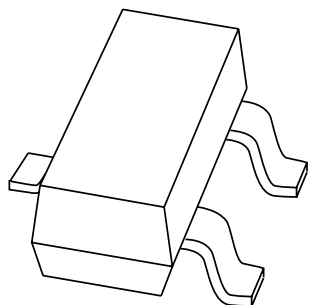


# DATA SHEET



## **PMBT2369** NPN switching transistor

Product specification  
Supersedes data of September 1994  
File under Discrete Semiconductors, SC04

1997 Jun 02

## NPN switching transistor

## PMBT2369

## FEATURES

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

## APPLICATIONS

- High-speed switching, especially in portable equipment.

## DESCRIPTION

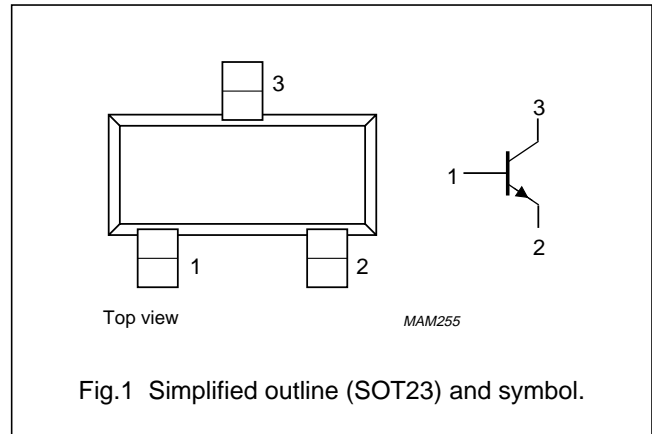
NPN switching transistor in a SOT23 plastic package.

## MARKING

TYPE NUMBER	MARKING CODE
PMBT2369	p1J

## PINNING

PIN	DESCRIPTION
1	base
2	emitter
3	collector



## QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{CBO}$	collector-base voltage	open emitter	–	40	V
$V_{CEO}$	collector-emitter voltage	open base	–	15	V
$I_C$	collector current (DC)		–	200	mA
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ }^\circ\text{C}$	–	250	mW
$h_{FE}$	DC current gain	$I_C = 10\text{ mA}; V_{CE} = 1\text{ V}$	40	120	
		$I_C = 100\text{ mA}; V_{CE} = 2\text{ V}$	20	–	
$f_T$	transition frequency	$I_C = 10\text{ mA}; V_{CE} = 10\text{ V}; f = 100\text{ MHz}$	500	–	MHz
$t_{off}$	turn-off time	$I_{Con} = 10\text{ mA}; I_{Bon} = 3\text{ mA}; I_{Boff} = -1.5\text{ mA}$	–	30	ns

## NPN switching transistor

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**LIMITING VALUES**

In accordance with the Absolute Maximum Rating System (IEC 134).

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	$T_{amb} \leq 25\text{ °C}$ ; note 1	–	250	mW
$T_{stg}$	storage temperature		–65	+150	°C
$T_j$	junction temperature		–	150	°C
$T_{amb}$	operating ambient temperature		–65	+150	°C

**Note**

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

**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**

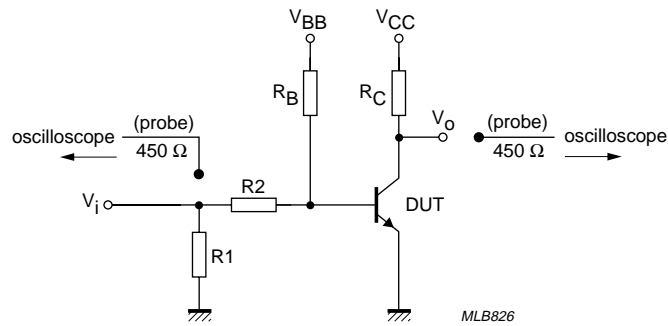
$T_j = 25\text{ °C}$  unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$I_{CBO}$	collector cut-off current	$I_E = 0$ ; $V_{CB} = 20\text{ V}$	–	400	nA
		$I_E = 0$ ; $V_{CB} = 20\text{ V}$ ; $T_j = 125\text{ °C}$	–	30	μA
$I_{EBO}$	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	
		$I_C = 10\text{ mA}$ ; $V_{CE} = 1\text{ V}$ ; $T_{amb} = -55\text{ °C}$	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

