

## NPN SWITCHING TRANSISTOR

## MMBT3904

### FEATURES

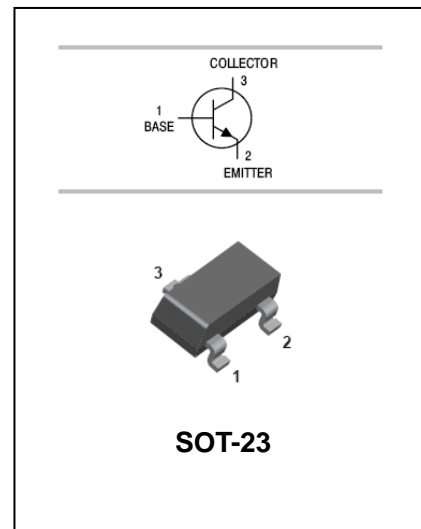
- Epitaxial planar die construction.
- Complementary PNP type available (MMBT3906).
- Collector Current Capability  $I_c=200\text{mA}$ .
- Collector-emitter Voltage  $V_{CE0}=40\text{V}$ .



Lead-free

### APPLICATIONS

- General switching and amplification



### ORDERING INFORMATION

Type No.	Marking	Package Code
MMBT3904	1AM	SOT-23

### MAXIMUM RATING @ $T_a=25^\circ\text{C}$ unless otherwise specified

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

**Note** Transistor mounted on an FR4 printed-circuit board.

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### ELECTRICAL CHARACTERISTICS @ Ta=25°C unless otherwise specified

