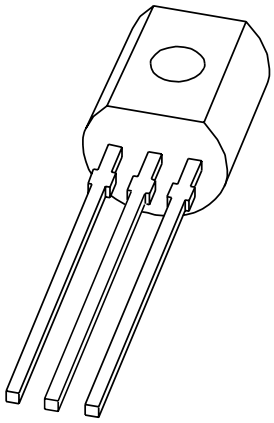
# DATA SHEET



# PBSS4140S

## 40 V low $V_{CEsat}$ NPN transistor

Product data sheet
Supersedes data of 2001 Nov 27

2004 Aug 20

# 40 V low $V_{CEsat}$ NPN transistor PBSS4140S

## FEATURES

- High power dissipation (830 mW)
- Ultra low collector-emitter saturation voltage
- 1 A continuous current
- High current switching
- Improved device reliability due to reduced heat generation.

## APPLICATIONS

- Medium power switching and muting
- Linear regulators
- DC/DC converter
- LCD back-lighting
- Supply line switching circuits
- Battery driven equipment (mobile phones, video cameras and hand-held devices).

## DESCRIPTION

NPN low $V_{CEsat}$ transistor in a SOT54 plastic package.
PNP complement: PBSS5140S.

## MARKING

| TYPE NUMBER | MARKING CODE |
|---|---|
| PBSS4140S | S4140S |

## QUICK REFERENCE DATA

| SYMBOL | PARAMETER | MAX. | UNIT |
|---|---|---|---|
| $V_{CEO}$ | collector-emitter voltage | 40 | V |
| $I_C$ | collector current (DC) | 1 | A |
| $I_{CM}$ | peak collector current | 2 | A |
| $R_{CEsat}$ | equivalent on-resistance | <500 | mΩ |

## PINNING

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

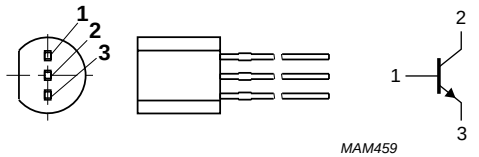



Fig.1 Simplified outline (SOT54) and symbol.

## 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 | – | 5 | V |
| $I_C$ | collector current (DC) | | – | 1 | A |
| $I_{CM}$ | peak collector current | | – | 2 | A |
| $I_{BM}$ | peak base current | | – | 1 | A |
| $P_{tot}$ | total power dissipation | $T_{amb} \leq 25$ °C; note 1 | – | 830 | mW |
| $T_{stg}$ | storage temperature | | −65 | +150 | °C |
| $T_j$ | junction temperature | | – | 150 | °C |
| $T_{amb}$ | operating ambient temperature | | −65 | +150 | °C |

**Note**

1. Device mounted on a printed-circuit board, single-sided copper, tinplated and standard footprint.

## THERMAL CHARACTERISTICS

| SYMBOL | PARAMETER | CONDITIONS | VALUE | UNIT |
|---|---|---|---|---|
| $R_{th\ j\text{-}a}$ | thermal resistance from junction to ambient | in free air; note 1 | 150 | K/W |