NPN switching transistor

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SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
<b>Switching times (between 10% and 90% levels); see Fig.2</b>					
$t_{on}$	turn-on time	$I_{Con} = 10 \text{ mA}; I_{Bon} = 3 \text{ mA};$ $I_{Boff} = -1.5 \text{ mA}$	–	10	ns
$t_d$	delay time		–	4	ns
$t_r$	rise time		–	6	ns
$t_{off}$	turn-off time		–	30	ns
$t_s$	storage time		–	15	ns
$t_f$	fall time		–	15	ns



$V_i = 0.5 \text{ to } 4.2 \text{ V}; T = 500 \mu\text{s}; t_p = 10 \mu\text{s}; t_r = t_f \leq 3 \text{ ns}.$   
 $R_1 = 56 \Omega; R_2 = 1 \text{ k}\Omega; R_B = 1 \text{ k}\Omega; R_C = 270 \Omega.$   
 $V_{BB} = 0.2 \text{ V}; V_{CC} = 2.7 \text{ V}.$   
 Oscilloscope input impedance  $Z_i = 50 \Omega.$

Fig.2 Test circuit for switching times.

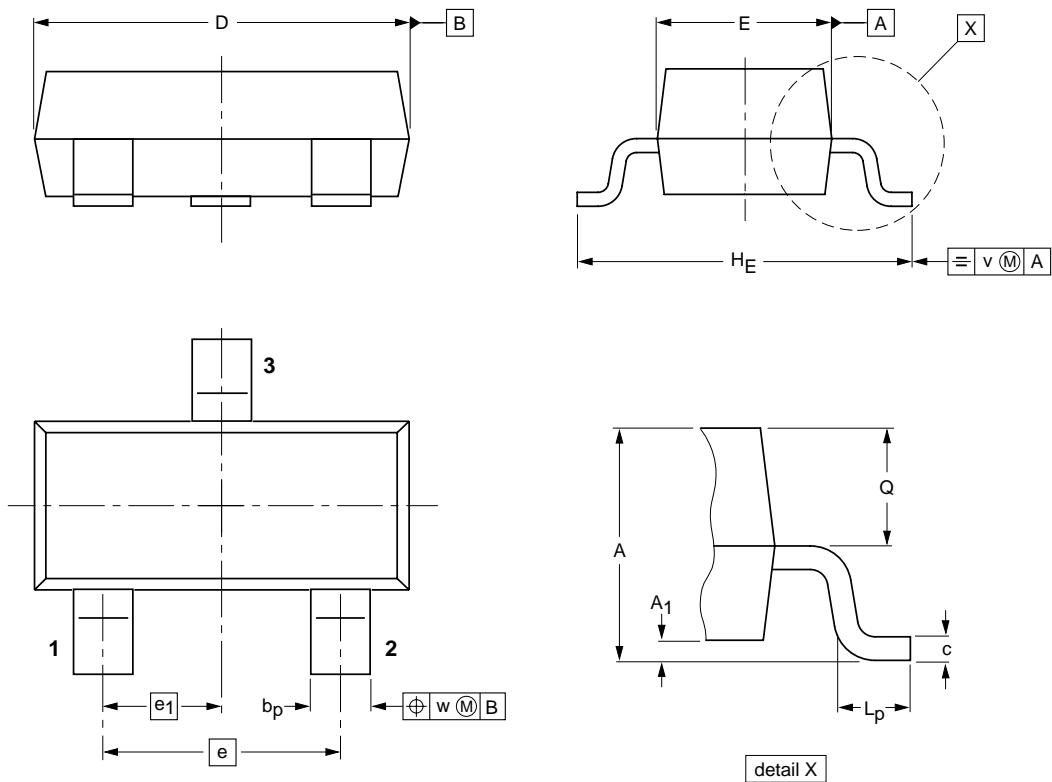
NPN switching transistor

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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> 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 0.9	0.1	0.48 0.38	0.15 0.09	3.0 2.8	1.4 1.2	1.9	0.95	2.5 2.1	0.45 0.15	0.55 0.45	0.2	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT23						97-02-28

## NPN switching transistor

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**DEFINITIONS**

<b>Data sheet status</b>	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
<b>Limiting values</b>	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
<b>Application information</b>	
Where application information is given, it is advisory and does not form part of the specification.	

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NPN switching transistor

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