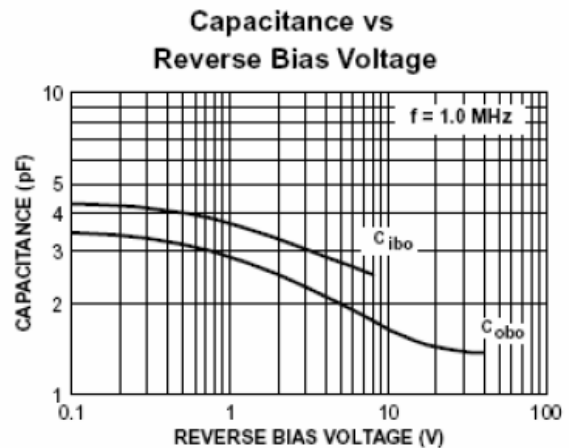
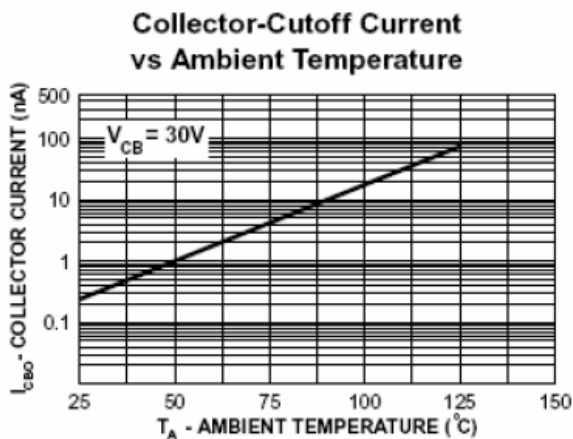
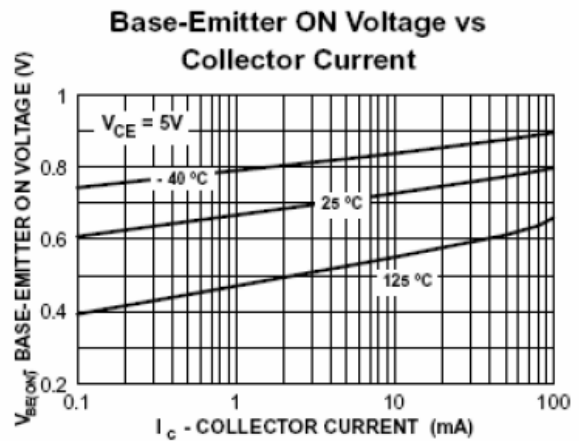
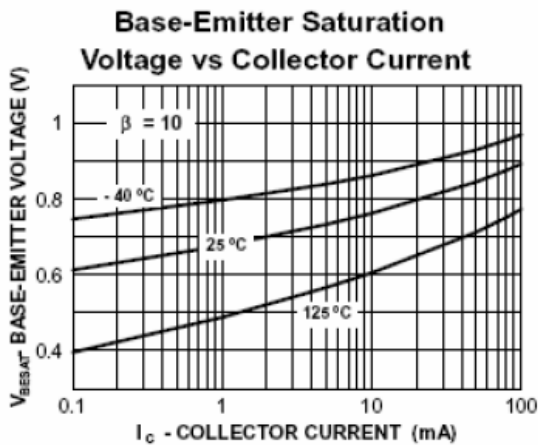
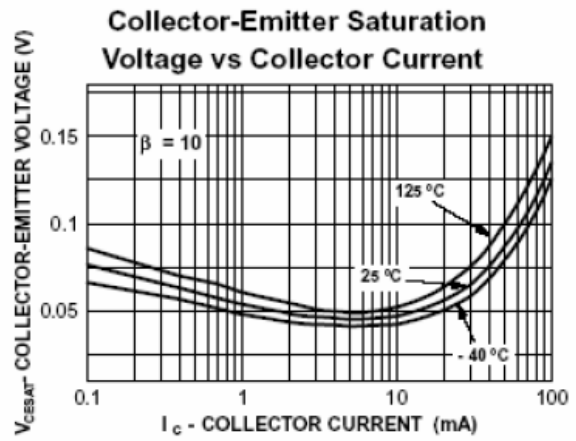
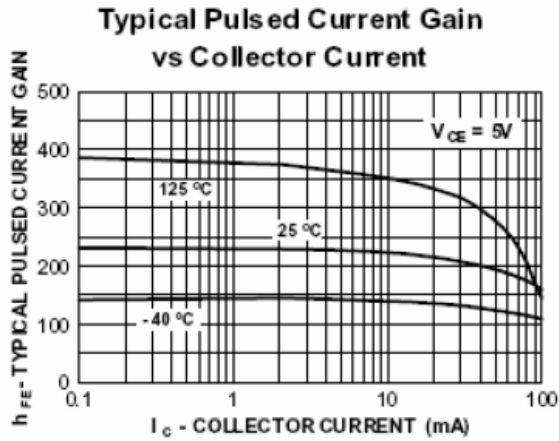
SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$I_{CBO}$	collector cut-off current	$I_E = 0; V_{CB} = 30\text{ V}$	-	50	nA
$I_{EBO}$	emitter cut-off current	$I_C = 0; V_{EB} = 6\text{ V}$	-	50	nA
$h_{FE}$	DC current gain	$V_{CE} = 1\text{ V};$ $I_C = 0.1\text{ mA}$	60	-	
		$I_C = 1\text{ mA}$	80	-	
		$I_C = 10\text{ mA}$	100	300	
		$I_C = 50\text{ mA}$	60	-	
		$I_C = 100\text{ mA}$	30	-	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 10\text{ mA}; I_B = 1\text{ mA}$	-	200	mV
		$I_C = 50\text{ mA}; I_B = 5\text{ mA}$	-	300	mV
$V_{BEsat}$	base-emitter saturation voltage	$I_C = 10\text{ mA}; I_B = 1\text{ mA}$	650	850	mV
		$I_C = 50\text{ mA}; I_B = 5\text{ mA}$	-	950	mV
$C_c$	collector capacitance	$I_E = I_e = 0; V_{CB} = 5\text{ V};$ $f = 1\text{ MHz}$	-	4	pF
$C_e$	emitter capacitance	$I_C = I_c = 0; V_{BE} = 500\text{ mV};$ $f = 1\text{ MHz}$	-	8	pF
$f_T$	transition frequency	$I_C = 10\text{ mA}; V_{CE} = 20\text{ V};$ $f = 100\text{ MHz}$	300	-	MHz
F	noise figure	$I_C = 100\text{ mA}; V_{CE} = 5\text{ V};$ $R_S = 1\text{ k}\Omega; f = 10\text{ Hz to } 15.7\text{ kHz}$	-	5	dB
<b>Switching times (between 10% and 90% levels);</b>					
$t_d$	delay time	$I_{Con} = 10\text{ mA}; I_{Bon} = 1\text{ mA};$ $I_{Boff} = -1\text{ mA}$	-	35	ns
$t_r$	rise time		-	35	ns
$t_s$	storage time		-	200	ns
$t_f$	fall time		-	50	ns

