |      |      |      |                  |
| $h_{FE}$                                                                                        | DC current gain                      | $V_{CE} = -5\text{ V}; I_C = -100\text{ mA}$                        | 300  | –    | 800  |                  |
|                                                                                                 |                                      | $V_{CE} = -5\text{ V}; I_C = -500\text{ mA}$                        | 250  | –    | –    |                  |
|                                                                                                 |                                      | $V_{CE} = -5\text{ V}; I_C = -1\text{ A}$                           | 160  | –    | –    |                  |
|                                                                                                 |                                      | $V_{CE} = -5\text{ V}; I_C = -2\text{ A}; \text{note 1}$            | 50   | –    | –    |                  |
| $V_{CEsat}$                                                                                     | saturation voltage                   | $I_C = -100\text{ mA}; I_B = -1\text{ mA}$                          | –    | -90  | -120 | mV               |
|                                                                                                 |                                      | $I_C = -500\text{ mA}; I_B = -50\text{ mA}$                         | –    | -100 | -145 | mV               |
|                                                                                                 |                                      | $I_C = -1\text{ A}; I_B = -100\text{ mA}$                           | –    | -180 | -260 | mV               |
|                                                                                                 |                                      | $I_C = -2\text{ A}; I_B = -200\text{ mA}; \text{note 1}$            | –    | -400 | -530 | mV               |
| $V_{BEsat}$                                                                                     | saturation voltage                   | $I_C = -1\text{ A}; I_B = -50\text{ mA}$                            | –    | –    | -1.1 | V                |
| $V_{BEon}$                                                                                      | base-emitter turn-on voltage         | $V_{CE} = -5\text{ V}; I_C = -1\text{ A}$                           | –    | –    | -1   | V                |
| $R_{CEsat}$                                                                                     | equivalent on-resistance             | $I_C = -1\text{ A}; I_B = -100\text{ mA}; \text{note 1}$            | –    | –    | 260  | $\text{m}\Omega$ |

## Note

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

40 V low  $V_{CEsat}$  NPN/PNP transistor

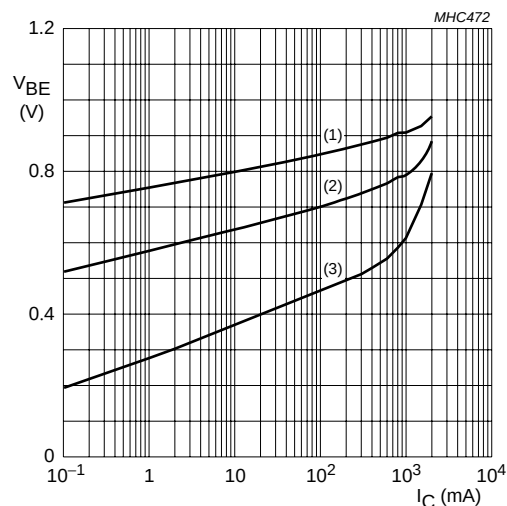
## PBSS4240DPN



TR1 (NPN);  $V_{CE} = 5$  V.

- (1)  $T_{amb} = 150$  °C.
- (2)  $T_{amb} = 25$  °C.
- (3)  $T_{amb} = -55$  °C.

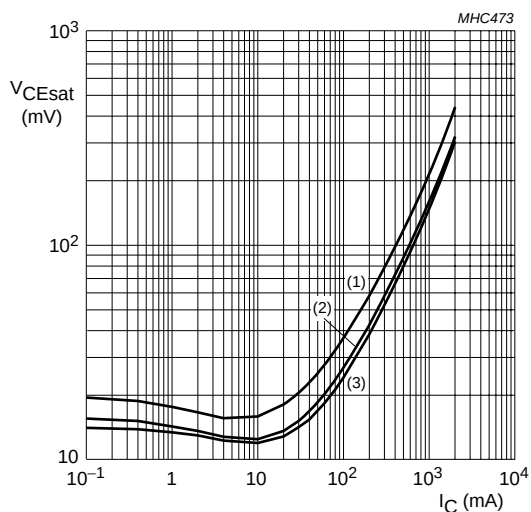
Fig.2 DC current gain as a function of collector current; typical values.



