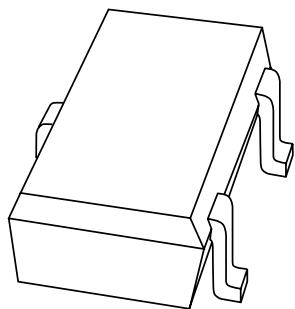


# DATA SHEET



## **PMST3904** NPN switching transistor

Product specification  
Supersedes data of August 1993  
File under Discrete Semiconductors, SC04

1997 Jul 04

# NPN switching transistor

# PMST3904

### FEATURES

- Low current (max. 200 mA)
- Low voltage (max. 40 V).

### APPLICATIONS

- Telephony
- Professional communication equipment.

### DESCRIPTION

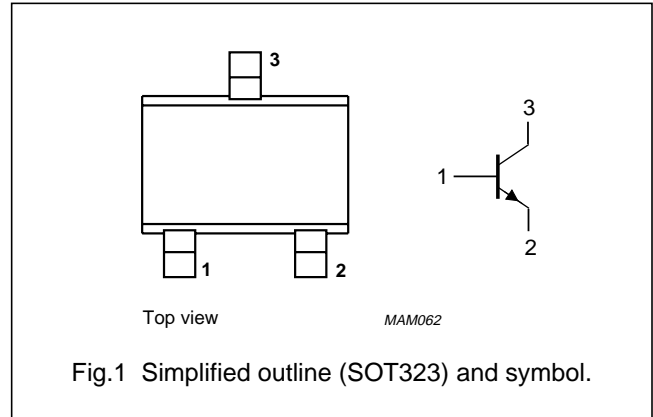
NPN switching transistor in a SOT323 plastic package.  
PNP complement: PMST3906.

### MARKING

TYPE NUMBER	MARKING CODE
PMST3904	t1A

### 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	–	60	V
$V_{CEO}$	collector-emitter voltage	open base	–	40	V
$I_C$	collector current (DC)		–	200	mA
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ °C}$	–	200	mW
$h_{FE}$	DC current gain	$I_C = 10\text{ mA}; V_{CE} = 1\text{ V}$	100	300	
$f_T$	transition frequency	$I_C = 10\text{ mA}; V_{CE} = 20\text{ V}; f = 100\text{ MHz}$	300	–	MHz
$t_{off}$	turn-off time	$I_{Con} = 10\text{ mA}; I_{Bon} = 1\text{ mA}; I_{Boff} = -1\text{ mA}$	–	240	ns

## NPN switching transistor

## PMST3904

**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	–	60	V
$V_{CEO}$	collector-emitter voltage	open base	–	40	V
$V_{EBO}$	emitter-base voltage	open collector	–	6	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	–	200	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	625	K/W

