



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 _{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			-	200	mA
I _{CM}	peak collector current			-	200	mA
I _{BM}	peak base current			-	100	mA
P _{tot}	total power dissipation	T _{amb} ≤ 25 °C	[1]	-	200	mW
T _j	junction temperature			-	150	°C
T _{amb}	ambient temperature			-65	150	°C
T _{stg}	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 _{th(j-a)}	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 _{CBO}	collector-base cut-off current	V _{CB} = 30 V; I _E = 0 A; T _{amb} = 25 °C		-	-	50	nA
I _{EBO}	emitter-base cut-off current	V _{EB} = 6 V; I _C = 0 A; T _{amb} = 25 °C		-	-	50	nA
h _{FE}	DC current gain	V _{CE} = 1 V; I _C = 0.1 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C		60	-	-	
		V _{CE} = 1 V; I _C = 1 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C		80	-	-	
		V _{CE} = 1 V; I _C = 10 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C		100	-	300	
		V _{CE} = 1 V; I _C = 50 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C		60	-	-	
		V _{CE} = 1 V; I _C = 100 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C		30	-	-	
V _{CEsat}	collector-emitter saturation voltage	I _C = 10 mA; I _B = 1 mA; T _{amb} = 25 °C		-	-	200	mV
		I _C = 50 mA; I _B = 5 mA; T _{amb} = 25 °C		-	-	300	mV
V _{BEsat}	base-emitter saturation voltage	I _C = 10 mA; I _B = 1 mA; T _{amb} = 25 °C		650	-	850	mV
		I _C = 50 mA; I _B = 5 mA; T _{amb} = 25 °C		-	-	950	mV
C _c	collector capacitance	V _{CB} = 5 V; I _E = 0 A; i _e = 0 A; f = 1 MHz; T _{amb} = 25 °C		-	-	4	pF
C _e	emitter capacitance	V _{EB} = 0.5 V; I _C = 0 A; i _c = 0 A; f = 1 MHz; T _{amb} = 25 °C		-	-	8	pF
f _T	transition frequency	V _{CE} = 10 V; I _C = 20 mA; f = 100 MHz; T _{amb} = 25 °C		300	-	-	MHz
NF	noise figure	V _{CE} = 5 V; I _C = 100 μA; R _S = 1 kΩ; f = 10 Hz to 15.7 kHz; T _{amb} = 25 °C		-	-	5	dB
Switching times (between 10% and 90% levels)							
t _d	delay time	I _C = 10 mA; I _{Bon} = 1 mA; I _{Boff} = -1 mA; T _{amb} = 25 °C		-	-	35	ns
t _r	rise time			-	-	35	ns
t _s	storage time			-	-	200	ns
t _f	fall time			-	-	50	ns

