



# PMST3904

NPN switching transistor

28 February 2024

Product data sheet

## 1. General description

NPN switching transistor in a very small SOT323 (SC-70) Surface-Mounted Device (SMD) plastic package.

PNP complement: PMST3906

## 2. Features and benefits

- Collector current capability  $I_C = 200 \text{ mA}$
- Collector-emitter voltage  $V_{CEO} = 40 \text{ V}$
- AEC-Q101 qualified

## 3. Applications

- General amplification and switching

## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CEO}$	collector-emitter voltage	open base	-	-	40	V
$I_C$	collector current		-	-	200	mA
$h_{FE}$	DC current gain	$V_{CE} = 1 \text{ V}$ ; $I_C = 10 \text{ mA}$ ; pulsed; $t_p \leq 300 \mu\text{s}$ ; $\delta \leq 0.02$ ; $T_{amb} = 25 \text{ }^\circ\text{C}$	100	-	300	

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base	 SC-70 (SOT323)	 sym123
2	E	emitter		
3	C	collector		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMST3904	SC-70	plastic, surface-mounted package; 3 leads; 1.3 mm pitch; 2 mm x 1.25 mm x 0.95 mm body	SOT323

7. Marking

Table 4. Marking codes

Type number	Marking code[1]
PMST3904	%1A

[1] % = placeholder for manufacturing site code

8. Limiting values

Table 5. Limiting values

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

Symbol	Parameter	Conditions		Min	Max	Unit
V <sub>CBO</sub>	collector-base voltage	open emitter		-	60	V
V <sub>CEO</sub>	collector-emitter voltage	open base		-	40	V
V <sub>EBO</sub>	emitter-base voltage	open collector		-	6	V
I <sub>C</sub>	collector current			-	200	mA
I <sub>CM</sub>	peak collector current			-	200	mA
I <sub>BM</sub>	peak base current			-	100	mA
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> ≤ 25 °C	[1]	-	200	mW
T <sub>j</sub>	junction temperature			-	150	°C
T <sub>amb</sub>	ambient temperature			-65	150	°C
T <sub>stg</sub>	storage temperature			-65	150	°C

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
R <sub>th(j-a)</sub>	thermal resistance from junction to ambient	in free air	[1]	-	-	625	K/W

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I <sub>CBO</sub>	collector-base cut-off current	V <sub>CB</sub> = 30 V; I <sub>E</sub> = 0 A; T <sub>amb</sub> = 25 °C		-	-	50	nA
I <sub>EBO</sub>	emitter-base cut-off current	V <sub>EB</sub> = 6 V; I <sub>C</sub> = 0 A; T <sub>amb</sub> = 25 °C		-	-	50	nA
h <sub>FE</sub>	DC current gain	V <sub>CE</sub> = 1 V; I <sub>C</sub> = 0.1 mA; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C		60	-	-	
		V <sub>CE</sub> = 1 V; I <sub>C</sub> = 1 mA; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C		80	-	-	
		V <sub>CE</sub> = 1 V; I <sub>C</sub> = 10 mA; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C		100	-	300	
		V <sub>CE</sub> = 1 V; I <sub>C</sub> = 50 mA; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C		60	-	-	
		V <sub>CE</sub> = 1 V; I <sub>C</sub> = 100 mA; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C		30	-	-	
V <sub>CEsat</sub>	collector-emitter saturation voltage	I <sub>C</sub> = 10 mA; I <sub>B</sub> = 1 mA; T <sub>amb</sub> = 25 °C		-	-	200	mV
		I <sub>C</sub> = 50 mA; I <sub>B</sub> = 5 mA; T <sub>amb</sub> = 25 °C		-	-	300	mV
V <sub>BEsat</sub>	base-emitter saturation voltage	I <sub>C</sub> = 10 mA; I <sub>B</sub> = 1 mA; T <sub>amb</sub> = 25 °C		650	-	850	mV
		I <sub>C</sub> = 50 mA; I <sub>B</sub> = 5 mA; T <sub>amb</sub> = 25 °C		-	-	950	mV
C <sub>c</sub>	collector capacitance	V <sub>CB</sub> = 5 V; I <sub>E</sub> = 0 A; i <sub>e</sub> = 0 A; f = 1 MHz; T <sub>amb</sub> = 25 °C		-	-	4	pF
C <sub>e</sub>	emitter capacitance	V <sub>EB</sub> = 0.5 V; I <sub>C</sub> = 0 A; i <sub>c</sub> = 0 A; f = 1 MHz; T <sub>amb</sub> = 25 °C		-	-	8	pF
f <sub>T</sub>	transition frequency	V <sub>CE</sub> = 10 V; I <sub>C</sub> = 20 mA; f = 100 MHz; T <sub>amb</sub> = 25 °C		300	-	-	MHz
NF	noise figure	V <sub>CE</sub> = 5 V; I <sub>C</sub> = 100 μA; R <sub>S</sub> = 1 kΩ; f = 10 Hz to 15.7 kHz; T <sub>amb</sub> = 25 °C		-	-	5	dB
Switching times (between 10% and 90% levels)							
t <sub>d</sub>	delay time	I <sub>C</sub> = 10 mA; I <sub>Bon</sub> = 1 mA; I <sub>Boff</sub> = -1 mA; T <sub>amb</sub> = 25 °C		-	-	35	ns
t <sub>r</sub>	rise time			-	-	35	ns
t <sub>s</sub>	storage time			-	-	200	ns
t <sub>f</sub>	fall time			-	-	50	ns

