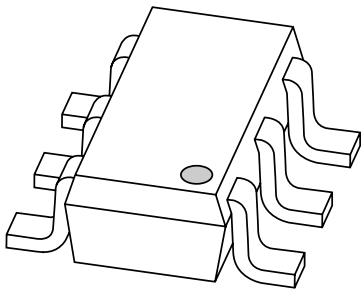


# DATA SHEET



## **PBSS4140DPN**

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

Product data sheet

2001 Dec 13

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

PBSS4140DPN

FEATURES

- 600 mW total power dissipation
- Low collector-emitter saturation voltage
- High current capability
- Improved device reliability due to reduced heat generation
- Replaces two SOT23 packaged low  $V_{CEsat}$  transistors on same PCB area
- Reduces required PCB area
- Reduced pick and place costs.

APPLICATIONS

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

DESCRIPTION

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

MARKING

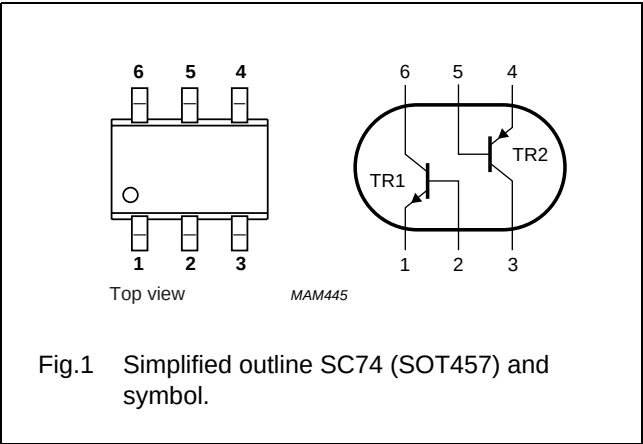
| TYPE NUMBER | MARKING CODE |
|-------------|--------------|
| PBSS4140DPN | M2           |

QUICK REFERENCE DATA

| SYMBOL      | PARAMETER                 | MAX. | UNIT       |
|-------------|---------------------------|------|------------|
| $V_{CEO}$   | collector-emitter voltage | 40   | V          |
| $I_C$       | peak collector current    | 1    | A          |
| $I_{CM}$    | peak collector current    | 2    | A          |
| TR1         | NPN                       | –    | –          |
| TR2         | PNP                       | –    | –          |
| $R_{CEsat}$ | equivalent on-resistance  | <500 | m $\Omega$ |

PINNING

| 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

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**LIMITING VALUES**

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

| SYMBOL                                                               | PARAMETER                     | CONDITIONS                           | MIN. | MAX. | UNIT |
|----------------------------------------------------------------------|-------------------------------|--------------------------------------|------|------|------|
| <b>Per transistor; 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)        |                                      | –    | 1    | A    |
| $I_{CM}$                                                             | peak collector current        |                                      | –    | 2    | A    |
| $I_{BM}$                                                             | peak base current             |                                      | –    | 1    | A    |
| $P_{tot}$                                                            | total power dissipation       | $T_{amb} \leq 25\text{ °C}$ ; note 1 | –    | 370  | mW   |
| $T_{stg}$                                                            | 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 1 | –    | 600  | mW   |

**Note**

1. Device mounted on a printed-circuit board, single side copper, tinplated, mounting pad for collector 1 cm<sup>2</sup>.

**THERMAL CHARACTERISTICS**

| SYMBOL        | PARAMETER                                   | CONDITIONS          | VALUE | UNIT |
|---------------|---------------------------------------------|---------------------|-------|------|
| $R_{th\ j-a}$ | thermal resistance from junction to ambient | in free air; note 1 | 208   | K/W  |

**Note**

1. Device mounted on a printed-circuit board, single side copper, tinplated, mounting pad for collector 1 cm<sup>2</sup>.