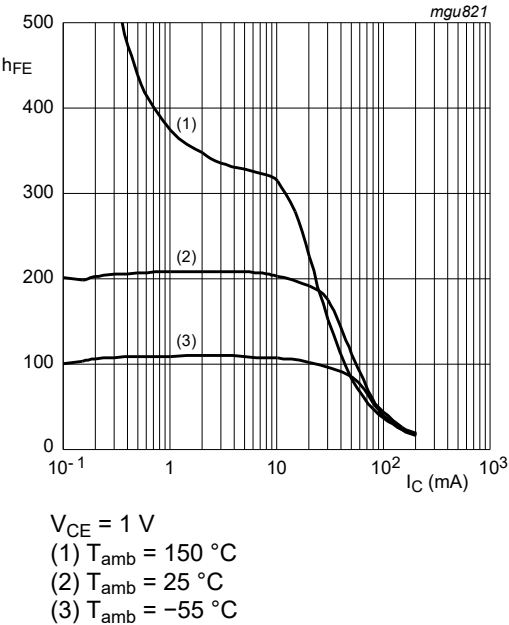


Fig. 1. DC current gain as a function of collector current; typical values

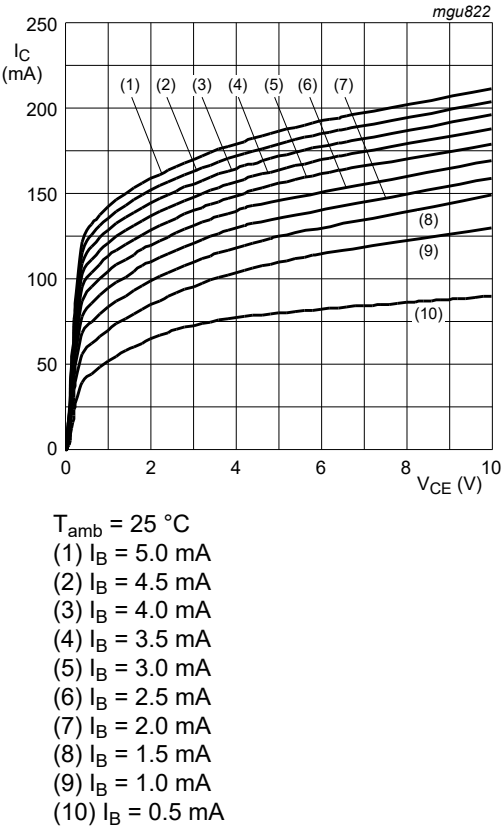


Fig. 2. Collector current as a function of collector-emitter voltage; typical values

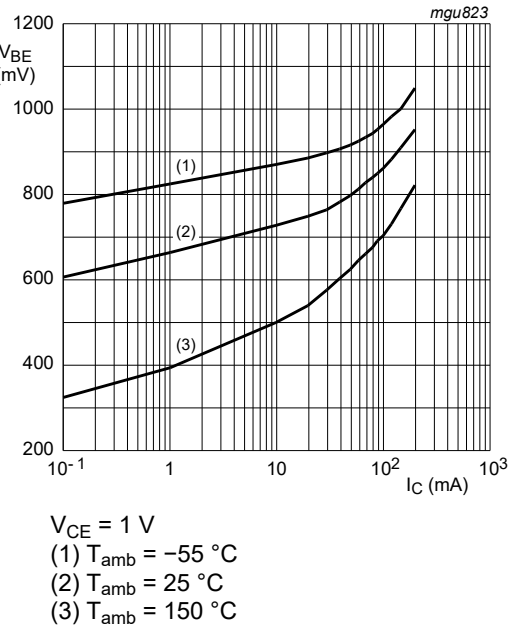


Fig. 3. Base-emitter voltage as a function of collector current; typical values

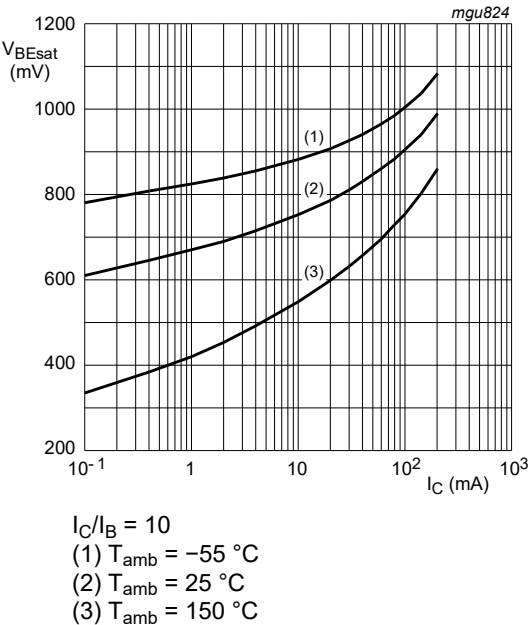
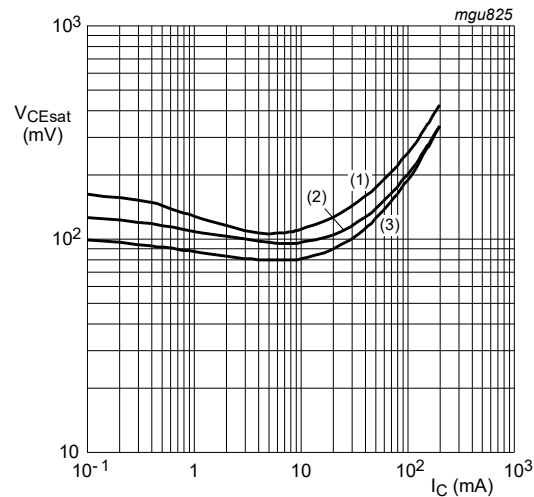