TR1 (NPN);  $V_{CE} = 5$  V.

- (1)  $T_{amb} = -55$  °C.
- (2)  $T_{amb} = 25$  °C.
- (3)  $T_{amb} = 150$  °C.

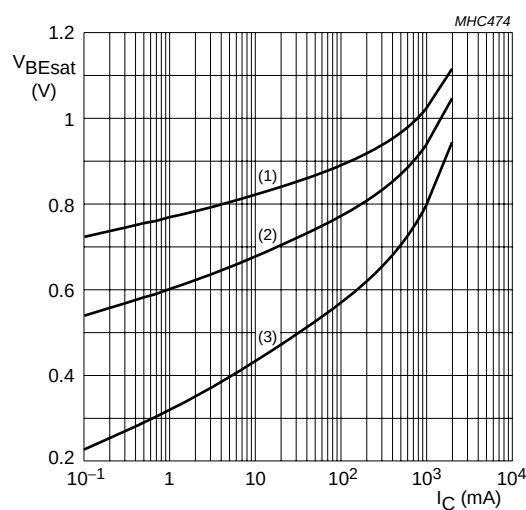
Fig.3 Base-emitter voltage as a function of collector current; typical values.



TR1 (NPN);  $I_C/I_B = 20$ .

- (1)  $T_{amb} = 150$  °C.
- (2)  $T_{amb} = 25$  °C.
- (3)  $T_{amb} = -55$  °C.

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



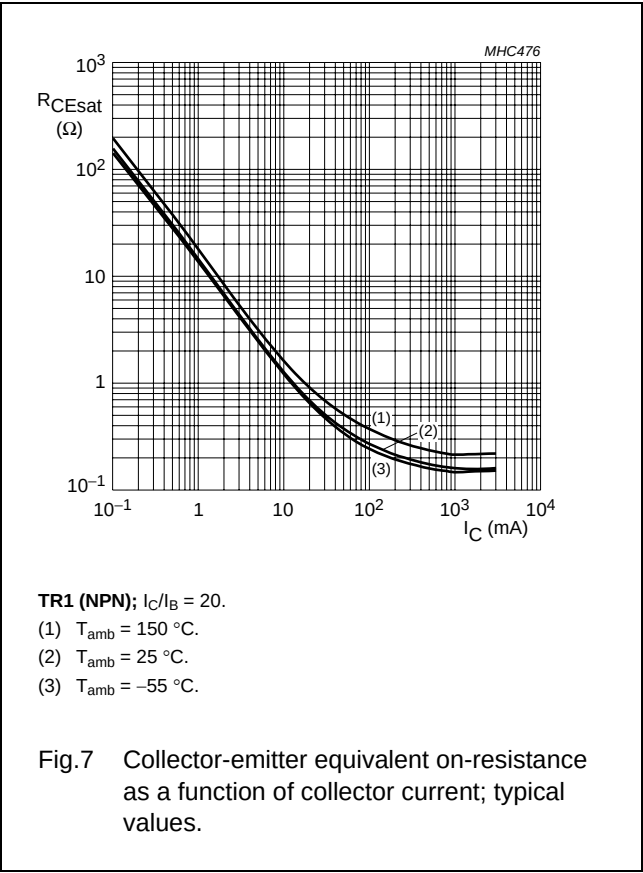
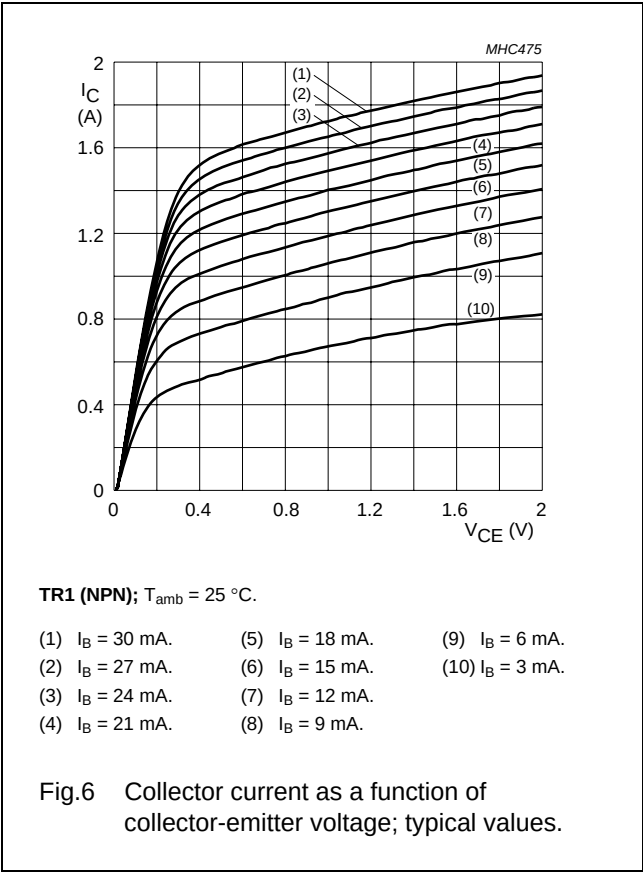
TR1 (NPN);  $I_C/I_B = 20$ .