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

## PBSS4140DPN

## CHARACTERISTICS

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

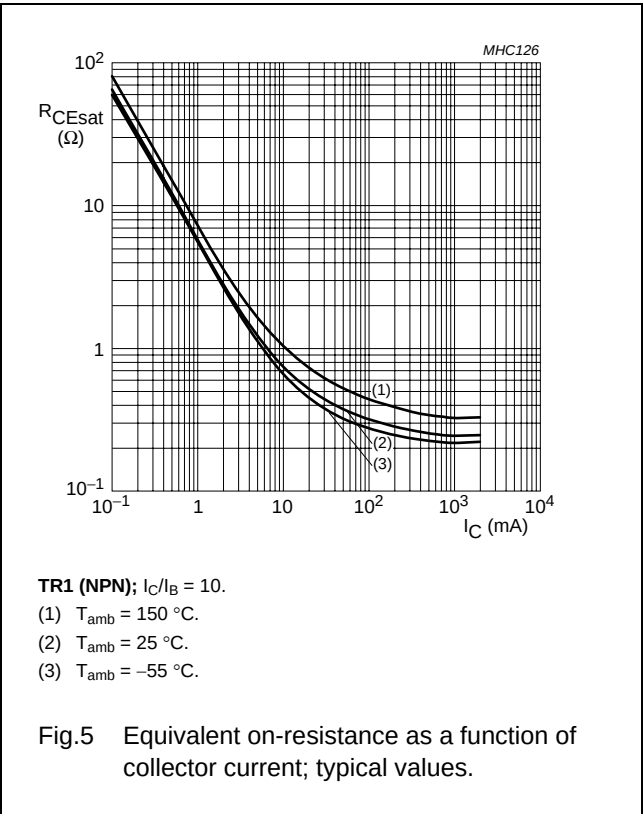
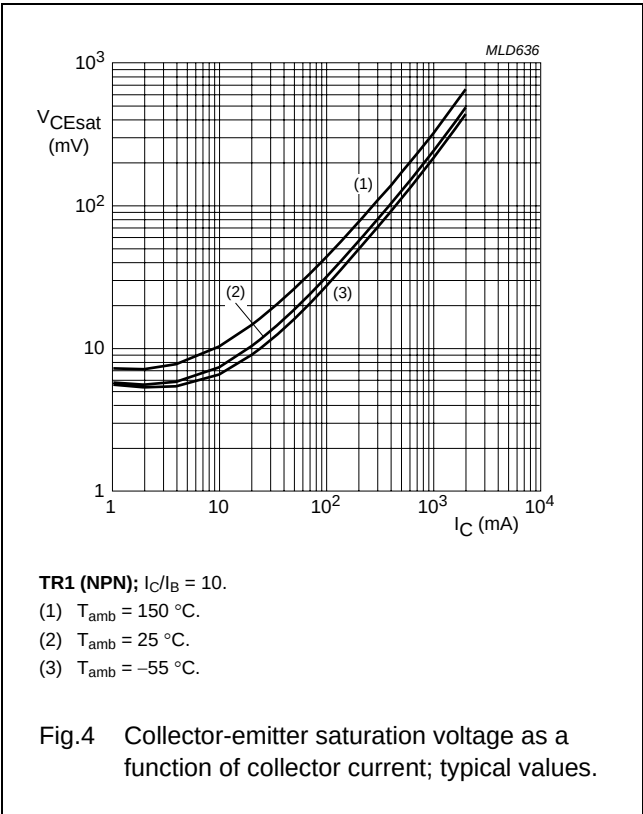
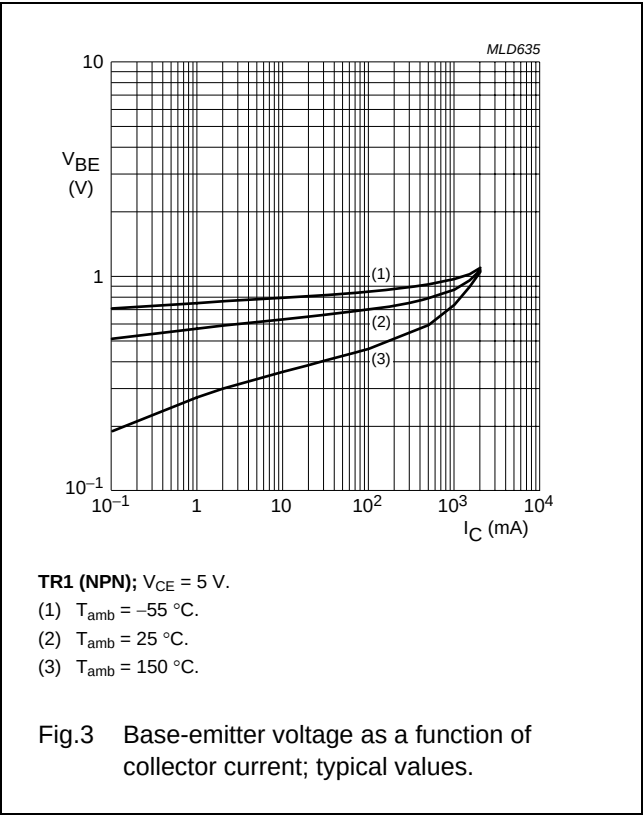
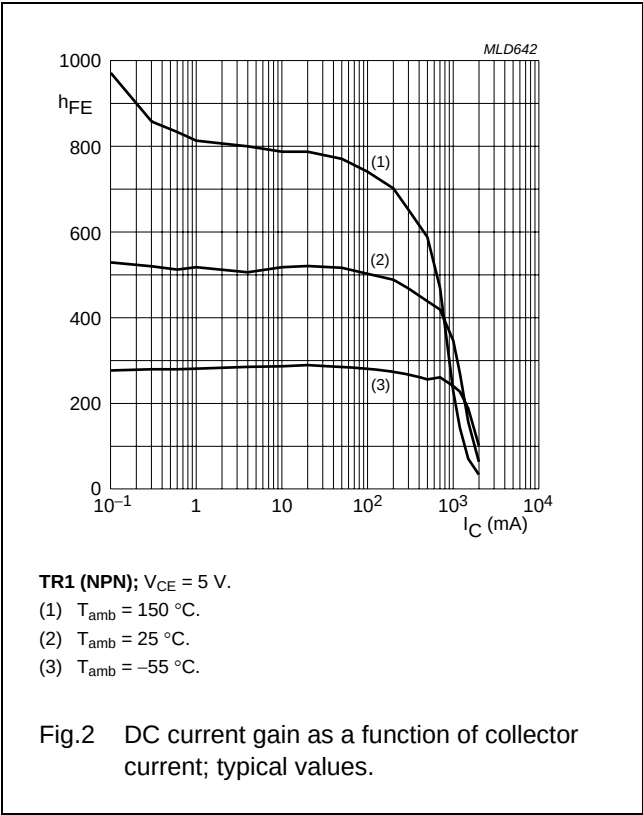
| SYMBOL                                                                                   | PARAMETER                            | CONDITIONS                                                             | MIN. | TYP. | MAX. | UNIT |
|------------------------------------------------------------------------------------------|--------------------------------------|------------------------------------------------------------------------|------|------|------|------|
| Per transistor unless otherwise specified; for the PNP transistor with negative polarity |                                      |                                                                        |      |      |      |      |
| I <sub>CBO</sub>                                                                         | collector-base cut-off current       | V <sub>CB</sub> = 40 V; I <sub>E</sub> = 0                             | –    | –    | 100  | nA   |
|                                                                                          |                                      | V <sub>CB</sub> = 40 V; I <sub>E</sub> = 0; T <sub>j</sub> = 150 °C    | –    | –    | 50   | μA   |
| I <sub>CEO</sub>                                                                         | collector-emitter cut-off current    | V <sub>CE</sub> = 30 V; I <sub>B</sub> = 0                             | –    | –    | 100  | nA   |
| I <sub>EBO</sub>                                                                         | emitter-base cut-off current         | V <sub>EB</sub> = 5 V; I <sub>C</sub> = 0                              | –    | –    | 100  | nA   |
| h <sub>FE</sub>                                                                          | DC current gain                      | V <sub>CE</sub> = 5 V; I <sub>C</sub> = 1 mA                           | 300  | –    | –    |      |
| V <sub>CEsat</sub>                                                                       | collector-emitter saturation voltage | I <sub>C</sub> = 100 mA; I <sub>B</sub> = 1 mA                         | –    | –    | 200  | mV   |
|                                                                                          |                                      | I <sub>C</sub> = 500 mA; I <sub>B</sub> = 50 mA                        | –    | –    | 250  | mV   |
|                                                                                          |                                      | I <sub>C</sub> = 1 A; I <sub>B</sub> = 100 mA                          | –    | –    | 500  | mV   |
| NPN transistor                                                                           |                                      |                                                                        |      |      |      |      |
| h <sub>FE</sub>                                                                          | DC current gain                      | V <sub>CE</sub> = 5 V; I <sub>C</sub> = 500 mA                         | 300  | –    | 900  |      |