**Note**

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

## NPN switching transistor

## PMST3904

**CHARACTERISTICS**

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

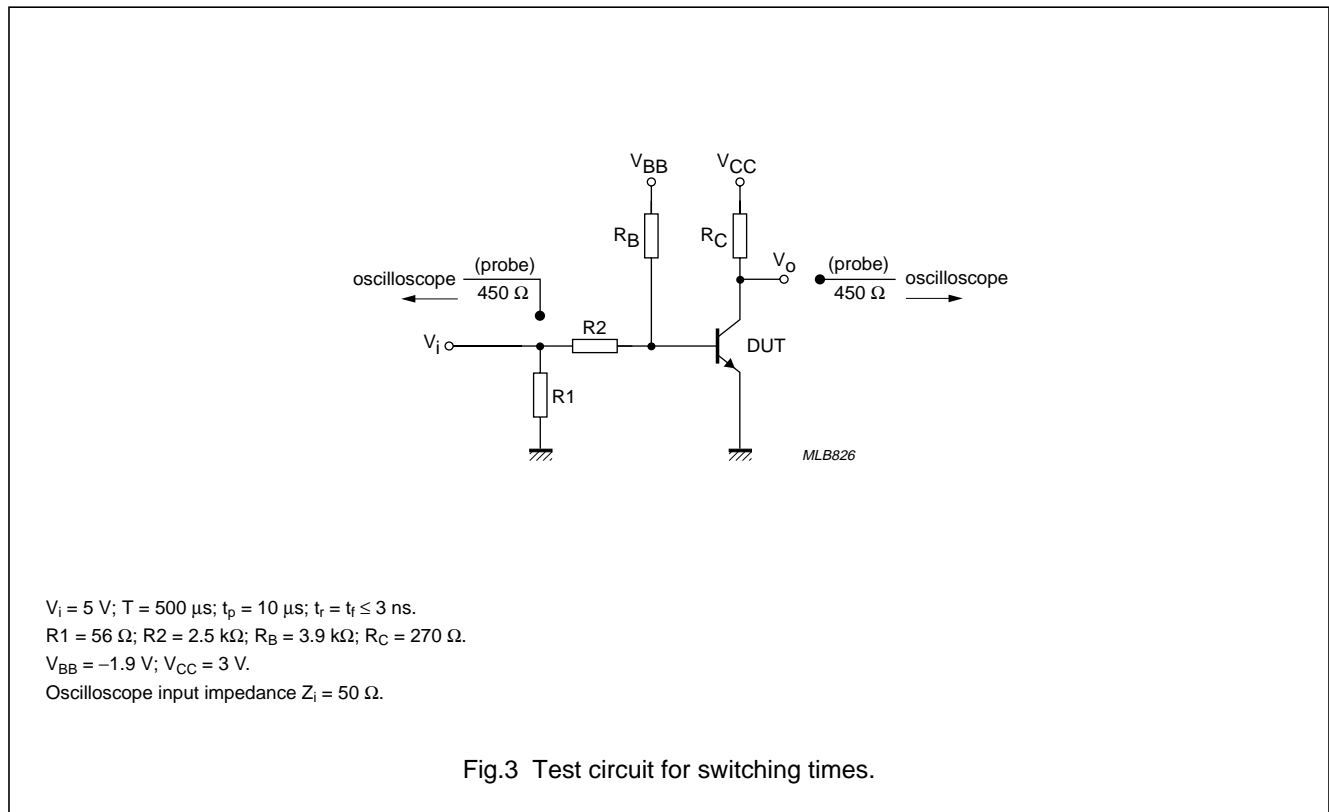
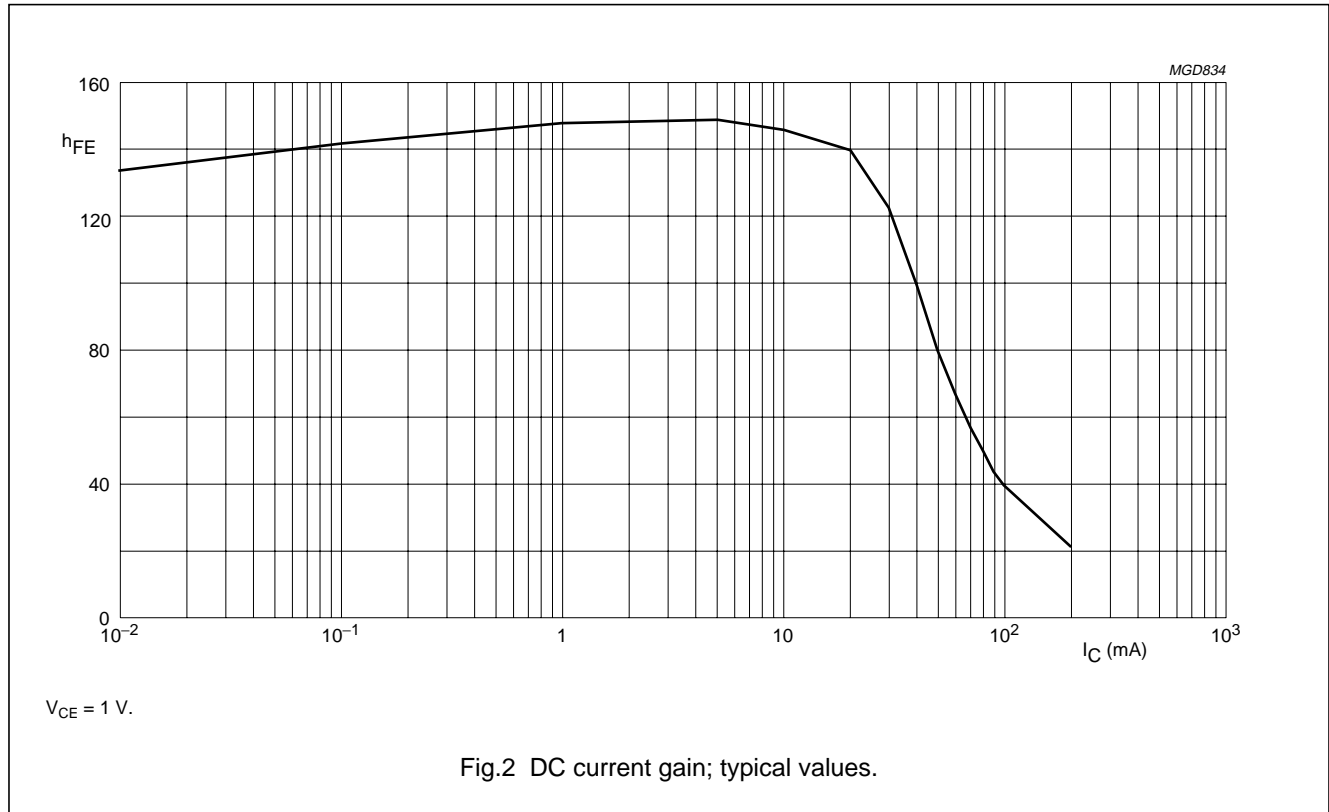
SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$I_{CBO}$	collector cut-off current	$I_E = 0; V_{CB} = 30\text{ V}$	–	50	nA
		$I_E = 0; V_{CB} = 30\text{ V}; T_j = 150\text{ °C}$	–	10	$\mu\text{A}$
$I_{EBO}$	emitter cut-off current	$I_C = 0; V_{EB} = 6\text{ V}$	–	50	nA
$h_{FE}$	DC current gain	$V_{CE} = 1\text{ V}$ ; see Fig.2			
		$I_C = 0.1\text{ mA}$	60	–	
		$I_C = 1\text{ mA}$	80	–	
		$I_C = 10\text{ mA}$	100	300	
		$I_C = 50\text{ mA}$ ; note 1	60	–	
		$I_C = 100\text{ mA}$ ; note 1	30	–	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 10\text{ mA}; I_B = 1\text{ mA}$ ; note 1	–	200	mV
		$I_C = 50\text{ mA}; I_B = 5\text{ mA}$ ; note 1	–	200	mV
