



# PMBS3904-Q

40 V, 100 mA NPN general-purpose transistor

7 October 2022

Product data sheet

## 1. General description

NPN transistor in a small SOT23 (SC-70) Surface-Mounted Device (SMD) plastic package.  
PNP complement: PMBS3906

## 2. Features and benefits

- Low current (max. 100 mA)
- Low voltage (max. 40 V)
- Qualified according to AEC-Q101 and recommended for use in automotive applications

## 3. Applications

- General-purpose switching and amplification
- Telephony and professional communication equipment

## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CE0}$	collector-emitter voltage	open base	-	-	40	V
$I_C$	collector current		-	-	100	mA
$h_{FE}$	DC current gain	$V_{CE} = 1\text{ V}$ ; $I_C = 10\text{ mA}$ ; $t_p \leq 300\text{ }\mu\text{s}$ ; $\delta \leq 0.02$ ; $T_{amb} = 25\text{ }^\circ\text{C}$	100	-	300	

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base	<p>SOT23</p>	<p>aaa-027673</p>
2	E	emitter		
3	C	collector		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
<a href="#">PMBS3904-Q</a>	SOT23	plastic, surface-mounted package; 3 terminals; 1.9 mm pitch; 2.9 mm x 1.3 mm x 1 mm body	<a href="#">SOT23</a>

## 7. Marking

Table 4. Marking codes

Type number	Marking code[1]
PMBS3904-Q	%04

[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		-	100	mA
$I_{CM}$	peak collector current		-	200	mA
$I_{BM}$	peak base current		-	200	mA
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ °C}$	-	250	mW
$T_j$	junction temperature		-	150	°C
$T_{amb}$	ambient temperature		-65	150	°C
$T_{stg}$	storage temperature		-65	150	°C

## 9. Thermal characteristics

Table 6. Thermal characteristics

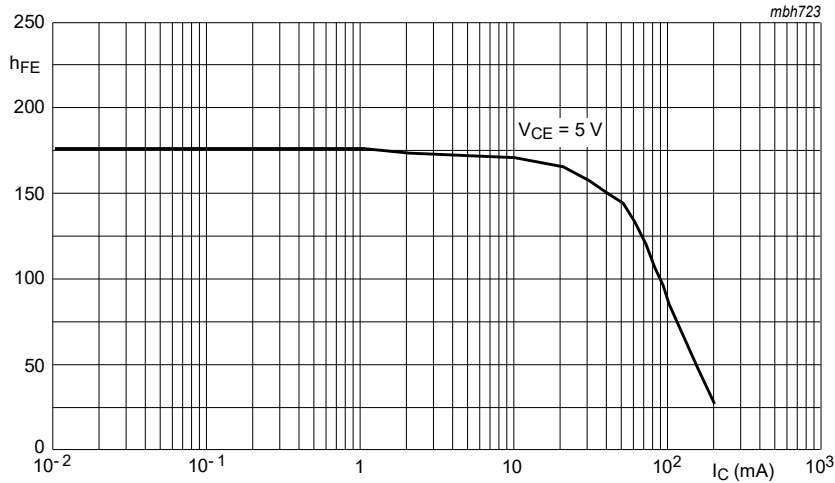
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient		[1]	-	500	K/W

