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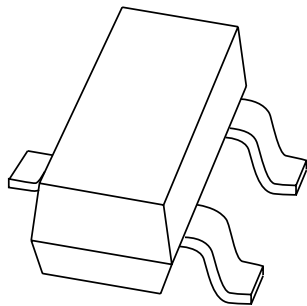
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Kind regards,

Team Nexperia

# DATA SHEET



**PBSS4160T**

60 V, 1 A

NPN low  $V_{CEsat}$  (BISS) transistor

Product data sheet  
Supersedes data of 2003 Jun 24

2004 May 12

# 60 V, 1 A NPN low $V_{CEsat}$ (BISS) transistor

**PBSS4160T****FEATURES**

- Low collector-emitter saturation voltage  $V_{CEsat}$
- High collector current capability  $I_C$  and  $I_{CM}$
- High efficiency, reduces heat generation
- Reduces printed-circuit board area required
- Cost effective replacement for medium power transistor BCP55 and BCX55.

**APPLICATIONS**

- Major application segments:
  - Automotive 42 V power
  - Telecom infrastructure
  - Industrial.
- Power management:
  - DC-to-DC conversion
  - Supply line switching.
- Peripheral driver
  - Driver in low supply voltage applications (e.g. lamps and LEDs)
  - Inductive load driver (e.g. relays, buzzers and motors).

**DESCRIPTION**

NPN low  $V_{CEsat}$  transistor in a SOT23 plastic package.  
PNP complement: PBSS5160T.

**MARKING**

| TYPE NUMBER | MARKING CODE <sup>(1)</sup> |
|-------------|-----------------------------|
| PBSS4160T   | *U5                         |

**Note**

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

**ORDERING INFORMATION**

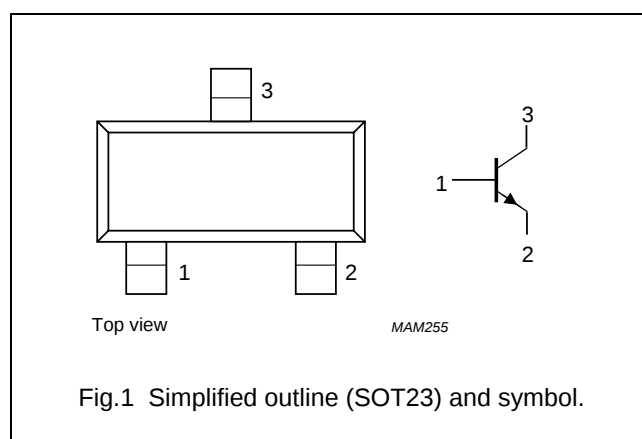
| TYPE NUMBER | PACKAGE |                                          |         |
|-------------|---------|------------------------------------------|---------|
|             | NAME    | DESCRIPTION                              | VERSION |
| PBSS4160T   | –       | plastic surface mounted package; 3 leads | SOT23   |

**QUICK REFERENCE DATA**

| SYMBOL      | PARAMETER                 | MAX. | UNIT |
|-------------|---------------------------|------|------|
| $V_{CEO}$   | collector-emitter voltage | 60   | V    |
| $I_C$       | collector current (DC)    | 1    | A    |
| $I_{CM}$    | peak collector current    | 2    | A    |
| $R_{CEsat}$ | equivalent on-resistance  | 250  | mΩ   |