|                                                                                          |                                      | V <sub>CE</sub> = 5 V; I <sub>C</sub> = 1 A                            | 200  | –    | –    |      |
| V <sub>BEsat</sub>                                                                       | base-emitter saturation voltage      | I <sub>C</sub> = 1 A; I <sub>B</sub> = 100 mA                          | –    | –    | 1.2  | V    |
| V <sub>BEon</sub>                                                                        | base-emitter turn-on voltage         | V <sub>CE</sub> = 5 V; I <sub>C</sub> = 1 A                            | –    | –    | 1.1  | V    |
| R <sub>CEsat</sub>                                                                       | equivalent on-resistance             | I <sub>C</sub> = 500 mA; I <sub>B</sub> = 50 mA; note 1                | –    | 260  | <500 | mΩ   |
| f <sub>T</sub>                                                                           | transition frequency                 | V <sub>CE</sub> =10 V; I <sub>C</sub> = 50 mA; f = 100 MHz             | 150  | –    | –    | MHz  |
| C <sub>c</sub>                                                                           | collector capacitance                | V <sub>CB</sub> = 10 V; I <sub>E</sub> = I <sub>e</sub> = 0; f = 1 MHz | –    | –    | 10   | pF   |
| PNP transistor                                                                           |                                      |                                                                        |      |      |      |      |
| h <sub>FE</sub>                                                                          | DC current gain                      | V <sub>CE</sub> = –5 V; I <sub>C</sub> = –100 mA                       | 300  | –    | 800  |      |
|                                                                                          |                                      | V <sub>CE</sub> = –5 V; I <sub>C</sub> = –500 mA                       | 250  | –    | –    |      |
|                                                                                          |                                      | V <sub>CE</sub> = –5 V; I <sub>C</sub> = –1 A                          | 160  | –    | –    |      |
| V <sub>BEsat</sub>                                                                       | base-emitter saturation voltage      | I <sub>C</sub> = –1 A; I <sub>B</sub> = –50 mA                         | –    | –    | –1.1 | V    |
| V <sub>BEon</sub>                                                                        | base-emitter turn-on voltage         | V <sub>CE</sub> = –5 V; I <sub>C</sub> = –1 A                          | –    | –    | –1.0 | V    |
| R <sub>CEsat</sub>                                                                       | equivalent on-resistance             | I <sub>C</sub> = –500 mA; I <sub>B</sub> –50 mA; note 1                | –    | 300  | <500 | mΩ   |
| f <sub>T</sub>                                                                           | transition frequency                 | V <sub>CE</sub> = –10 V; I <sub>C</sub> = –50 mA;<br>f = 100 MHz       | 150  | –    | –    | MHz  |
| C <sub>c</sub>                                                                           | collector capacitance                | V <sub>CB</sub> = –10 V; I <sub>E</sub> = I <sub>e</sub> = 0; f =1 MHz | –    | –    | 12   | pF   |

