



# MMBT3904

40 V, 200 mA NPN switching transistor

30 September 2025

Product data sheet

## 1. General description

NPN switching transistor in a small SOT23 Surface-Mounted Device (SMD) plastic package.

PNP complement: MMBT3906

## 2. Features and benefits

- Collector current capability  $I_C = 200$  mA
- Collector-emitter voltage  $V_{CE0} = 40$  V

## 3. Applications

- General switching and amplification

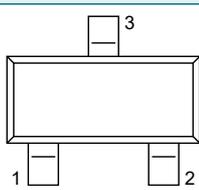
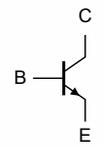
## 4. Quick reference data

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		-	-	200	mA
$h_{FE}$	DC current gain	$V_{CE} = 1$ V; $I_C = 10$ mA; $t_p \leq 300$ $\mu$ s; $\delta \leq 0.02$ ; $T_{amb} = 25$ °C	100	-	300	

## 5. Pinning information

Table 2. Pinning information

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

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
<a href="#">MMBT3904</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]
MMBT3904	7A%

[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	$T_{amb} \leq 25\text{ °C}$	[1]	-	250	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

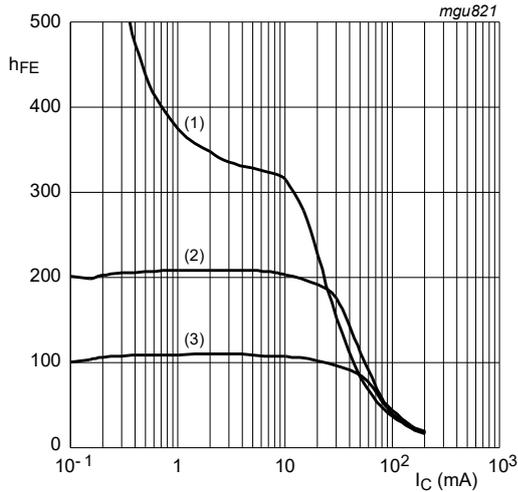
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient		[1]	-	-	500	K/W

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

## 10. Characteristics

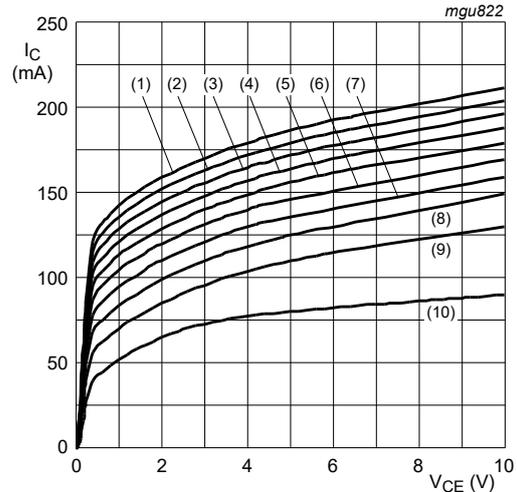
Table 7. Characteristics

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	$V_{EB} = 6 \text{ V}; I_C = 0 \text{ A}; T_{amb} = 25 \text{ }^\circ\text{C}$	-	-	50	nA
$h_{FE}$	DC current gain	$V_{CE} = 1 \text{ V}; I_C = 0.1 \text{ mA}; t_p \leq 300 \text{ } \mu\text{s}; \delta \leq 0.02; T_{amb} = 25 \text{ }^\circ\text{C}$	60	-	-	
		$V_{CE} = 1 \text{ V}; I_C = 1 \text{ mA}; t_p \leq 300 \text{ } \mu\text{s}; \delta \leq 0.02; T_{amb} = 25 \text{ }^\circ\text{C}$	80	-	-	
		$V_{CE} = 1 \text{ V}; I_C = 10 \text{ mA}; t_p \leq 300 \text{ } \mu\text{s}; \delta \leq 0.02; T_{amb} = 25 \text{ }^\circ\text{C}$	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	$V_{EB} = 500 \text{ mV}; I_C = 0 \text{ A}; i_c = 0 \text{ A}; f = 1 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}$	-	-	8	pF
$f_T$	transition frequency	$V_{CE} = 20 \text{ V}; I_C = 10 \text{ mA}; f = 100 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}$	300	-	-	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	$I_C = 10 \text{ mA}; I_{Bon} = 1 \text{ mA}; I_{Boff} = -1 \text{ mA}; T_{amb} = 25 \text{ }^\circ\text{C}$	-	-	35	ns
$t_r$	rise time		-	-	35	ns
$t_s$	storage time		-	-	200	ns
$t_f$	fall time		-	-	50	ns