**PINNING**

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



# 60 V, 1 A

## NPN low $V_{CEsat}$ (BISS) transistor

PBSS4160T

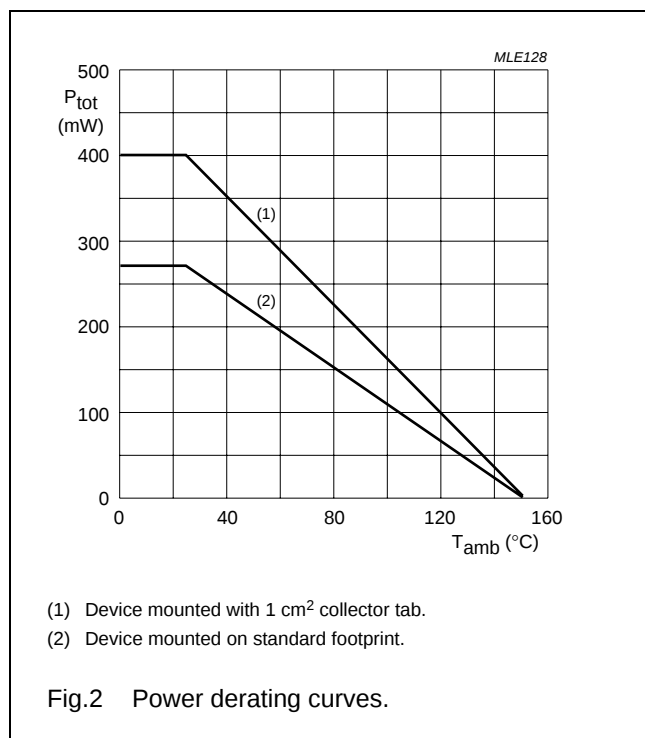
### LIMITING VALUES

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

| SYMBOL    | PARAMETER                     | CONDITIONS                                 | MIN. | MAX. | UNIT |
|-----------|-------------------------------|--------------------------------------------|------|------|------|
| $V_{CBO}$ | collector-base voltage        | open emitter                               | –    | 80   | V    |
| $V_{CEO}$ | collector-emitter voltage     | open base                                  | –    | 60   | V    |
| $V_{EBO}$ | emitter-base voltage          | open collector                             | –    | 5    | V    |
| $I_C$     | collector current (DC)        | note 1                                     | –    | 0.9  | A    |
|           |                               | note 2                                     | –    | 1    | A    |
| $I_{CM}$  | peak collector current        | $t_p = 1$ ms or limited by $T_{j(max)}$    | –    | 2    | A    |
| $I_B$     | base current (DC)             |                                            | –    | 300  | mA   |
| $I_{BM}$  | peak base current             | $t_p \leq 300$ $\mu$ s; $\delta \leq 0.02$ | –    | 1    | A    |
| $P_{tot}$ | total power dissipation       | $T_{amb} \leq 25$ °C; note 1               | –    | 270  | mW   |
|           |                               | $T_{amb} \leq 25$ °C; note 2               | –    | 400  | mW   |
|           |                               | $T_{amb} \leq 25$ °C; notes 1 and 3        | –    | 1.25 | W    |
| $T_{stg}$ | storage temperature           |                                            | –65  | +150 | °C   |
| $T_j$     | junction temperature          |                                            | –    | 150  | °C   |
| $T_{amb}$ | operating ambient temperature |                                            | –65  | +150 | °C   |

### Notes

- Device mounted on an FR4 printed-circuit board, single-sided copper, tin-plated, standard footprint.
- Device mounted on an FR4 printed-circuit board, single-sided copper, tin-plated, 1 cm<sup>2</sup> collector mounting pad.
- Operated under pulsed conditions: duty cycle  $\delta \leq 20\%$ , pulse width  $t_p \leq 10$  ms.