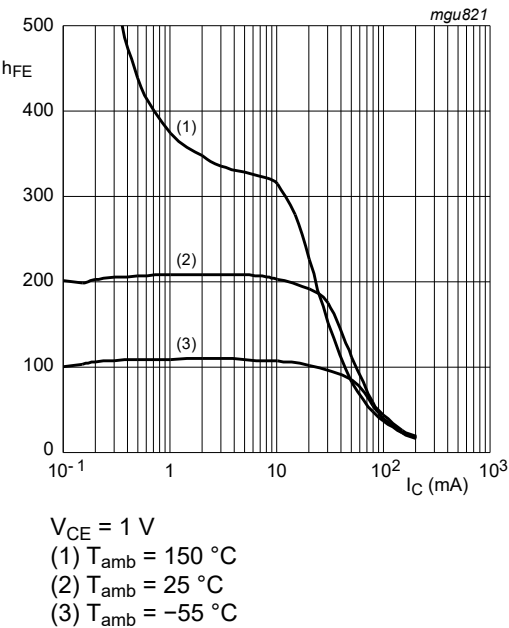


Fig. 1. DC current gain as a function of collector current; typical values

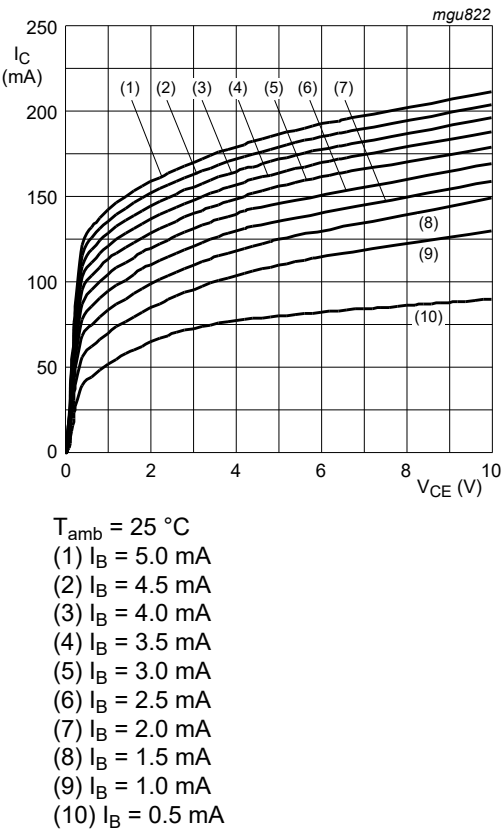


Fig. 2. Collector current as a function of collector-emitter voltage; typical values