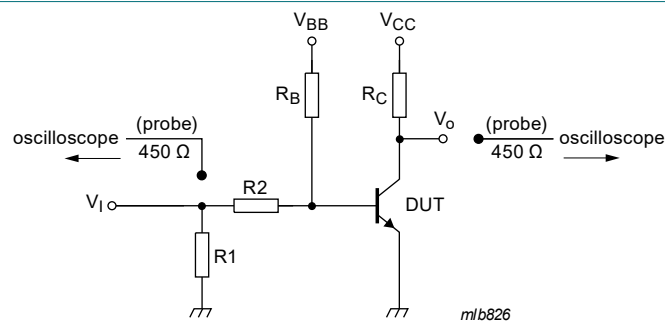
Fig. 4. Base-emitter saturation voltage as a function of collector current; typical values



$I_C/I_B = 10$
 (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



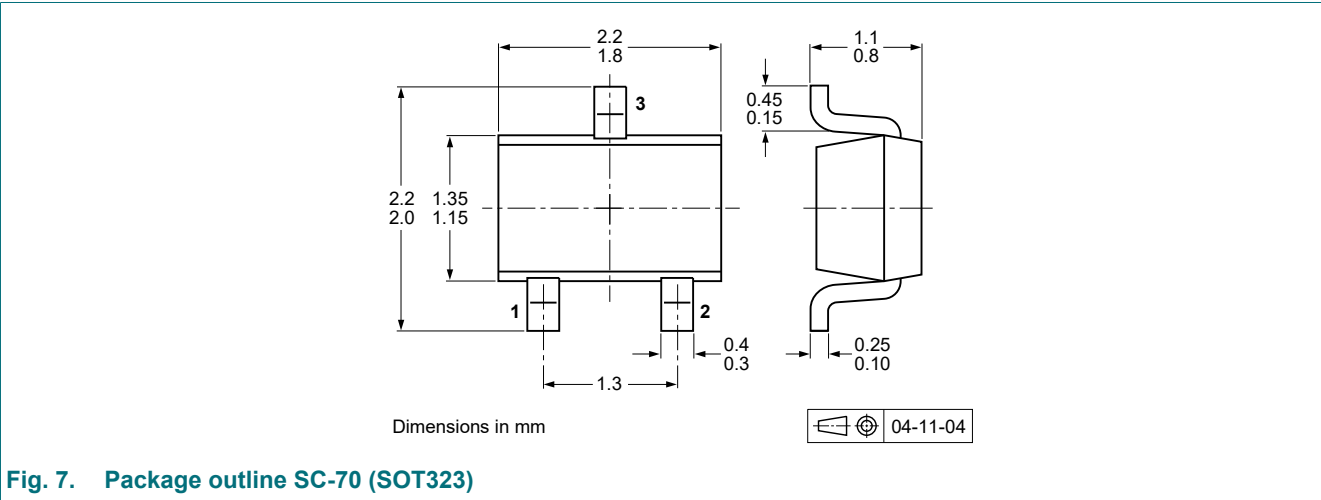
$V_1 = 5\text{ V}$; $t = 600\text{ }\mu\text{s}$; $t_p = 10\text{ }\mu\text{s}$; $t_r = t_f \leq 3\text{ ns}$
 $R_1 = 56\text{ }\Omega$; $R_2 = 2.5\text{ k}\Omega$; $R_B = 3.9\text{ k}\Omega$; $R_C = 270\text{ }\Omega$
 $V_{BB} = -1.9\text{ V}$; $V_{CC} = 3\text{ V}$
 Oscilloscope: input impedance $Z_i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

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.