$V_{BEsat}$	base-emitter saturation voltage	$I_C = 10\text{ mA}; I_B = 1\text{ mA}$ ; note 1	650	850	mV
		$I_C = 50\text{ mA}; I_B = 5\text{ mA}$ ; note 1	–	950	mV
$C_c$	collector capacitance	$I_E = i_e = 0; V_{CB} = 5\text{ V}; f = 1\text{ MHz}$	–	4	pF
$C_e$	emitter capacitance	$I_C = i_c = 0; V_{EB} = 500\text{ mV}; f = 1\text{ MHz}$	–	8	pF
$f_T$	transition frequency	$I_C = 10\text{ mA}; V_{CE} = 20\text{ V}; f = 100\text{ MHz}$	300	–	MHz
F	noise figure	$I_C = 100\text{ }\mu\text{A}; V_{CE} = 5\text{ V}; R_S = 1\text{ k}\Omega$ $f = 10\text{ Hz to }15.7\text{ kHz}$	–	5	dB
<b>Switching times (between 10% and 90% levels); see Fig.3</b>					
$t_{on}$	turn-on time	$I_{Con} = 10\text{ mA}; I_{Bon} = 1\text{ mA}; I_{Boff} = -1\text{ mA}$	–	65	ns
$t_d$	delay time		–	35	ns
$t_r$	rise time		–	35	ns
$t_{off}$	turn-off time		–	240	ns
$t_s$	storage time		–	200	ns
$t_f$	fall time		–	50	ns