60 V, 1 A

NPN low  $V_{CEsat}$  (BISS) transistor

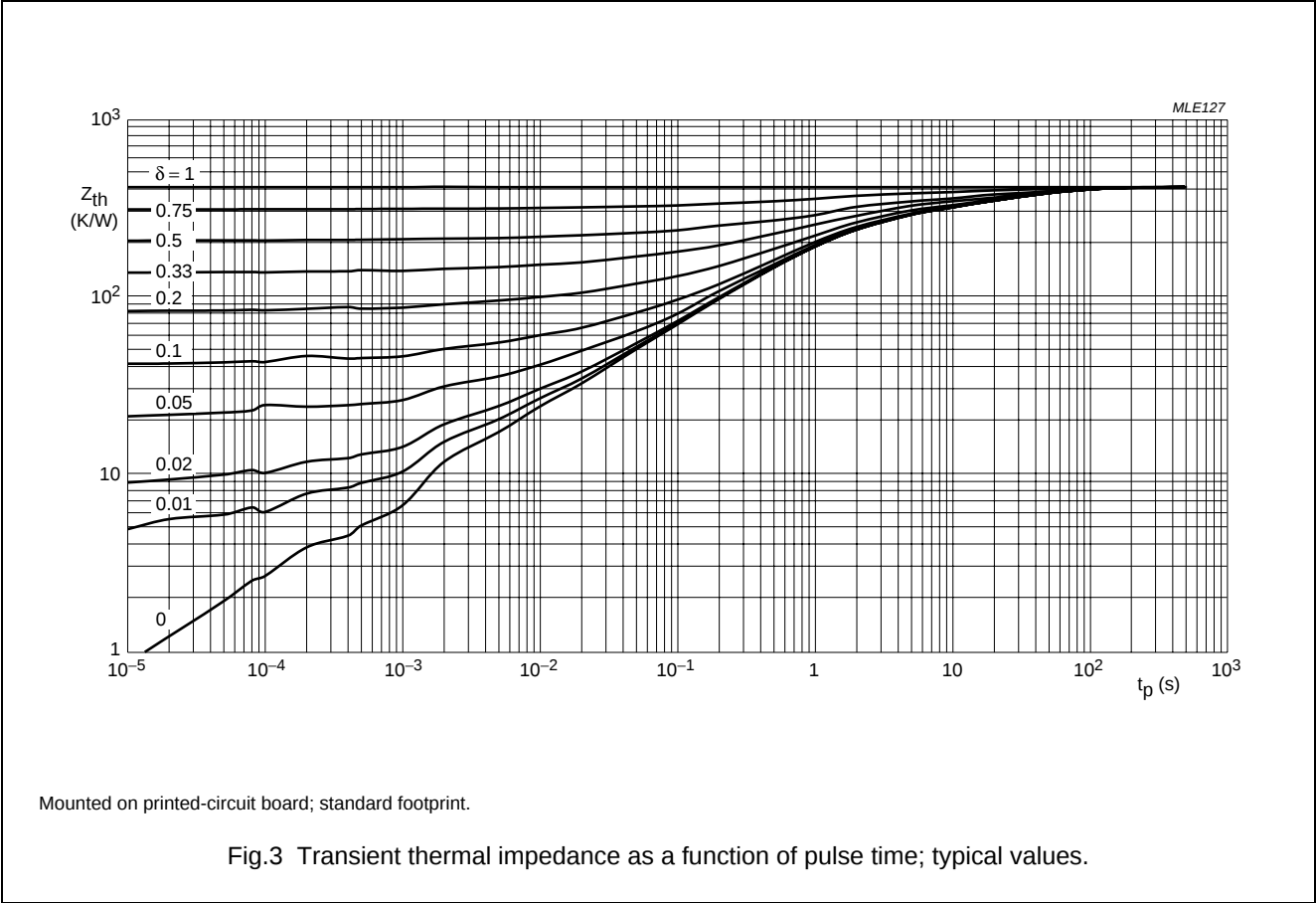
PBSS4160T

THERMAL CHARACTERISTICS

| SYMBOL        | PARAMETER                                   | CONDITIONS                 | VALUE | UNIT |
|---------------|---------------------------------------------|----------------------------|-------|------|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air; note 1        | 465   | K/W  |
|               |                                             | in free air; note 2        | 312   | K/W  |
|               |                                             | in free air; notes 1 and 3 | 100   | K/W  |

Notes

1. Device mounted on an FR4 printed-circuit board, single-sided copper, tin-plated and standard footprint.
2. Device mounted on an FR4 printed-circuit board, single-sided copper, tin-plated and 1 cm<sup>2</sup> collector mounting pad.
3. Operated under pulsed conditions: duty cycle  $\delta \leq 20\%$ , pulse width  $t_p \leq 10$  ms.