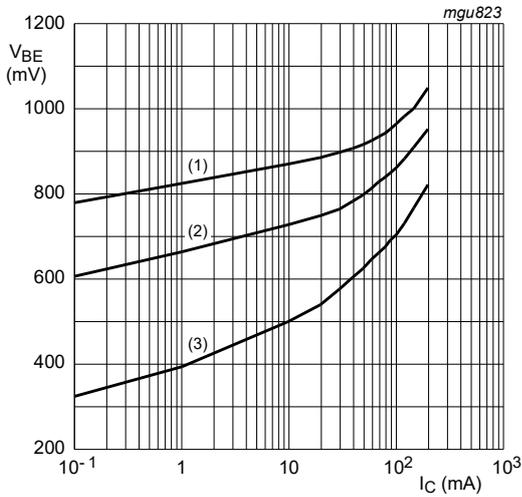
$V_{CE} = 1\text{ V}$   
 (1)  $T_{amb} = 150\text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25\text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -55\text{ }^\circ\text{C}$

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



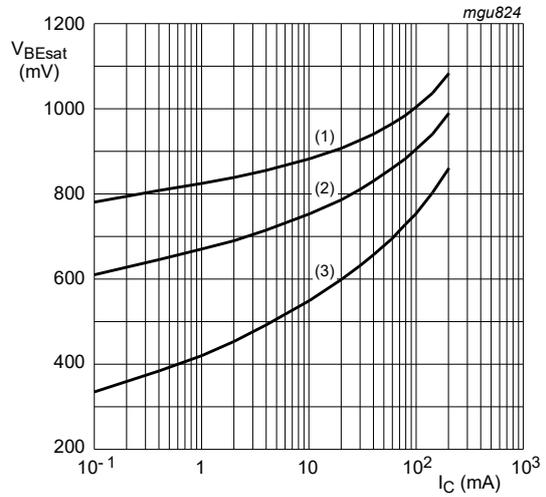
$T_{amb} = 25\text{ }^\circ\text{C}$   
 (1)  $I_B = 5.0\text{ mA}$   
 (2)  $I_B = 4.5\text{ mA}$   
 (3)  $I_B = 4.0\text{ mA}$   
 (4)  $I_B = 3.5\text{ mA}$   
 (5)  $I_B = 3.0\text{ mA}$   
 (6)  $I_B = 2.5\text{ mA}$   
 (7)  $I_B = 2.0\text{ mA}$   
 (8)  $I_B = 1.5\text{ mA}$   
 (9)  $I_B = 1.0\text{ mA}$   
 (10)  $I_B = 0.5\text{ mA}$

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



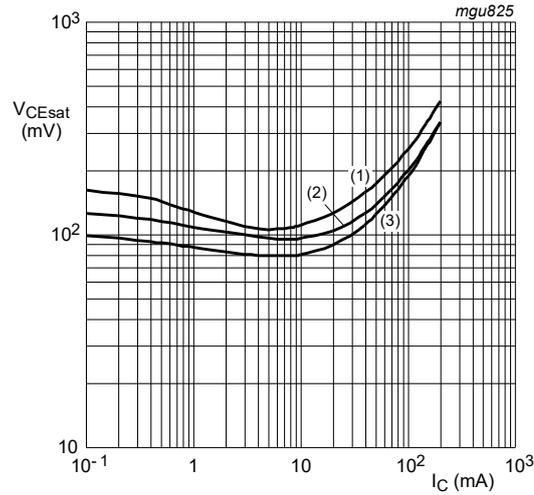
$V_{CE} = 1\text{ V}$   
 (1)  $T_{amb} = -55\text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25\text{ }^\circ\text{C}$   
 (3)  $T_{amb} = 150\text{ }^\circ\text{C}$

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



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

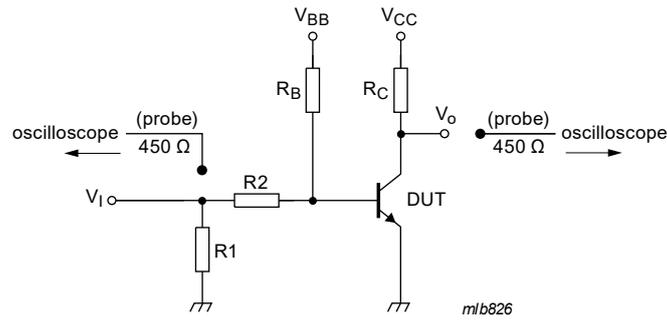
**Fig. 4. Base-emitter saturation voltage as a function of collector current; typical values**



$I_C/I_B = 10$   
 (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



$V_I = 5\text{ V}$ ;  $T = 500\text{ }\mu\text{s}$ ;  $t_p = 10\text{ }\mu\text{s}$ ;  $t_r = t_f \leq 3\text{ ns}$ .  
 $R_1 = 56\text{ }\Omega$ ;  $R_2 = 2.5\text{ k}\Omega$ ;  $R_B = 3.9\text{ k}\Omega$ ;  $R_C = 270\text{ }\Omega$ .  
 $V_{BB} = -1.9\text{ V}$ ;  $V_{CC} = 3\text{ V}$ .  
 Oscilloscope: input impedance  $Z_i = 50\text{ }\Omega$ .