## Note

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

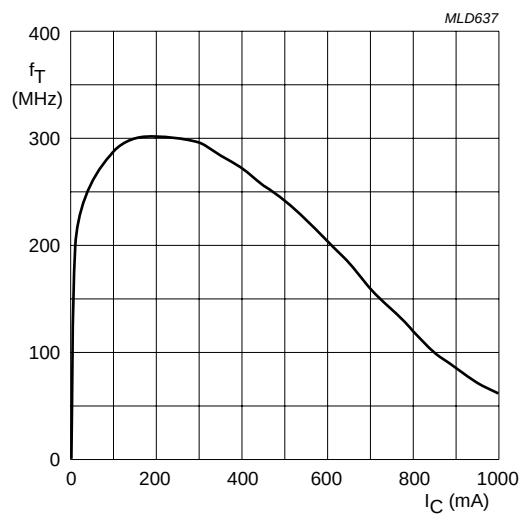
40 V low  $V_{CEsat}$  NPN/PNP transistor

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

PBSS4140DPN

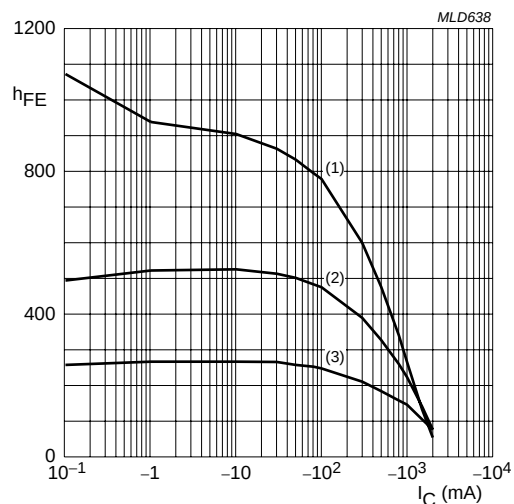


TR1 (NPN);  $V_{CE} = 10$  V.