60 V, 1 A  
NPN low  $V_{CEsat}$  (BISS) transistor

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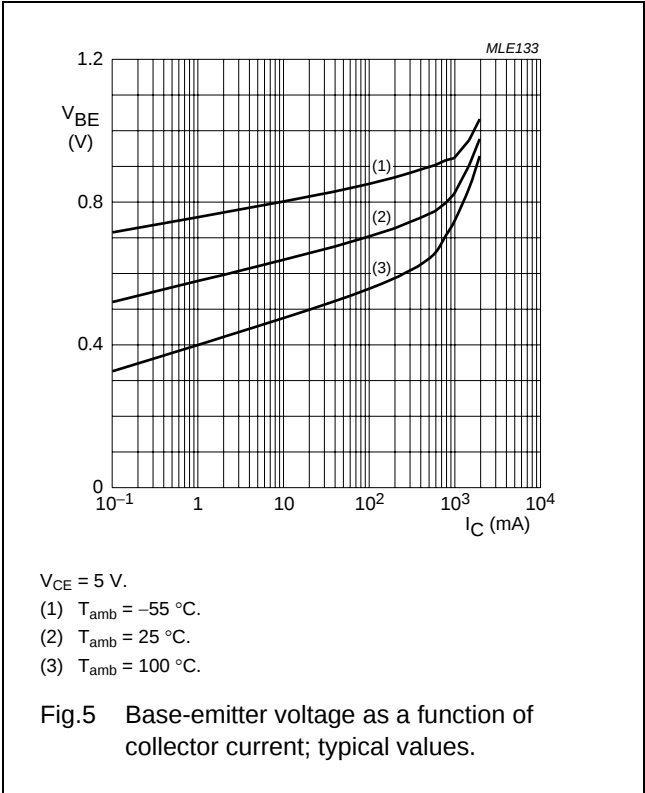
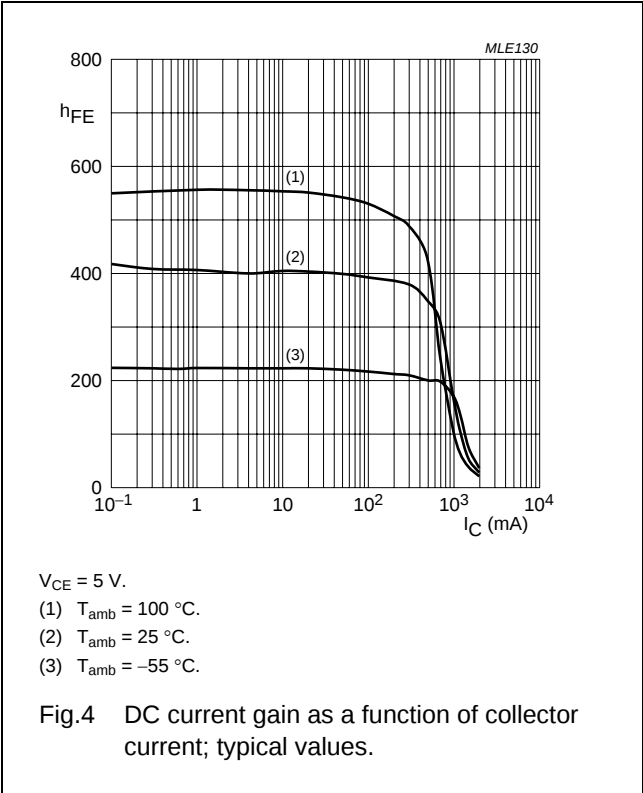
CHARACTERISTICS