- (1)  $T_{amb} = -55$  °C.
- (2)  $T_{amb} = 25$  °C.
- (3)  $T_{amb} = 150$  °C.

Fig.5 Base-emitter saturation voltage as a function of collector current; typical values.

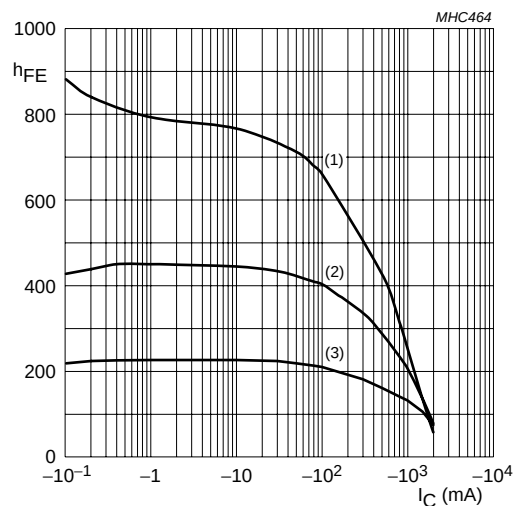
40 V low  $V_{CEsat}$  NPN/PNP transistor

PBSS4240DPN



40 V low  $V_{CEsat}$  NPN/PNP transistor

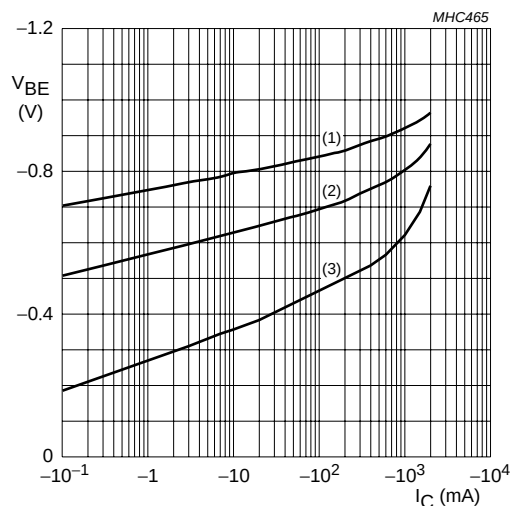
## PBSS4240DPN



TR2 (PNP);  $V_{CE} = -5$  V.

- (1)  $T_{amb} = 150$  °C.
- (2)  $T_{amb} = 25$  °C.
- (3)  $T_{amb} = -55$  °C.