Fig.6 Transition frequency as a function of collector current; typical values.

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

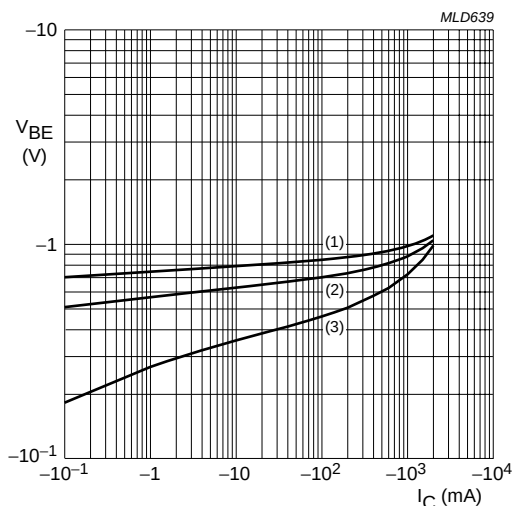
## PBSS4140DPN



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

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

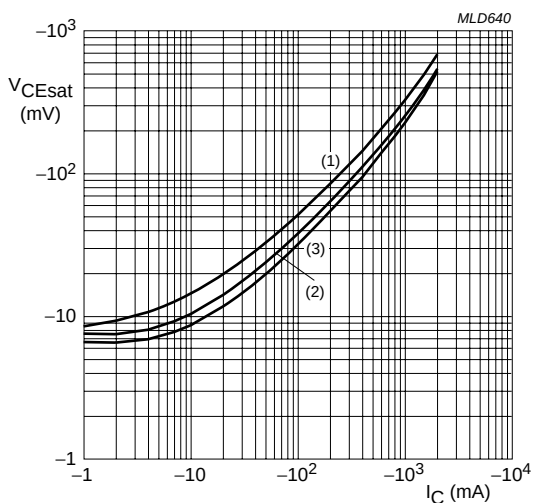
Fig.7 DC current gain as a function of collector current; typical values.



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

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

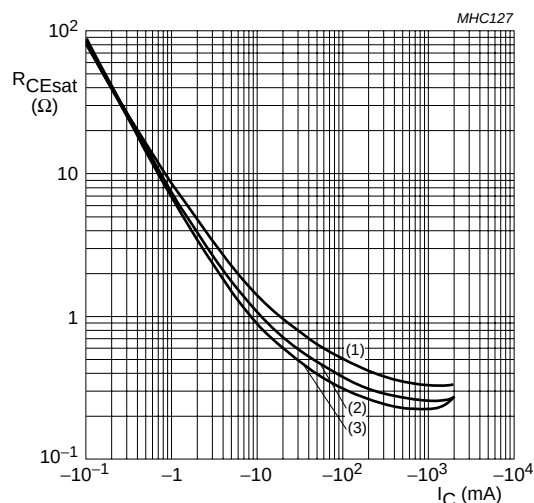
Fig.8 Base-emitter voltage as a function of collector current; typical values.



TR2 (PNP);  $I_C/I_B = 10$ .

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

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



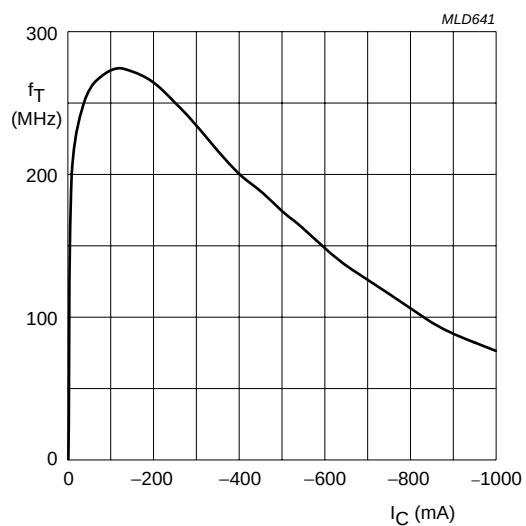
TR2 (PNP);  $I_C/I_B = 10$ .