Fig. 6. Test circuit for switching times

## 12. Package outline

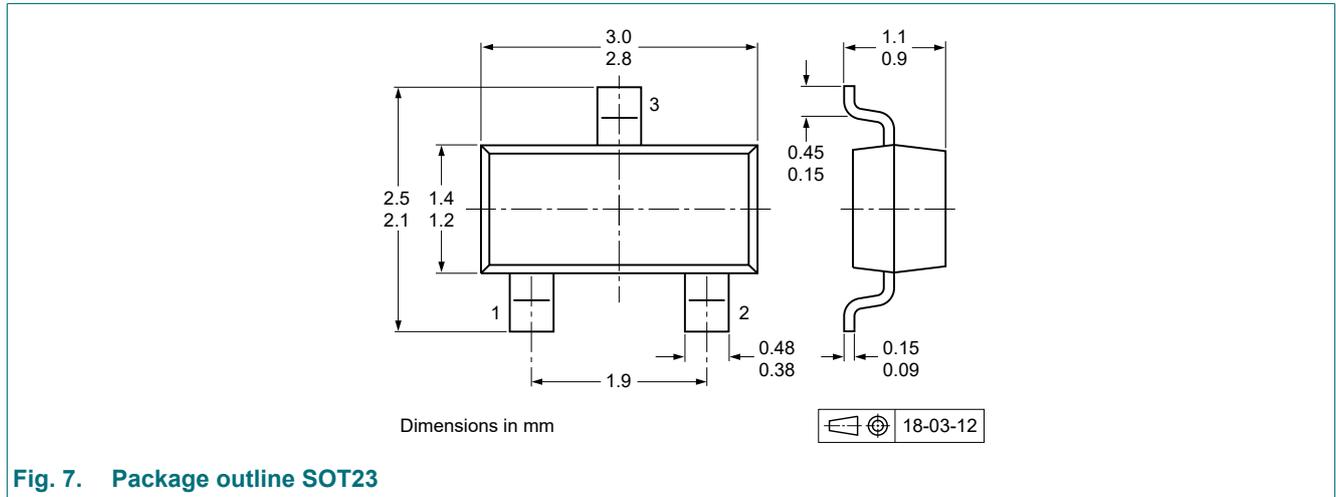


Fig. 7. Package outline SOT23

## 13. Soldering

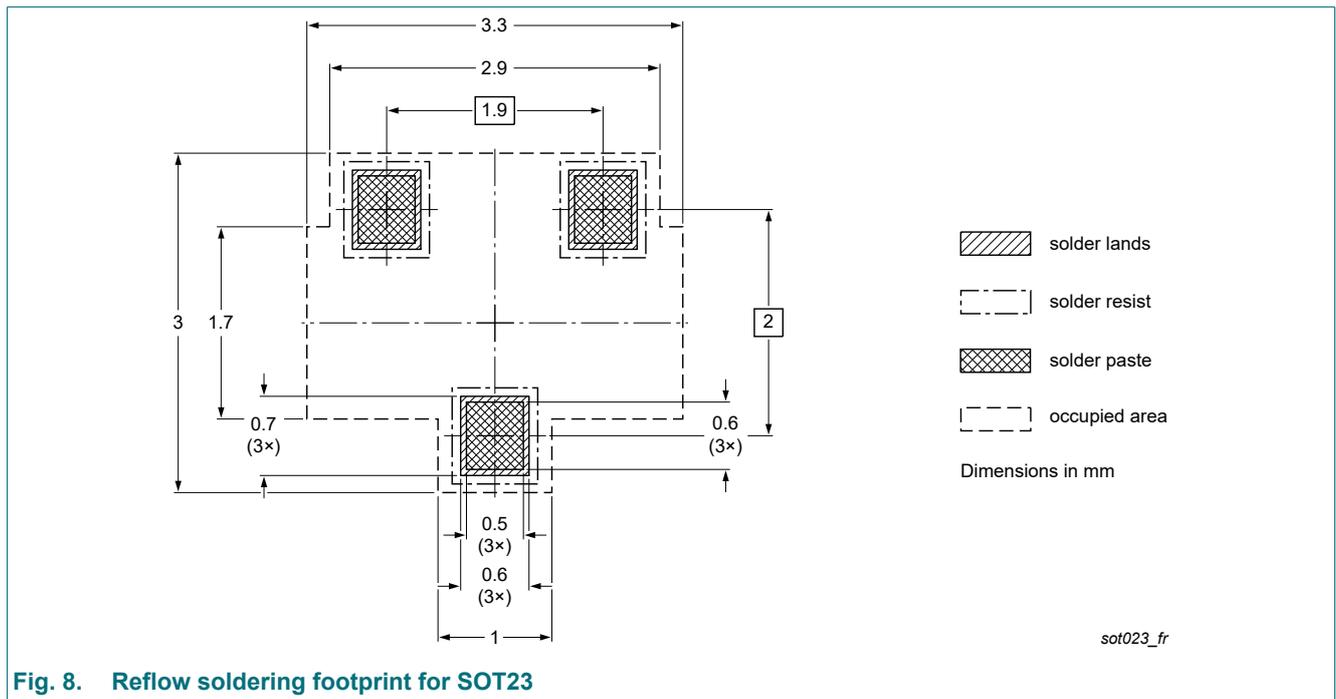


Fig. 8. Reflow soldering footprint for SOT23

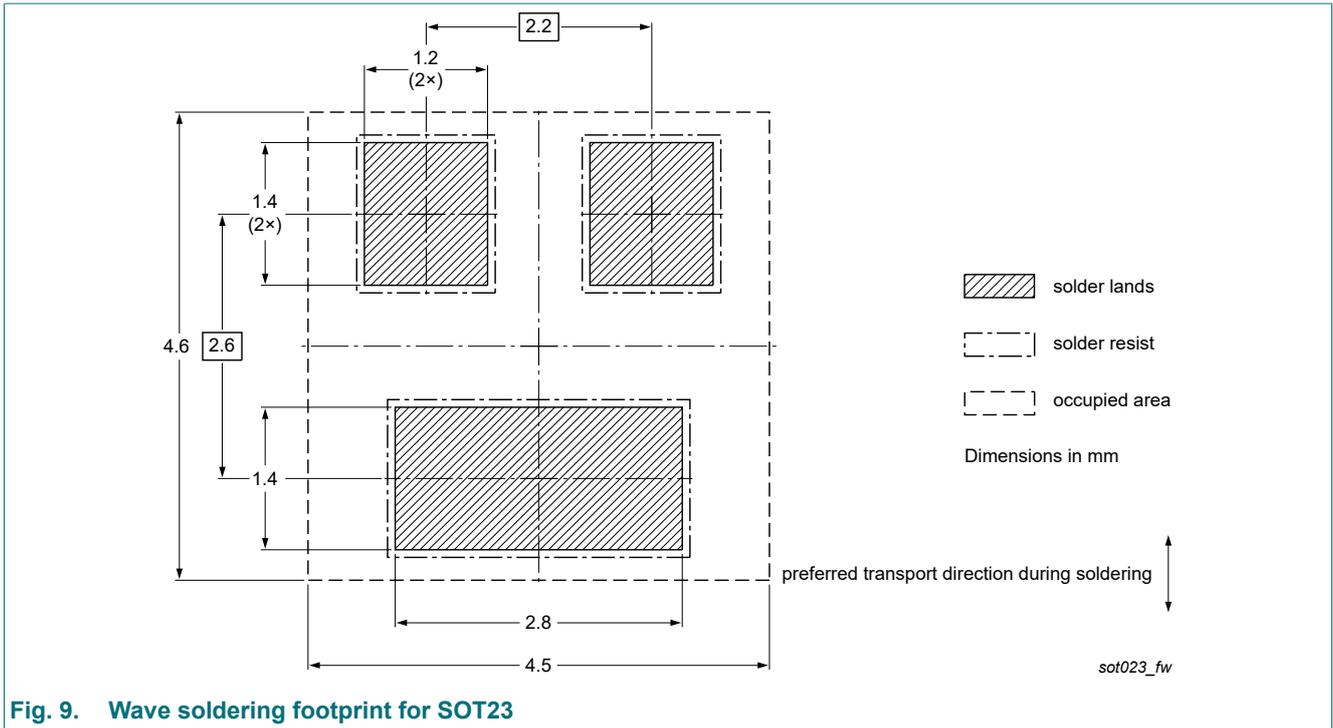


Fig. 9. Wave soldering footprint for SOT23

## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
MMBT3904 v.4	20250930	Product data sheet	-	MMBT3904 v.2
Modifications:	<ul style="list-style-type: none"><li>Product(s) changed to non-automotive qualification. Please refer to nexperia.com for automotive (-Q) product alternative(s).</li></ul>			
MMBT3904 v.3	20240411	Product data sheet	-	MMBT3904 v.2
MMBT3904 v.2	20040203	Product data sheet	-	MMBT3904 v.1
MMBT3904 v.1	20021004	Product specification	-	-

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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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