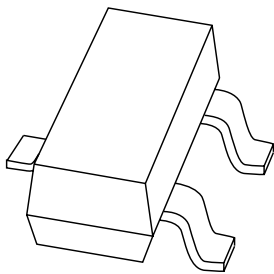


# DATA SHEET



**PMBT2369**

NPN switching transistor

Product data sheet  
Supersedes data of 1999 Apr 27

2004 Jan 22

## NPN switching transistor

## PMBT2369

## FEATURES

- Low current (max. 200 mA)
- Low voltage (max. 15 V).

## APPLICATIONS

- High-speed switching, especially in portable equipment.

## DESCRIPTION

NPN switching transistor in a SOT23 plastic package.

## MARKING

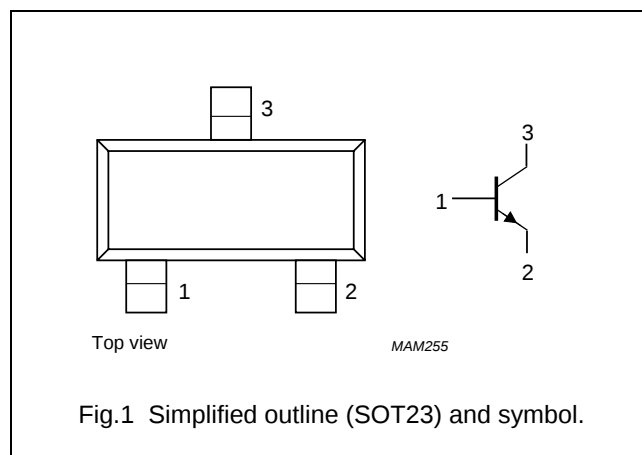
| TYPE NUMBER | MARKING CODE <sup>(1)</sup> |
|-------------|-----------------------------|
| PMBT2369    | *1J                         |

## Note

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

## PINNING

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



## ORDERING INFORMATION

| TYPE NUMBER | PACKAGE |                                          |         |
|-------------|---------|------------------------------------------|---------|
|             | NAME    | DESCRIPTION                              | VERSION |
| PMBT2369    | –       | plastic surface mounted package; 3 leads | SOT23   |

## 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                                          | –    | 15   | V                  |
| $V_{EBO}$ | emitter-base voltage          | open collector                                     | –    | 5    | V                  |
| $I_C$     | collector current (DC)        |                                                    | –    | 200  | mA                 |
| $I_{CM}$  | peak collector current        |                                                    | –    | 300  | mA                 |
| $I_{BM}$  | peak base current             |                                                    | –    | 100  | mA                 |
| $P_{tot}$ | total power dissipation       | $T_{amb} \leq 25\text{ }^{\circ}\text{C}$ ; note 1 | –    | 250  | mW                 |
| $T_{stg}$ | storage temperature           |                                                    | –65  | +150 | $^{\circ}\text{C}$ |
| $T_j$     | junction temperature          |                                                    | –    | 150  | $^{\circ}\text{C}$ |
| $T_{amb}$ | operating ambient temperature |                                                    | –65  | +150 | $^{\circ}\text{C}$ |

## Note

1. Transistor mounted on an FR4 printed-circuit board.

## NPN switching transistor

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## THERMAL CHARACTERISTICS

| SYMBOL        | PARAMETER                                   | CONDITIONS | VALUE | UNIT |
|---------------|---------------------------------------------|------------|-------|------|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | note 1     | 500   | K/W  |