[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	$V_{CB} = 30 \text{ V}; I_E = 0 \text{ A}; T_{amb} = 25 \text{ }^\circ\text{C}$	-	-	50	nA
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = 5 \text{ V}; I_C = 0 \text{ A}; T_{amb} = 25 \text{ }^\circ\text{C}$	-	-	50	nA
$h_{FE}$	DC current gain	$V_{CE} = 1 \text{ V}; I_C = 0.1 \text{ mA}; t_p \leq 300 \text{ } \mu\text{s}; \delta \leq 0.02; T_{amb} = 25 \text{ }^\circ\text{C}$	40	-	-	
		$V_{CE} = 1 \text{ V}; I_C = 1 \text{ mA}; t_p \leq 300 \text{ } \mu\text{s}; \delta \leq 0.02; T_{amb} = 25 \text{ }^\circ\text{C}$	70	-	-	
		$V_{CE} = 1 \text{ V}; I_C = 10 \text{ mA}; t_p \leq 300 \text{ } \mu\text{s}; \delta \leq 0.02; T_{amb} = 25 \text{ }^\circ\text{C}$	100	-	300	
		$V_{CE} = 1 \text{ V}; I_C = 50 \text{ mA}; t_p \leq 300 \text{ } \mu\text{s}; \delta \leq 0.02; T_{amb} = 25 \text{ }^\circ\text{C}$	60	-	-	
		$V_{CE} = 1 \text{ V}; I_C = 100 \text{ mA}; t_p \leq 300 \text{ } \mu\text{s}; \delta \leq 0.02; T_{amb} = 25 \text{ }^\circ\text{C}$	30	-	-	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 10 \text{ mA}; I_B = 1 \text{ mA}; T_{amb} = 25 \text{ }^\circ\text{C}$	-	-	200	mV
		$I_C = 50 \text{ mA}; I_B = 5 \text{ mA}; T_{amb} = 25 \text{ }^\circ\text{C}$	-	-	300	mV
$V_{BEsat}$	base-emitter saturation voltage	$I_C = 10 \text{ mA}; I_B = 1 \text{ mA}; T_{amb} = 25 \text{ }^\circ\text{C}$	650	-	850	mV
		$I_C = 50 \text{ mA}; I_B = 5 \text{ mA}; T_{amb} = 25 \text{ }^\circ\text{C}$	-	-	950	mV
$C_c$	collector capacitance	$V_{CB} = 5 \text{ V}; I_E = 0 \text{ A}; i_e = 0 \text{ A}; f = 1 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}$	-	-	4	pF
$C_e$	emitter capacitance	$V_{EB} = 0.5 \text{ V}; I_C = 0 \text{ A}; i_c = 0 \text{ A}; f = 1 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}$	-	-	12	pF
$f_T$	transition frequency	$V_{CE} = 20 \text{ V}; I_C = 10 \text{ mA}; f = 100 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}$	180	-	-	MHz
NF	noise figure	$V_{CE} = 5 \text{ V}; I_C = 100 \text{ } \mu\text{A}; R_S = 1 \text{ k}\Omega; f = 10 \text{ Hz to } 15.7 \text{ kHz}; T_{amb} = 25 \text{ }^\circ\text{C}$	-	-	5	dB
<b>Switching times (between 10% and 90% levels);</b>						
$t_d$	delay time	$I_C = 10 \text{ mA}; I_{Bon} = 1 \text{ mA}; I_{Boff} = -1 \text{ mA}; V_{CC} = 3 \text{ V}; T_{amb} = 25 \text{ }^\circ\text{C}$	-	-	50	ns
$t_r$	rise time		-	-	60	ns
$t_{on}$	turn-on time		-	-	110	ns
$t_s$	storage time		-	-	1000	ns
$t_f$	fall time		-	-	200	ns
$t_{off}$	turn-off time		-	-	1200	ns