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

| SYMBOL      | PARAMETER                            | CONDITIONS                                                                  | MIN. | TYP. | MAX. | UNIT             |
|-------------|--------------------------------------|-----------------------------------------------------------------------------|------|------|------|------------------|
| $I_{CBO}$   | collector-base cut-off current       | $V_{CB} = 60\text{ V}; I_E = 0\text{ A}$                                    | –    | –    | 100  | nA               |
|             |                                      | $V_{CB} = 60\text{ V}; I_E = 0\text{ A}; T_J = 150\text{ }^{\circ}\text{C}$ | –    | –    | 50   | $\mu\text{A}$    |
| $I_{CES}$   | collector-emitter cut-off current    | $V_{CE} = 60\text{ V}; V_{BE} = 0\text{ A}$                                 | –    | –    | 100  | nA               |
| $I_{EBO}$   | emitter-base cut-off current         | $V_{EB} = 5\text{ V}; I_C = 0\text{ A}$                                     | –    | –    | 100  | nA               |
| $h_{FE}$    | DC current gain                      | $V_{CE} = 5\text{ V}; I_C = 1\text{ mA}$                                    | 250  | 400  | –    |                  |
|             |                                      | $V_{CE} = 5\text{ V}; I_C = 500\text{ mA}; \text{note 1}$                   | 200  | 350  | –    |                  |
|             |                                      | $V_{CE} = 5\text{ V}; I_C = 1\text{ A}; \text{note 1}$                      | 100  | 150  | –    |                  |
| $V_{CEsat}$ | collector-emitter saturation voltage | $I_C = 100\text{ mA}; I_B = 1\text{ mA}$                                    | –    | 90   | 110  | mV               |
|             |                                      | $I_C = 500\text{ mA}; I_B = 50\text{ mA}$                                   | –    | 110  | 140  | mV               |
|             |                                      | $I_C = 1\text{ A}; I_B = 100\text{ mA}; \text{note 1}$                      | –    | 200  | 250  | mV               |
| $V_{BEsat}$ | base-emitter saturation voltage      | $I_C = 1\text{ A}; I_B = 50\text{ mA}$                                      | –    | 0.95 | 1.1  | V                |
| $R_{CEsat}$ | equivalent on-resistance             | $I_C = 1\text{ A}; I_B = 100\text{ mA}; \text{note 1}$                      | –    | 200  | 250  | $\text{m}\Omega$ |
| $V_{BEon}$  | base-emitter turn-on voltage         | $V_{CE} = 5\text{ V}; I_C = 1\text{ A}$                                     | –    | 0.82 | 0.9  | V                |
| $f_T$       | transition frequency                 | $I_C = 50\text{ mA}; V_{CE} = 10\text{ V}; f = 100\text{ MHz}$              | 150  | 220  | –    | MHz              |
| $C_c$       | collector capacitance                | $V_{CB} = 10\text{ V}; I_E = I_e = 0\text{ A}; f = 1\text{ MHz}$            | –    | 5.5  | 10   | pF               |

Note

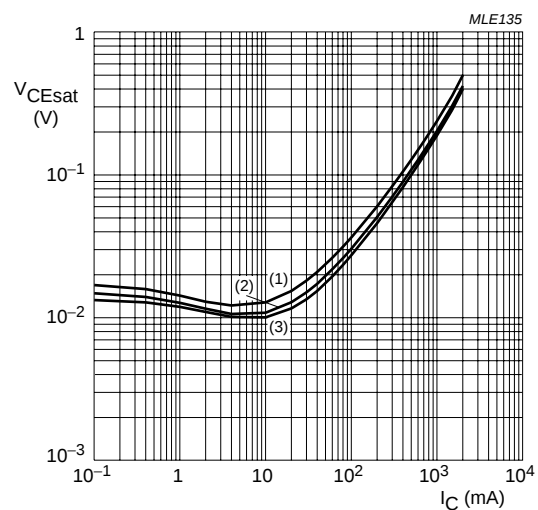
1. Pulse test:  $t_p \leq 300\text{ }\mu\text{s}$ ;  $\delta \leq 0.02$ .



# 60 V, 1 A

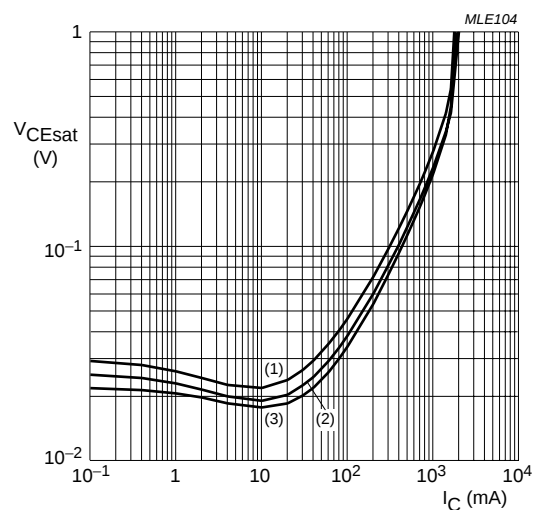
## NPN low $V_{CEsat}$ (BISS) transistor

PBSS4160T

 $I_C/I_B = 10$ .

