PMST4401-Q

NPN switching transistor

17 January 2024 Product data sheet

1. General description

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

2. Features and benefits

- High current (max. 600 mA)
- Low voltage (max. 40 V)
- Qualified according to AEC-Q101 and recommended for use in automotive applications

3. Applications

- General purpose switching and linear amplification, especially in portable equipment

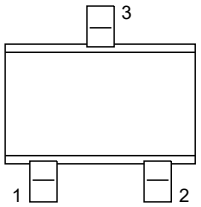
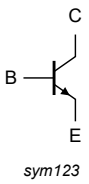
4. Quick reference data

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			-	-	600	mA
h_{FE}	DC current gain	V_{CE} = 1 V; I_C = 10 mA; T_{amb} = 25 °C		80	-	-	

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
PMST4401-Q	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]
PMST4401-Q	%2X

[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			-	600	mA
I_{CM}	peak collector current			-	600	mA
I_{BM}	peak base current			-	200	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °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} = 60 V; I_E = 0 A; T_{amb} = 25 °C		-	-	50	nA
		V_{CB} = 60 V; I_E = 0 A; T_j = 150 °C		-	-	10	µA
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; T_{amb} = 25 °C		20	-	-	
		V_{CE} = 1 V; I_C = 1 mA; T_{amb} = 25 °C		40	-	-	
		V_{CE} = 1 V; I_C = 10 mA; T_{amb} = 25 °C		80	-	-	
		V_{CE} = 1 V; I_C = 150 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02; T_{amb} = 25 °C		100	-	300	
		V_{CE} = 2 V; I_C = 500 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02; T_{amb} = 25 °C		40	-	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = 150 mA; I_B = 15 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02; T_{amb} = 25 °C		-	-	400	mV
		I_C = 500 mA; I_B = 50 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02; T_{amb} = 25 °C		-	-	750	mV
V_{BEsat}	base-emitter saturation voltage	I_C = 150 mA; I_B = 15 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02; T_{amb} = 25 °C		-	-	950	mV
		I_C = 500 mA; I_B = 50 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02; T_{amb} = 25 °C		-	-	1.2	V
C_c	collector capacitance	V_{CB} = 5 V; I_E = 0 A; i_e = 0 A; f = 1 MHz; T_{amb} = 25 °C		-	-	8	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		-	-	30	pF
f_T	transition frequency	V_{CE} = 10 V; I_C = 20 mA; f = 100 MHz; T_{amb} = 25 °C		250	-	-	MHz
Switching times (between 10% and 90% levels)							
t_d	delay time	I_C = 150 mA; I_{Bon} = 15 mA; I_{Boff} = -15 mA; T_{amb} = 25 °C		-	-	15	ns
t_r	rise time			-	-	20	ns
t_{on}	turn-on time	I_C = 150 mA; I_{Bon} = 15 A; I_{Boff} = -15 mA; T_{amb} = 25 °C		-	-	35	ns
t_s	storage time	I_C = 150 mA; I_{Bon} = 15 mA; I_{Boff} = -15 mA; T_{amb} = 25 °C		-	-	200	ns
t_f	fall time			-	-	60	ns
t_{off}	turn-off time			-	-	250	ns