$V_{CE} = 5\text{ V}$

Fig. 1. DC current gain; typical values

## 11. Test information

### 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

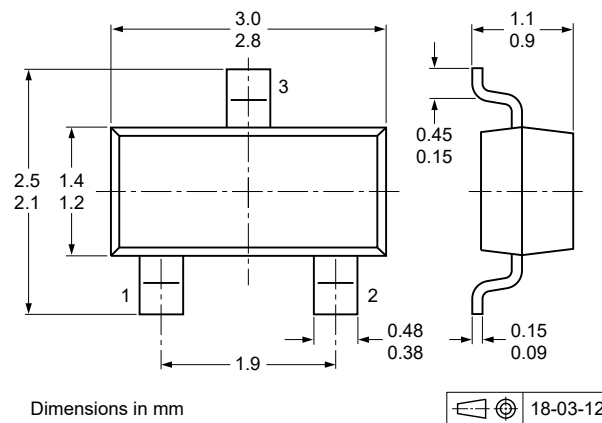


Fig. 2. Package outline SOT23

### 13. Soldering

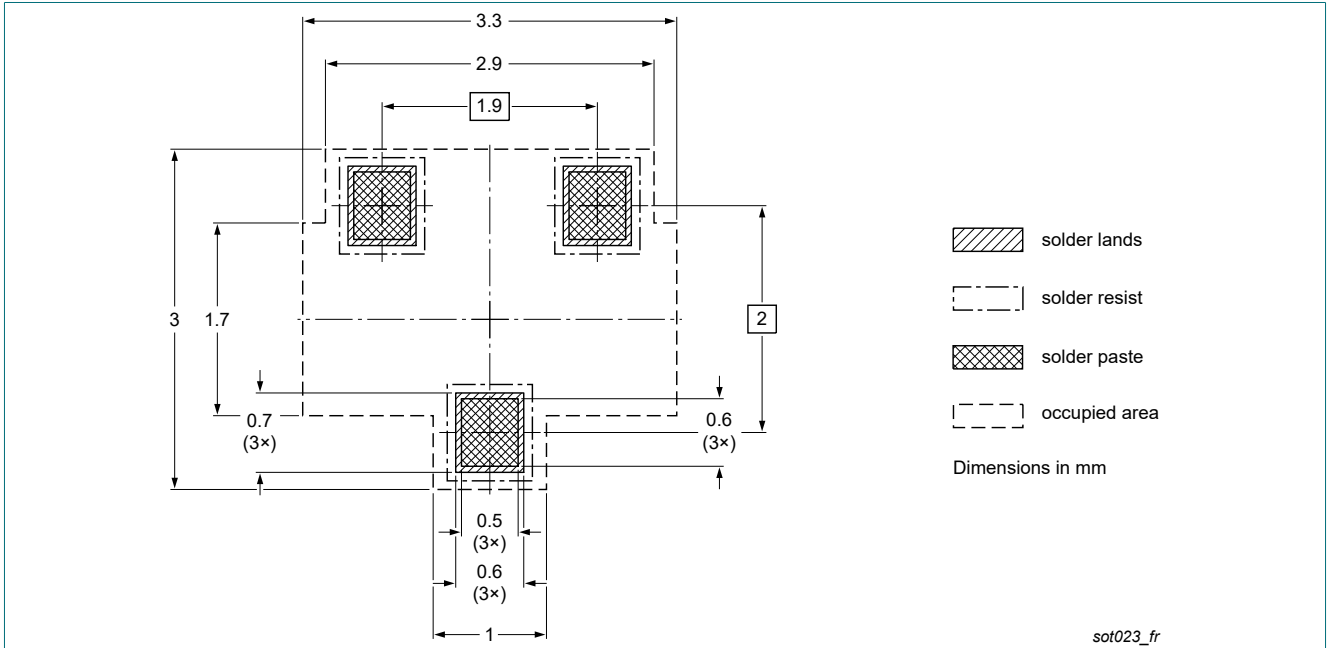


Fig. 3. Reflow soldering footprint for SOT23

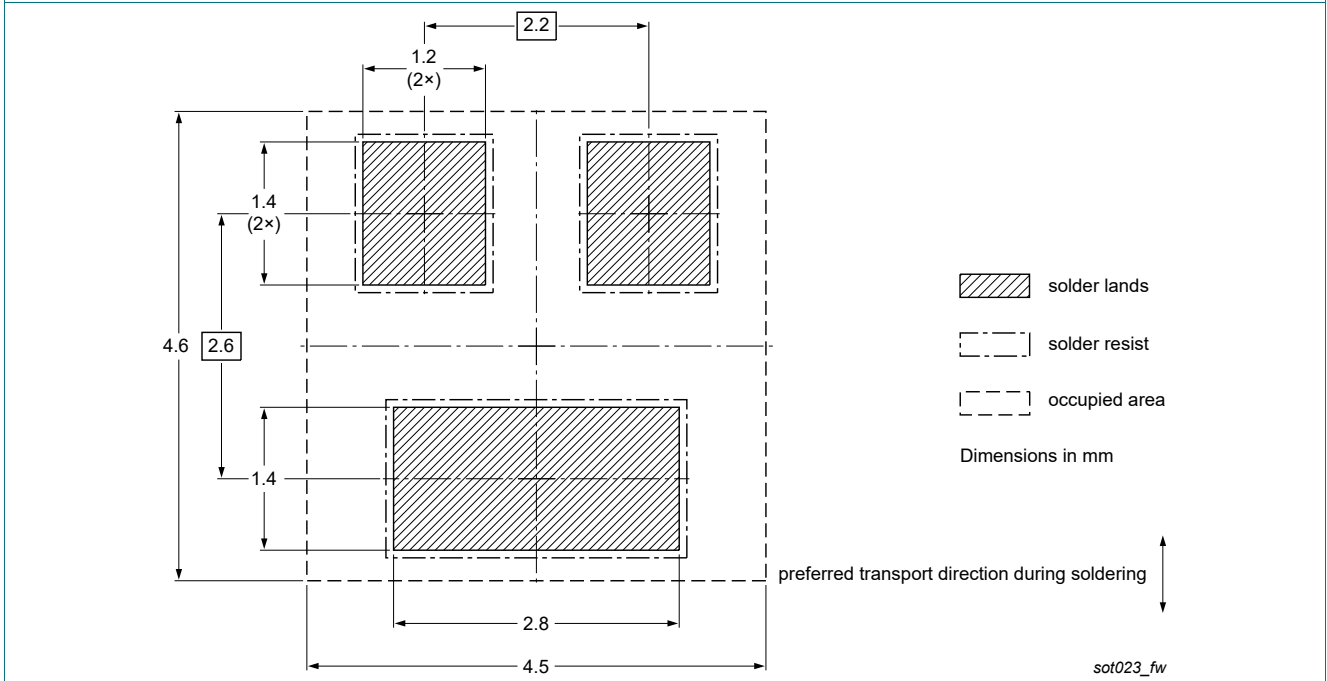


Fig. 4. Wave soldering footprint for SOT23

## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMBS3904-Q v.1	20221007	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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