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

Fig.10 Equivalent on-resistance as a function of collector current; typical values.

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

PBSS4140DPN



**TR2 (PNP);**  $V_{CE} = -10$  V.

Fig.11 Transition frequency as a function of collector current; typical values.



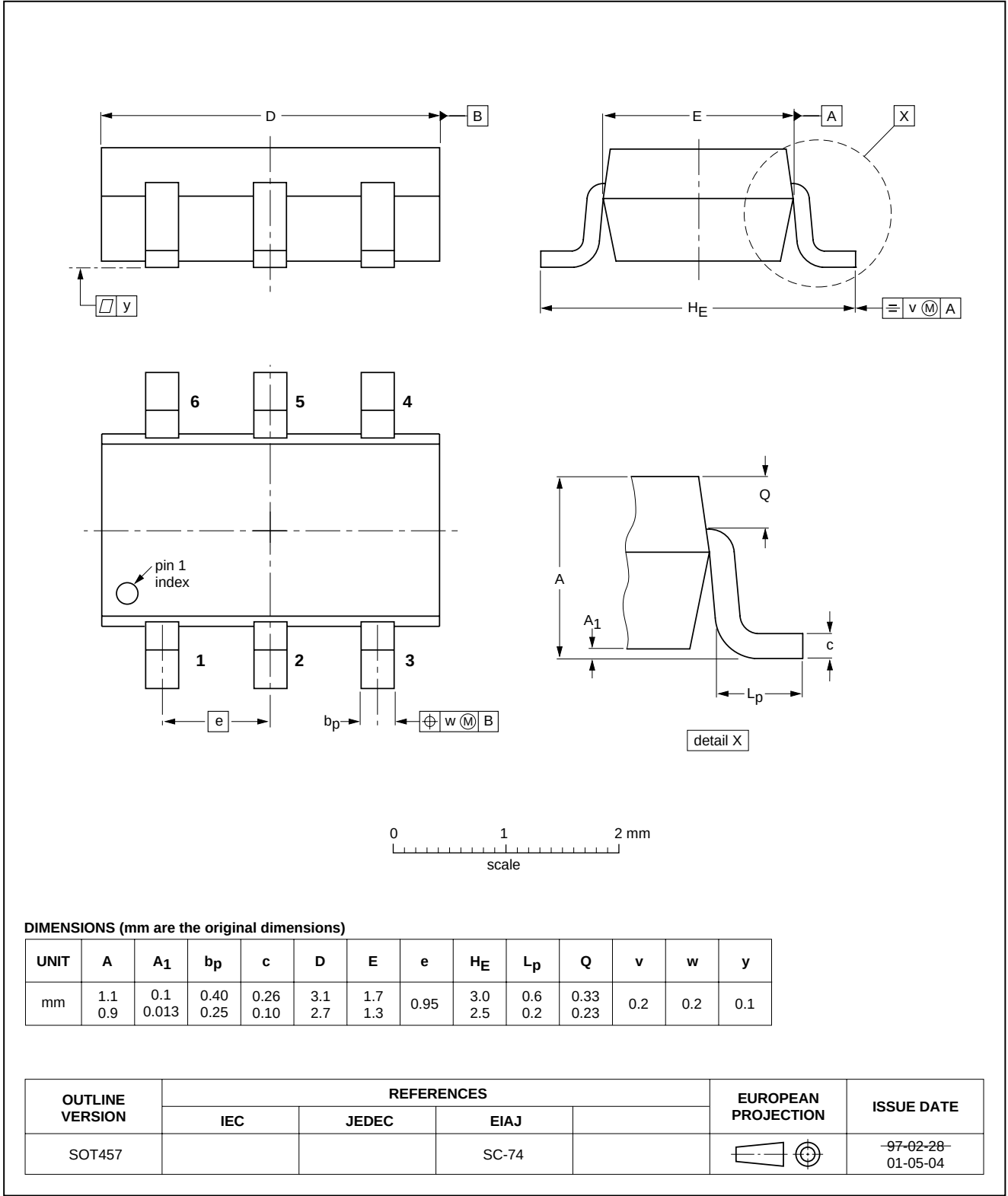
40 V low  $V_{CEsat}$  NPN/PNP transistor

PBSS4140DPN

PACKAGE OUTLINE

Plastic surface mounted package; 6 leads

SOT457



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

## PBSS4140DPN

## 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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