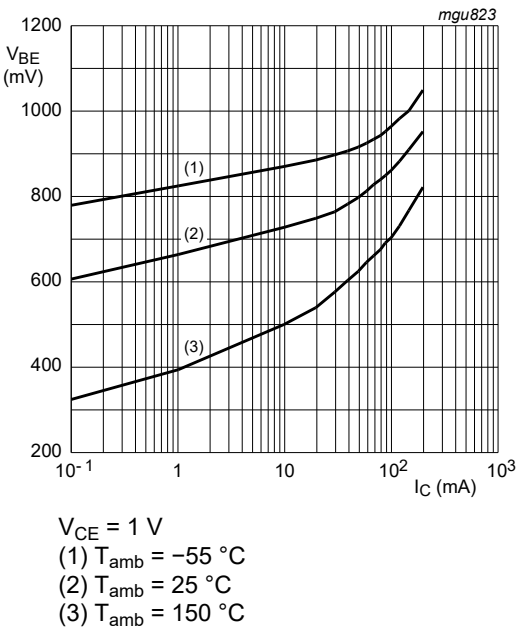


Fig. 3. Base-emitter voltage as a function of collector current; typical values

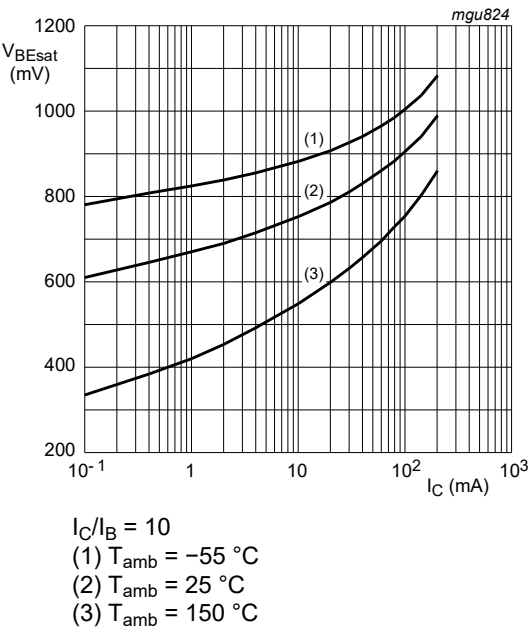
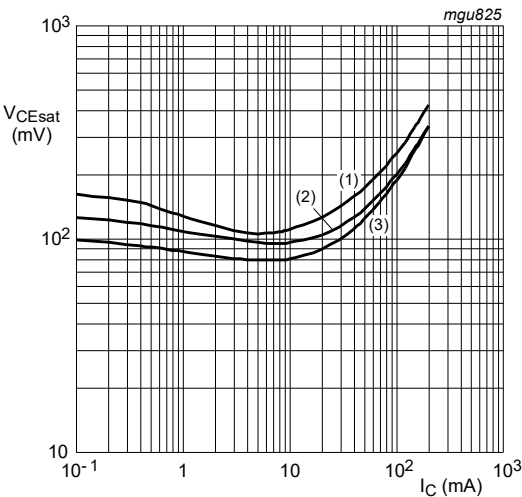


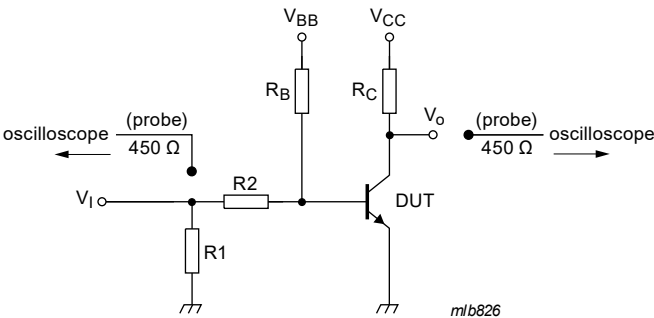
Fig. 4. Base-emitter saturation voltage as a function of collector current; typical values



$I_C/I_B = 10$   
(1)  $T_{amb} = 150\text{ °C}$   
(2)  $T_{amb} = 25\text{ °C}$   
(3)  $T_{amb} = -55\text{ °C}$

Fig. 5. Collector-emitter saturation voltage as a function of collector current; typical values

11. Test information



$V_1 = 5\text{ V}$ ;  $t = 600\text{ }\mu\text{s}$ ;  $t_p = 10\text{ }\mu\text{s}$ ;  $t_r = t_f \leq 3\text{ ns}$   
 $R_1 = 56\text{ }\Omega$ ;  $R_2 = 2.5\text{ k}\Omega$ ;  $R_B = 3.9\text{ k}\Omega$ ;  $R_C = 270\text{ }\Omega$   
 $V_{BB} = -1.9\text{ V}$ ;  $V_{CC} = 3\text{ V}$   
Oscilloscope: input impedance  $Z_i = 50\text{ }\Omega$

Fig. 6. Test circuit for switching times

Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - Stress test qualification for discrete semiconductors, and is suitable for use in automotive applications.



14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMST3904 v.3	20240228	Product data sheet	-	PMST3904 v.2
Modifications:	<ul style="list-style-type: none"><li>The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.</li><li>Legal texts have been adapted to the new company name where appropriate.</li></ul>			
PMST3904 v.2	20040421	Product data sheet	-	PMST3904 v.1
PMST3904 v.1	19990422	Product data sheet	-	-

## 15. Legal information

### Data sheet status

Document status [1][2]	Product status [3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

- [1] Please consult the most recently issued document before initiating or completing a design.
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Contents

1. General description..... 1

2. Features and benefits..... 1

3. Applications..... 1

4. Quick reference data..... 1

5. Pinning information..... 1

6. Ordering information..... 2

7. Marking..... 2

8. Limiting values..... 2

9. Thermal characteristics..... 2

10. Characteristics..... 3

11. Test information..... 5

12. Package outline..... 6

13. Soldering..... 6

14. Revision history..... 7

15. Legal information..... 8

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Date of release: 28 February 2024

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