## Note

1. Transistor mounted on an FR4 printed-circuit board.

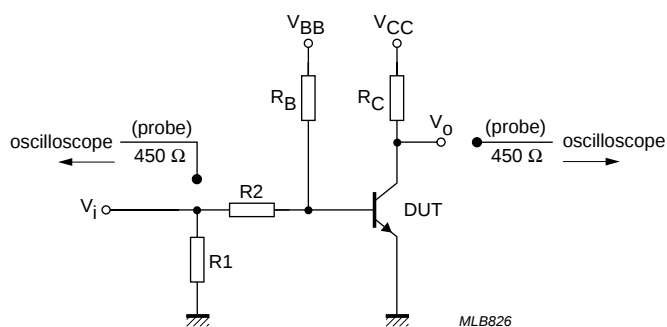
## CHARACTERISTICS

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

| SYMBOL                                                           | PARAMETER                            | CONDITIONS                                                                             | MIN. | MAX. | UNIT          |
|------------------------------------------------------------------|--------------------------------------|----------------------------------------------------------------------------------------|------|------|---------------|
| $I_{CBO}$                                                        | collector cut-off current            | $I_E = 0$ ; $V_{CB} = 20\text{ V}$                                                     | –    | 400  | nA            |
|                                                                  |                                      | $I_E = 0$ ; $V_{CB} = 20\text{ V}$ ; $T_j = 125\text{ }^{\circ}\text{C}$               | –    | 30   | $\mu\text{A}$ |
| $I_{EBO}$                                                        | emitter cut-off current              | $I_C = 0$ ; $V_{EB} = 4\text{ V}$                                                      | –    | 100  | nA            |
| $h_{FE}$                                                         | DC current gain                      | $I_C = 10\text{ mA}$ ; $V_{CE} = 1\text{ V}$                                           | 40   | 120  |               |
|                                                                  |                                      | $I_C = 10\text{ mA}$ ; $V_{CE} = 1\text{ V}$ ; $T_{amb} = -55\text{ }^{\circ}\text{C}$ | 20   | –    |               |
|                                                                  |                                      | $I_C = 100\text{ mA}$ ; $V_{CE} = 2\text{ V}$                                          | 20   | –    |               |
| $V_{CEsat}$                                                      | collector-emitter saturation voltage | $I_C = 10\text{ mA}$ ; $I_B = 1\text{ mA}$                                             | –    | 250  | mV            |
| $V_{BEsat}$                                                      | base-emitter saturation voltage      | $I_C = 10\text{ mA}$ ; $I_B = 1\text{ mA}$                                             | 700  | 850  | mV            |
| $C_c$                                                            | collector capacitance                | $I_E = I_e = 0$ ; $V_{CB} = 5\text{ V}$ ; $f = 1\text{ MHz}$                           | –    | 4    | pF            |
| $f_T$                                                            | transition frequency                 | $I_C = 10\text{ mA}$ ; $V_{CE} = 10\text{ V}$ ; $f = 100\text{ MHz}$                   | 500  | –    | MHz           |
| <b>Switching times (between 10% and 90% levels); (see Fig.2)</b> |                                      |                                                                                        |      |      |               |
| $t_{on}$                                                         | turn-on time                         | $I_{Con} = 10\text{ mA}$ ; $I_{Bon} = 3\text{ mA}$ ;<br>$I_{Boff} = -1.5\text{ mA}$    | –    | 10   | ns            |
| $t_d$                                                            | delay time                           |                                                                                        | –    | 4    | ns            |
| $t_r$                                                            | rise time                            |                                                                                        | –    | 6    | ns            |
| $t_{off}$                                                        | turn-off time                        |                                                                                        | –    | 20   | ns            |
| $t_s$                                                            | storage time                         |                                                                                        | –    | 10   | ns            |
| $t_f$                                                            | fall time                            |                                                                                        | –    | 10   | ns            |

## NPN switching transistor

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$V_i = 0.5$  to  $4.2$  V;  $T = 500$   $\mu$ s;  $t_p = 10$   $\mu$ s;  $t_r = t_f \leq 3$  ns.

$R_1 = 56$   $\Omega$ ;  $R_2 = 1$  k $\Omega$ ;  $R_B = 1$  k $\Omega$ ;  $R_C = 270$   $\Omega$ .

$V_{BB} = 0.2$  V;  $V_{CC} = 2.7$  V.

Oscilloscope input impedance  $Z_i = 50$   $\Omega$ .

Fig.2 Test circuit for switching times.

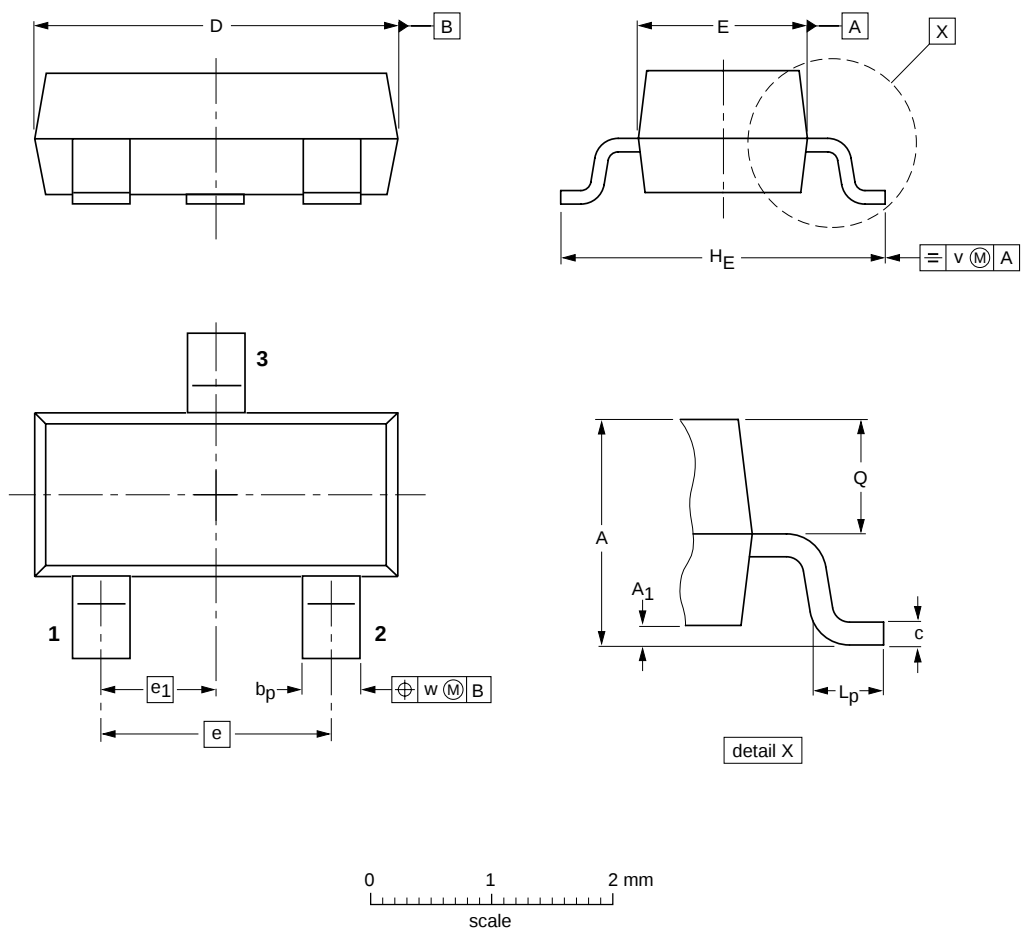
NPN switching transistor

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PACKAGE OUTLINE

Plastic surface-mounted package; 3 leads

SOT23



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 |

## NPN switching transistor

PMBT2369

## 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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Printed in The Netherlands

R75/04/pp7

Date of release: 2004 Jan 22

Document order number: 9397 750 12458

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