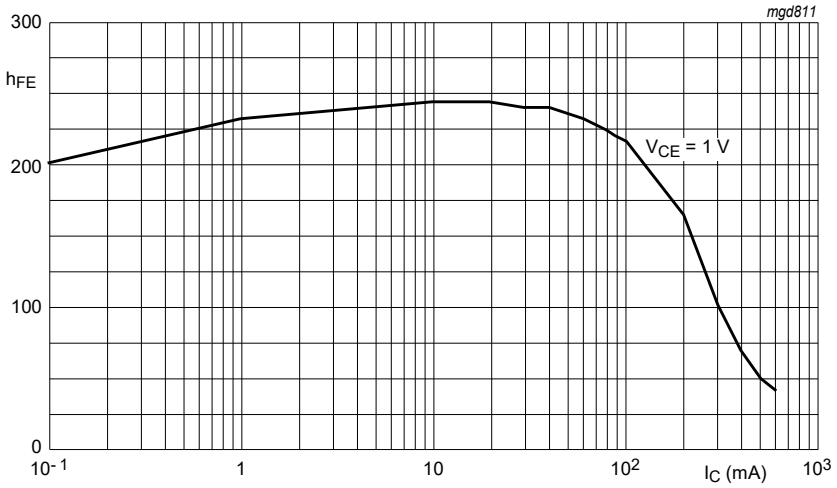


Fig. 1. DC current gain; typical value

11. Test information

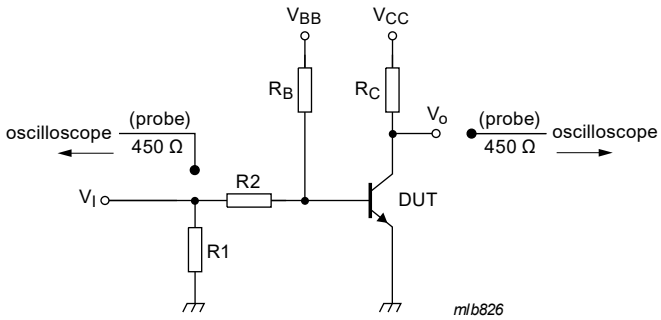


Fig. 2. Test circuit for switching times

V_i = 9.5 V; T = 500 µs; t_p = 10 µs; t_r = t_f ≤ 3 ns

R1 = 68 Ω; R2 = 325 Ω; R_B = 325 Ω; R_C = 160 Ω

V_{BB} = −3.5 V; V_{CC} = 29.5 V

Oscilloscope: input impedance Z_i = 50 Ω

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

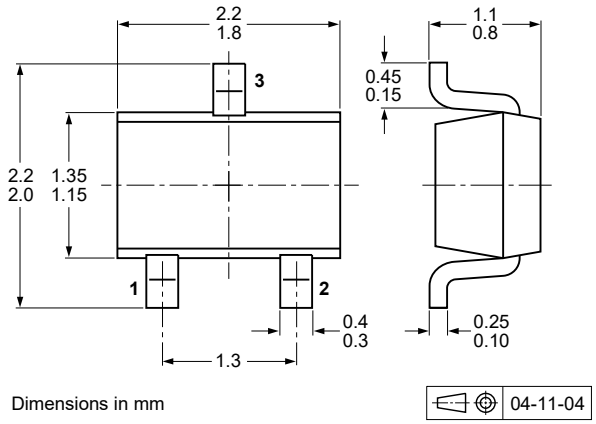


Fig. 3. Package outline SC-70 (SOT323)

13. Soldering

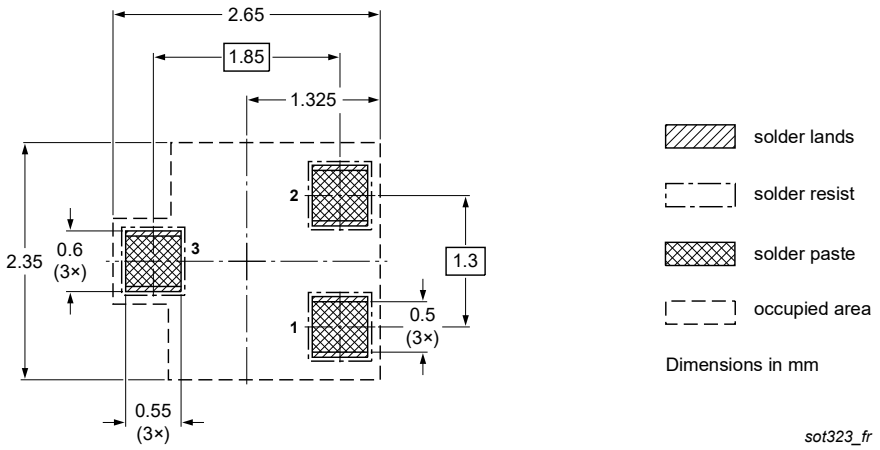


Fig. 4. Reflow soldering footprint for SC-70 (SOT323)

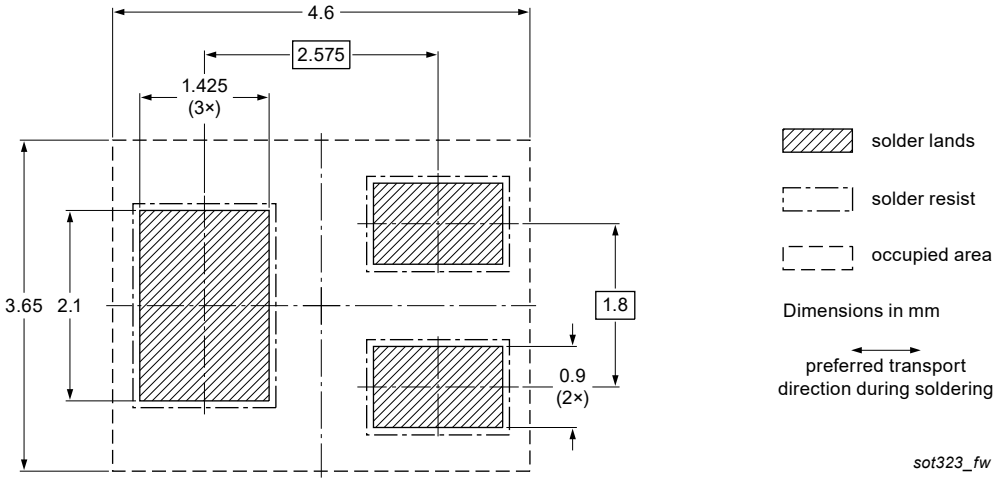


Fig. 5. Wave soldering footprint for SC-70 (SOT323)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMST4401-Q v.1	20240117	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.
[2] The term 'short data sheet' is explained in section "Definitions".
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