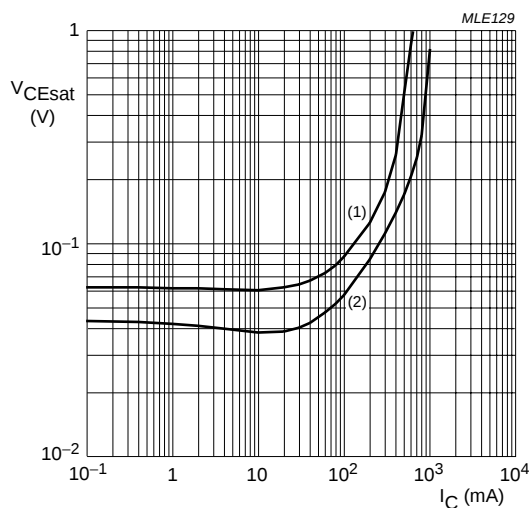
- (1)  $T_{amb} = 100\text{ °C}$ .
- (2)  $T_{amb} = 25\text{ °C}$ .
- (3)  $T_{amb} = -55\text{ °C}$ .

Fig.6 Collector-emitter saturation voltage as a function of collector current; typical values.

 $I_C/I_B = 20$ .

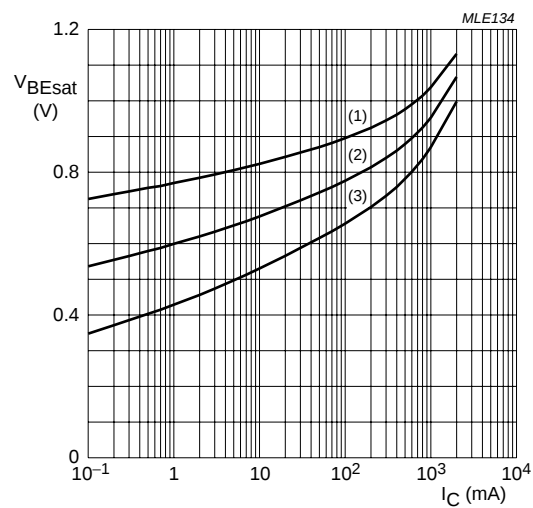
- (1)  $T_{amb} = 100\text{ °C}$ .
- (2)  $T_{amb} = 25\text{ °C}$ .
- (3)  $T_{amb} = -55\text{ °C}$ .

Fig.7 Collector-emitter saturation voltage as a function of collector current; typical values.

 $T_{amb} = 25\text{ °C}$ .

- (1)  $I_C/I_B = 100$ .
- (2)  $I_C/I_B = 50$ .

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

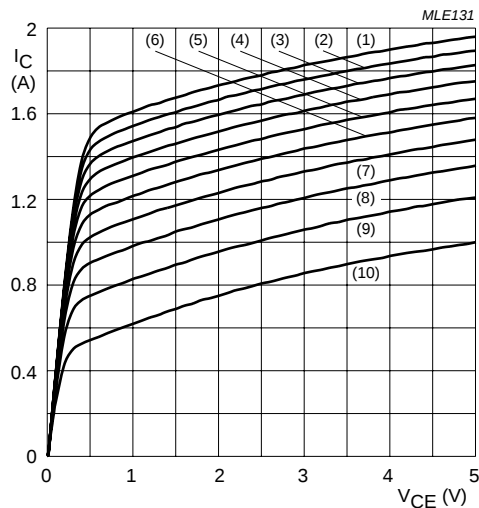
 $I_C/I_B = 20$ .