**Note**

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

NPN switching transistor

PMST3904



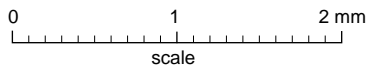
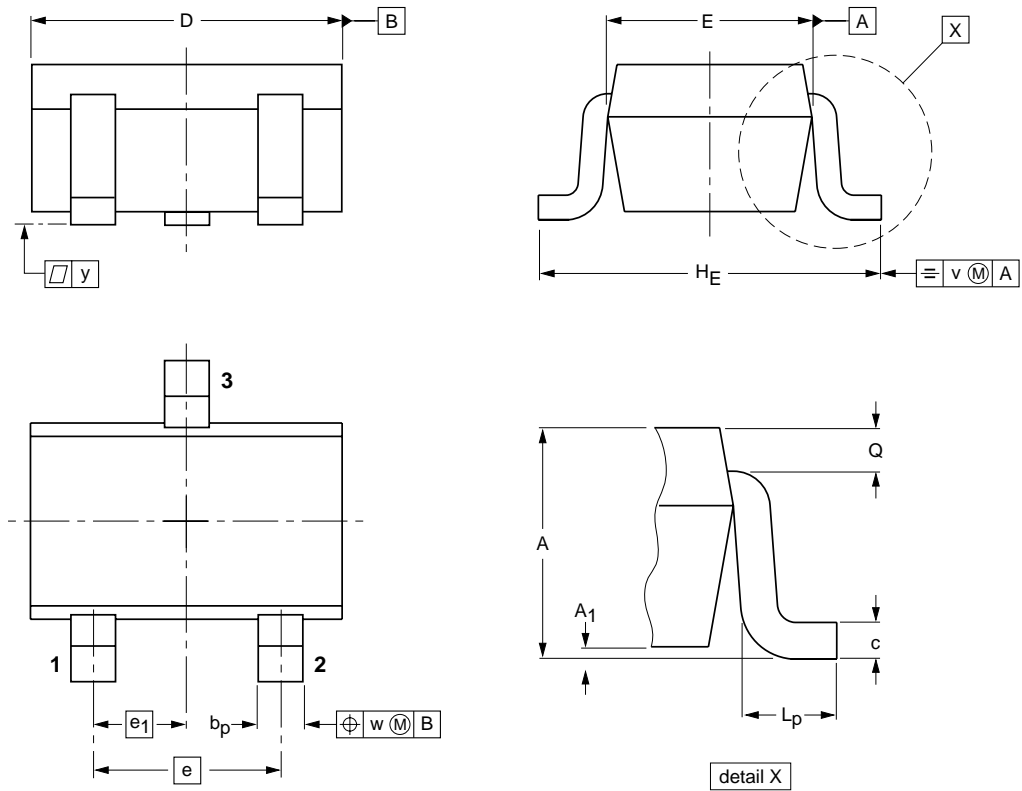
NPN switching transistor

PMST3904

PACKAGE OUTLINE

Plastic surface mounted package; 3 leads

SOT323



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 0.8	0.1	0.4 0.3	0.25 0.10	2.2 1.8	1.35 1.15	1.3	0.65	2.2 2.0	0.45 0.15	0.23 0.13	0.2	0.2

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT323			SC-70			97-02-28

## NPN switching transistor

PMST3904

**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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