12. Package outline



13. Soldering

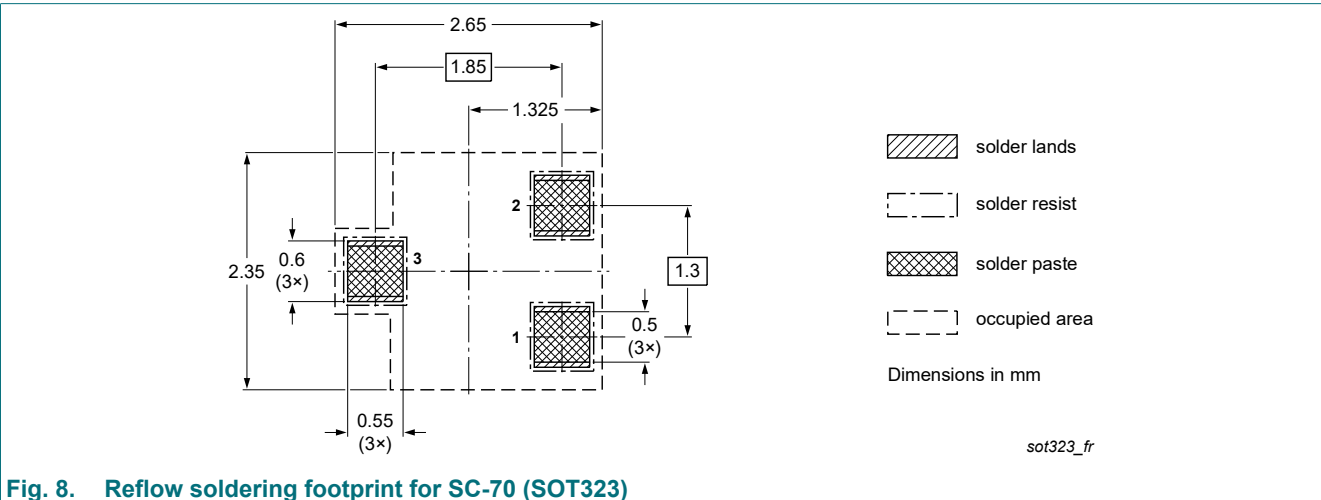


Fig. 8. Reflow soldering footprint for SC-70 (SOT323)

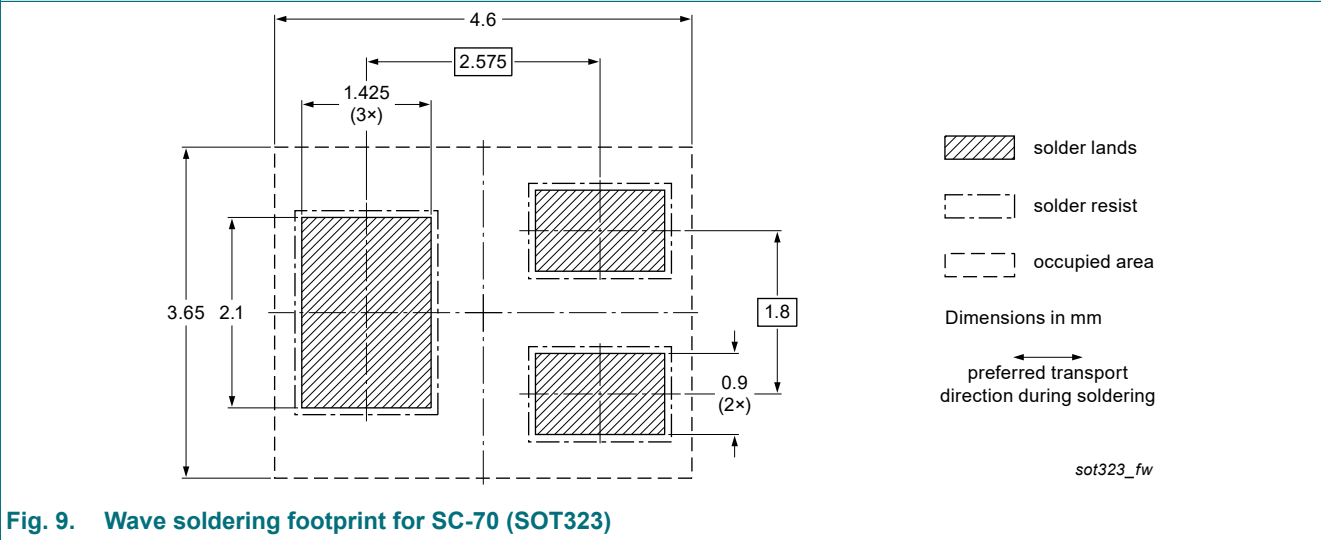


Fig. 9. Wave soldering footprint for SC-70 (SOT323)

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:	- The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. - Legal texts have been adapted to the new company name where appropriate.			
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.

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- [2] The term 'short data sheet' is explained in section "Definitions".
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