- (1)  $T_{amb} = -55\text{ °C}$ .
- (2)  $T_{amb} = 25\text{ °C}$ .
- (3)  $T_{amb} = 100\text{ °C}$ .

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

60 V, 1 A  
NPN low  $V_{CEsat}$  (BISS) transistor

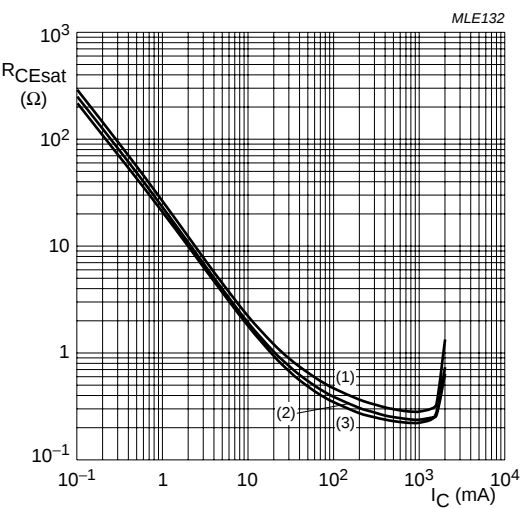
PBSS4160T



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

- |                            |                            |                            |
|----------------------------|----------------------------|----------------------------|
| (1) $I_B = 60\text{ mA}$ . | (5) $I_B = 36\text{ mA}$ . | (9) $I_B = 12\text{ mA}$ . |
| (2) $I_B = 54\text{ mA}$ . | (6) $I_B = 30\text{ mA}$ . | (10) $I_B = 6\text{ mA}$ . |
| (3) $I_B = 48\text{ mA}$ . | (7) $I_B = 24\text{ mA}$ . |                            |
| (4) $I_B = 42\text{ mA}$ . | (8) $I_B = 18\text{ mA}$ . |                            |

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



$I_C/I_B = 20$ .

- (1)  $T_{amb} = 100\text{ }^{\circ}\text{C}$ .      (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$ .      (3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$ .

Fig.11 Equivalent on-resistance as a function of collector current; typical values.

60 V, 1 A

NPN low  $V_{CEsat}$  (BISS) transistor

PBSS4160T

PACKAGE OUTLINE

Plastic surface-mounted package; 3 leads

SOT23

The diagrams illustrate the SOT23 package geometry. The top view shows dimensions D (total width) and B (lead width). The side view shows E (lead length), H<sub>E</sub> (height), A (total height), A<sub>1</sub> (lead height), Q (lead thickness), c (foot thickness), L<sub>p</sub> (foot length), v (pitch), and w (lead thickness). The bottom view shows dimensions 1, 2, 3 (lead positions), e<sub>1</sub>, b<sub>p</sub>, e (pitch), and a circular feature with diameter w and position A. A scale bar indicates 0 to 2 mm.

DIMENSIONS (mm are the original dimensions)

| UNIT | A          | A <sub>1</sub><br>max. | b <sub>p</sub> | c            | D          | E          | e   | e <sub>1</sub> | H <sub>E</sub> | L <sub>p</sub> | Q            | v   | w   |
|------|------------|------------------------|----------------|--------------|------------|------------|-----|----------------|----------------|----------------|--------------|-----|-----|
| mm   | 1.1<br>0.9 | 0.1                    | 0.48<br>0.38   | 0.15<br>0.09 | 3.0<br>2.8 | 1.4<br>1.2 | 1.9 | 0.95           | 2.5<br>2.1     | 0.45<br>0.15   | 0.55<br>0.45 | 0.2 | 0.1 |

| OUTLINE<br>VERSION | REFERENCES |          |       |  | EUROPEAN<br>PROJECTION | ISSUE DATE           |
|--------------------|------------|----------|-------|--|------------------------|----------------------|
|                    | IEC        | JEDEC    | JEITA |  |                        |                      |
| SOT23              |            | TO-236AB |       |  |                        | 04-11-04<br>06-03-16 |

# 60 V, 1 A NPN low $V_{CEsat}$ (BISS) transistor

PBSS4160T

## 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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## **Customer notification**

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