**Note**

1. Device mounted on a printed-circuit board, single-sided copper, tinplated and standard footprint.

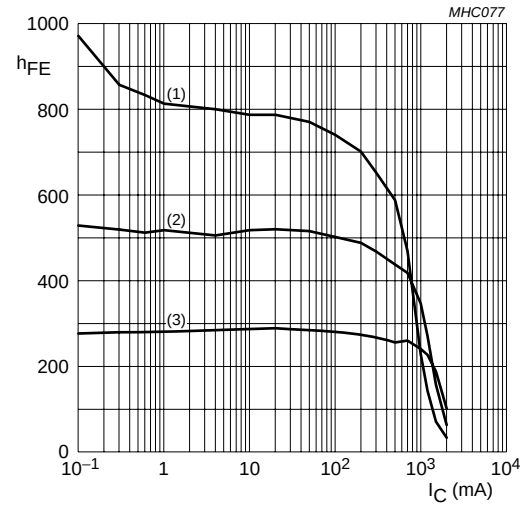
## CHARACTERISTICS

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

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| $I_{CBO}$ | collector-base cut-off current | $V_{CB}$ = 40 V; $I_C$ = 0 | – | – | 100 | nA |
| | | $V_{CB}$ = 40 V; $I_C$ = 0; $T_{amb}$ = 150 °C | – | – | 50 | μA |
| $I_{CEO}$ | collector-emitter cut-off current | $V_{CE}$ = 30 V; $I_B$ = 0 | – | – | 100 | nA |
| $I_{EBO}$ | emitter-base cut-off current | $V_{EB}$ = 5 V; $I_C$ = 0 | – | – | 100 | nA |
| $h_{FE}$ | DC current gain | $V_{CE}$ = 5 V; $I_C$ = 1 mA | 300 | – | – | |
| | | $V_{CE}$ = 5 V; $I_C$ = 500 mA | 300 | – | 900 | |
| | | $V_{CE}$ = 5 V; $I_C$ = 1 A | 200 | – | – | |
| $V_{CEsat}$ | collector-emitter saturation voltage | $I_C$ = 100 mA; $I_B$ = 1 mA | – | – | 200 | mV |
| | | $I_C$ = 500 mA; $I_B$ = 50 mA | – | – | 250 | mV |
| | | $I_C$ = 1 A; $I_B$ = 100 mA | – | – | 500 | mV |
| $R_{CEsat}$ | equivalent on-resistance | $I_C$ = 500 mA; $I_B$ = 50 mA; note 1 | – | 260 | <500 | mΩ |
| $V_{BEsat}$ | base-emitter saturation voltage | $I_C$ = 1 A; $I_B$ = 100 mA | – | – | 1.2 | V |
| $V_{BEon}$ | base-emitter turn-on voltage | $V_{CE}$ = 5 V; $I_C$ = 1 A | – | – | 1.1 | V |
| $f_T$ | transition frequency | $I_C$ = 50 mA; $V_{CE}$ = 10 V; f = 100 MHz | 150 | – | – | MHz |
| $C_c$ | collector capacitance | $V_{CB}$ = 10 V; $I_E = I_e$ = 0; f = 1 MHz | – | – | 10 | pF |

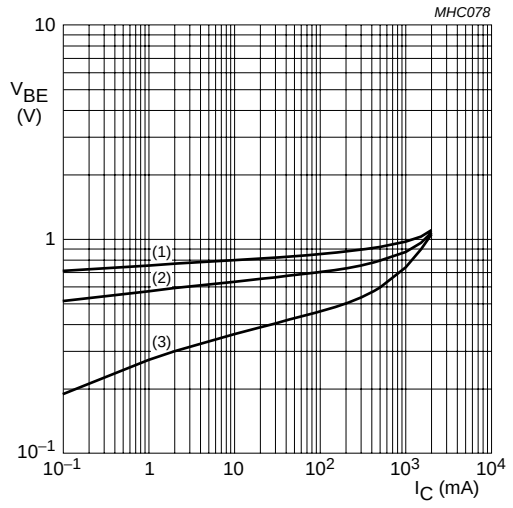
**Note**

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



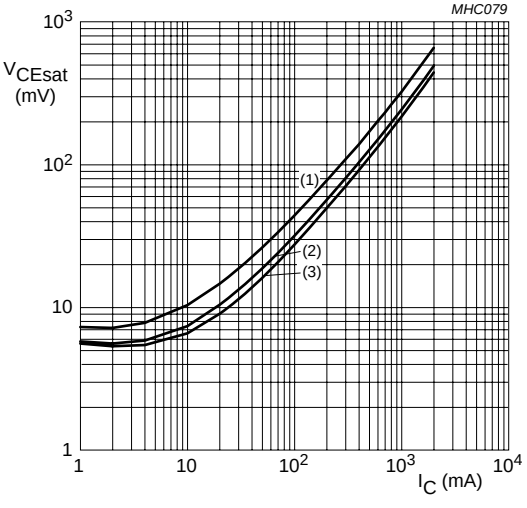

$V_{CE}$ = 5 V.
(1) $T_{amb}$ = 150 °C.
(2) $T_{amb}$ = 25 °C.
(3) $T_{amb}$ = –55 °C.

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



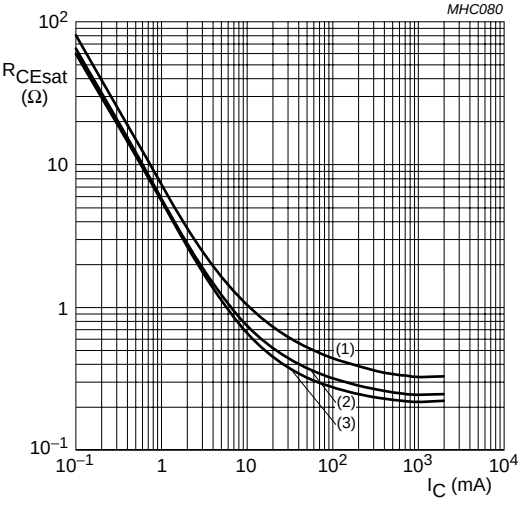

$V_{CE}$ = 5 V.
(1) $T_{amb}$ = –55 °C.
(2) $T_{amb}$ = 25 °C.
(3) $T_{amb}$ = 150 °C.

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



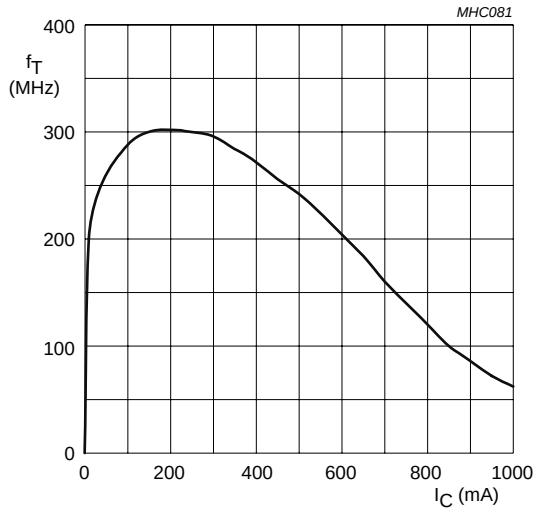

$I_C/I_B$ = 10.
(1) $T_{amb}$ = 150 °C.
(2) $T_{amb}$ = 25 °C.
(3) $T_{amb}$ = –55 °C.