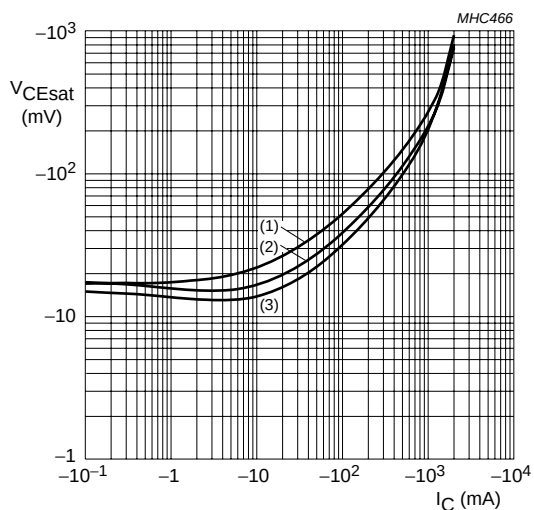
Fig.8 DC current gain as a function of collector current; typical values.



TR2 (PNP);  $V_{CE} = -5$  V.

- (1)  $T_{amb} = -55$  °C.
- (2)  $T_{amb} = 25$  °C.
- (3)  $T_{amb} = 150$  °C.

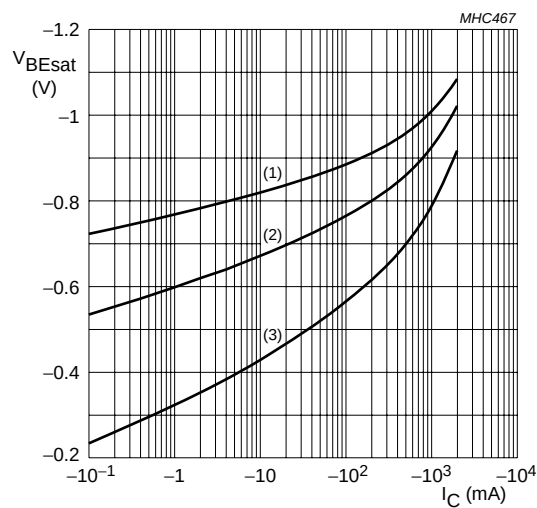
Fig.9 Base-emitter voltage as a function of collector current; typical values.



TR2 (PNP);  $I_C/I_B = 20$ .

- (1)  $T_{amb} = 150$  °C.
- (2)  $T_{amb} = 25$  °C.
- (3)  $T_{amb} = -55$  °C.

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



TR2 (PNP);  $I_C/I_B = 20$ .