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




$I_C/I_B$ = 10.
(1) $T_{amb}$ = 150 °C.
(2) $T_{amb}$ = 25 °C.
(3) $T_{amb}$ = –55 °C.

Fig.5 Equivalent on-resistance as a function of collector current; typical values.

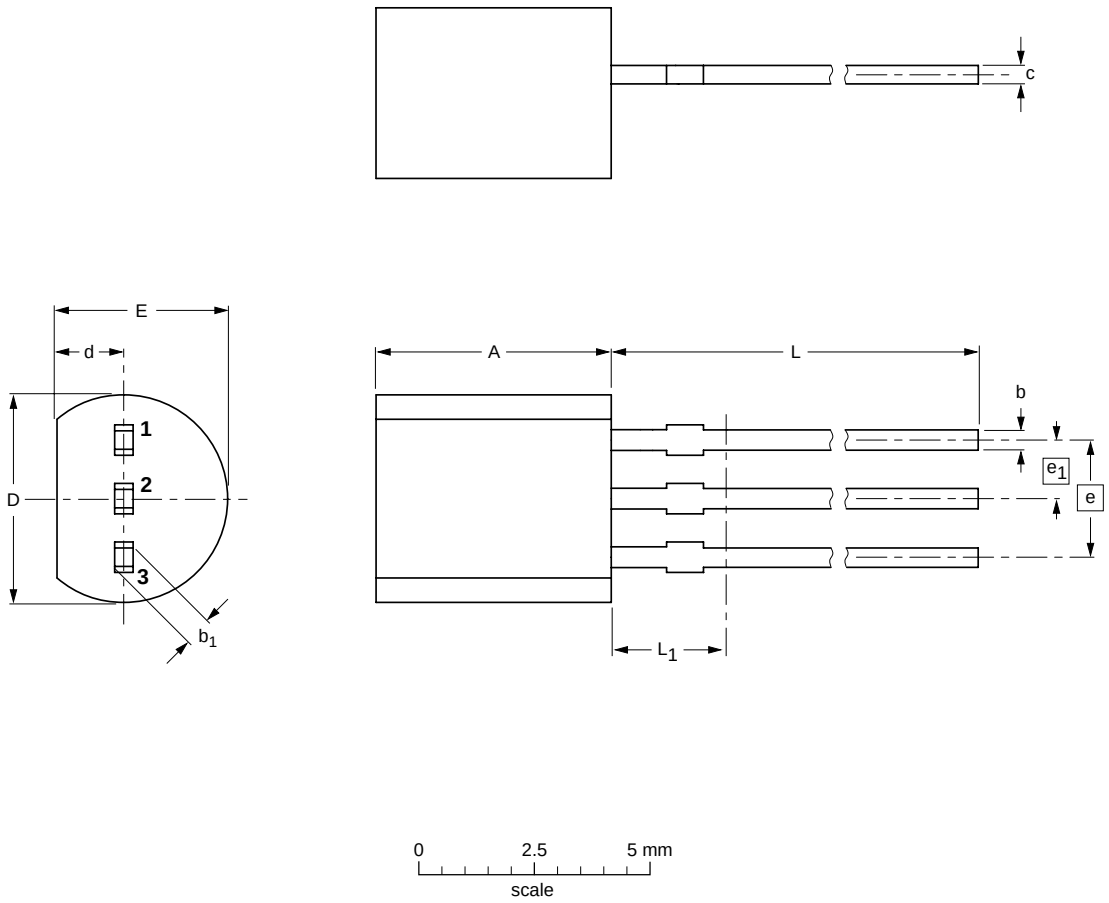



$V_{CE}$ = 10 V.

Fig.6 Transition frequency as a function of collector current.

## PACKAGE OUTLINE

**Plastic single-ended leaded (through hole) package; 3 leads** **SOT54**




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

| UNIT | A | b | $b_1$ | c | D | d | E | e | $e_1$ | L | $L_1$ (1) max. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 5.2<br>5.0 | 0.48<br>0.40 | 0.66<br>0.55 | 0.45<br>0.38 | 4.8<br>4.4 | 1.7<br>1.4 | 4.2<br>3.6 | 2.54 | 1.27 | 14.5<br>12.7 | 2.5 |

**Note**

1. Terminal dimensions within this zone are uncontrolled to allow for flow of plastic and terminal irregularities.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT54 | | TO-92 | SC-43A | | | ~~04-06-28~~<br>04-11-16 |

**DATA SHEET STATUS**

| DOCUMENT STATUS[1] | PRODUCT STATUS[2] | 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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