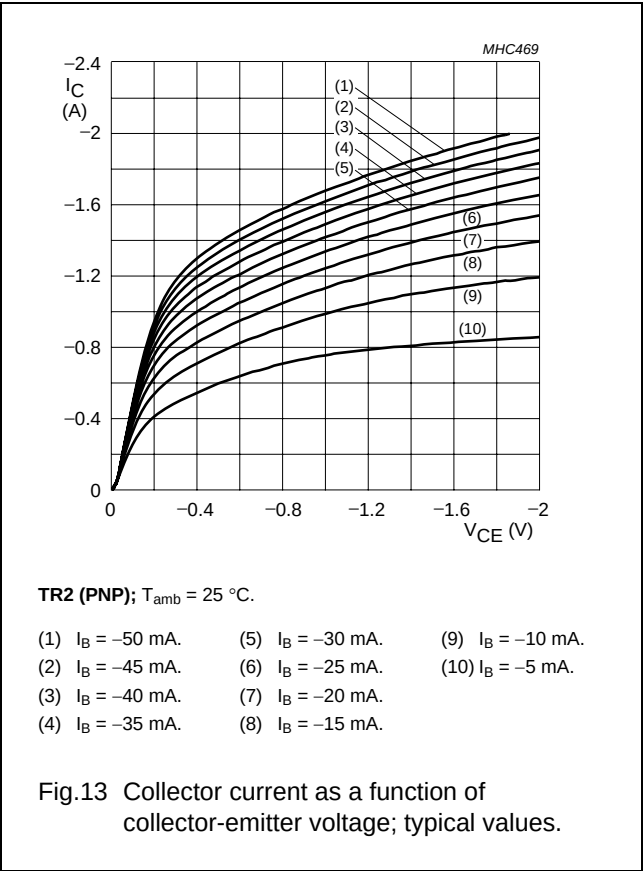
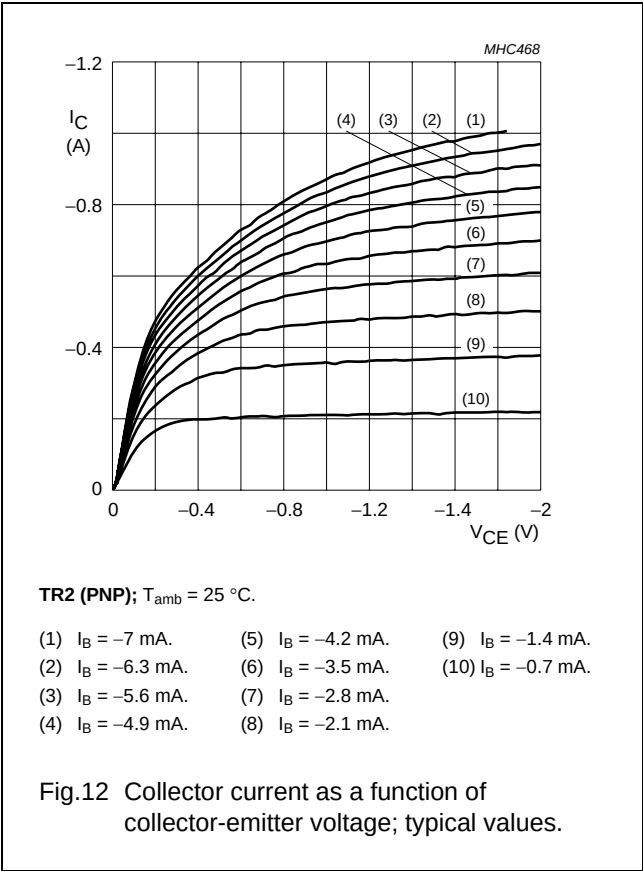
- (1)  $T_{amb} = -55$  °C.
- (2)  $T_{amb} = 25$  °C.
- (3)  $T_{amb} = 150$  °C.

Fig.11 Base-emitter saturation voltage as a function of collector current; typical values.



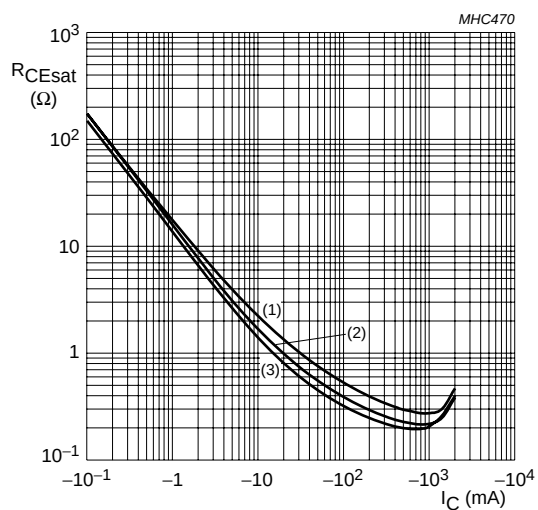
40 V low  $V_{CEsat}$  NPN/PNP transistor

PBSS4240DPN



40 V low  $V_{CEsat}$  NPN/PNP transistor

PBSS4240DPN



**TR2 (PNP);**  $I_C/I_B = 20$ .

(1)  $T_{amb} = 150\text{ }^{\circ}\text{C}$ .

(2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$ .

(3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$ .

Fig.14 Collector-emitter equivalent on-resistance as a function of collector current; typical values.

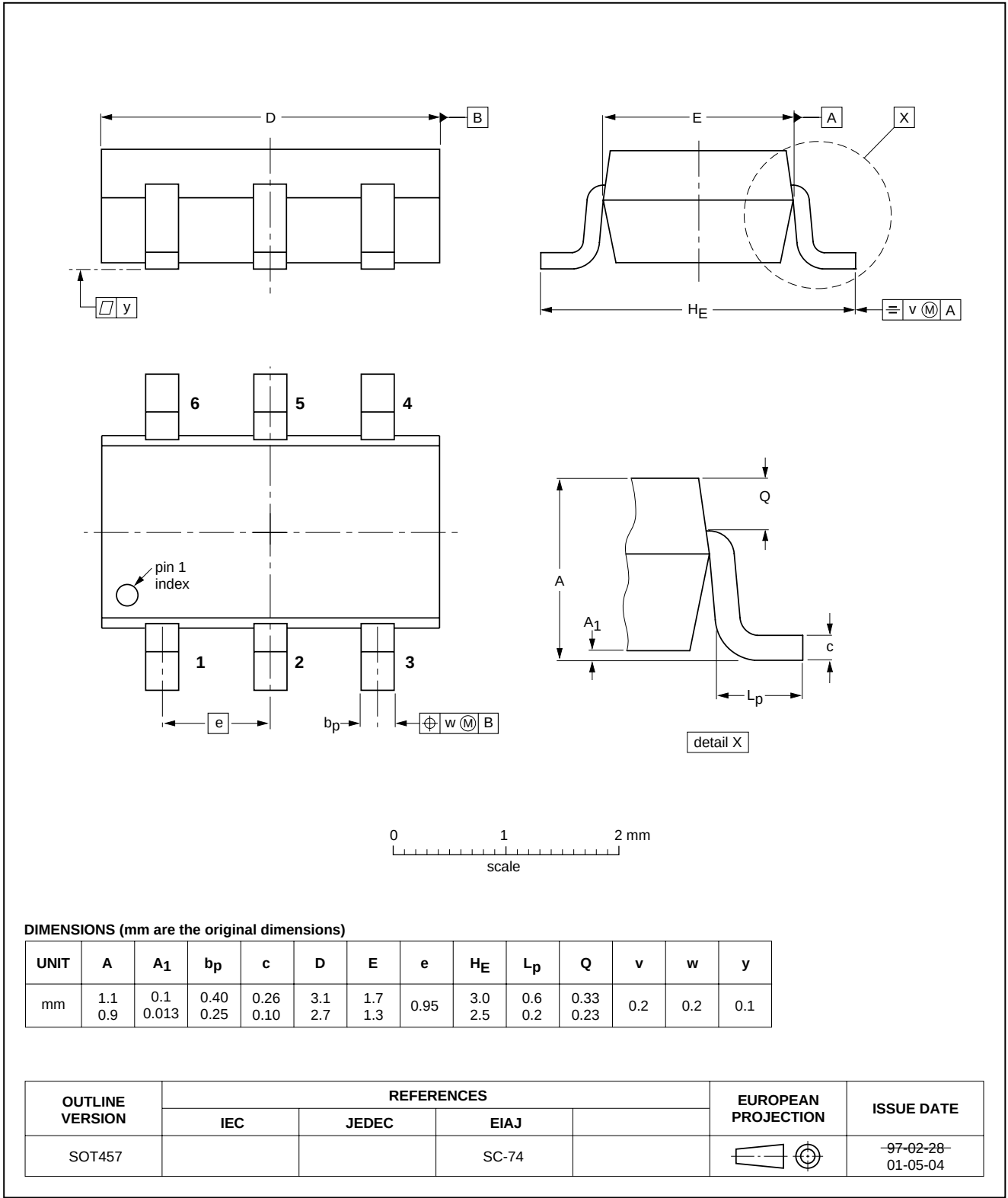
40 V low  $V_{CEsat}$  NPN/PNP transistor

PBSS4240DPN

PACKAGE OUTLINE

Plastic surface mounted package; 6 leads

SOT457



40 V low  $V_{CEsat}$  NPN/PNP transistor

## PBSS4240DPN

## DATA SHEET STATUS

| DOCUMENT STATUS <sup>(1)</sup> | PRODUCT STATUS <sup>(2)</sup> | DEFINITION                                                                            |
|--------------------------------|-------------------------------|---------------------------------------------------------------------------------------|
| Objective data sheet           | Development                   | This document contains data from the objective specification for product development. |
| Preliminary data sheet         | Qualification                 | This document contains data from the preliminary specification.                       |
| Product data sheet             | Production                    | This document contains the product specification.                                     |

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# ***NXP Semiconductors***

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