**Note** Pulse test:  $t_p \leq 300\text{ ms}; d \leq 0.02$ .

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TYPICAL CHARACTERISTICS @ Ta=25°C unless otherwise specified



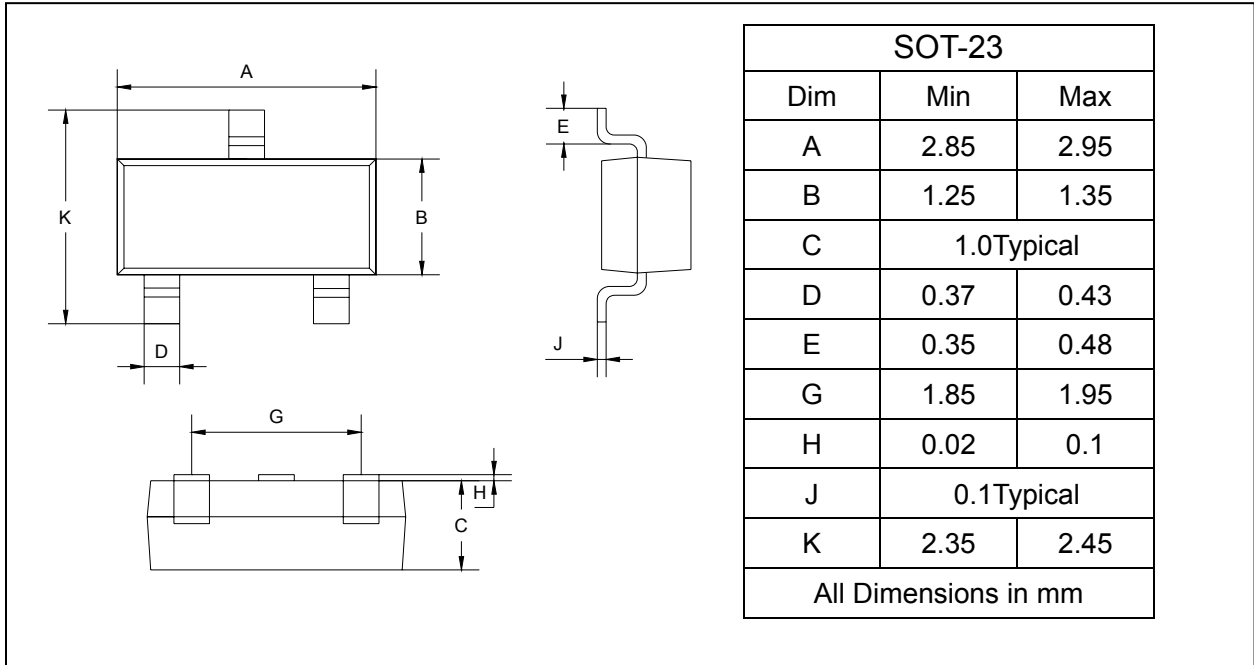
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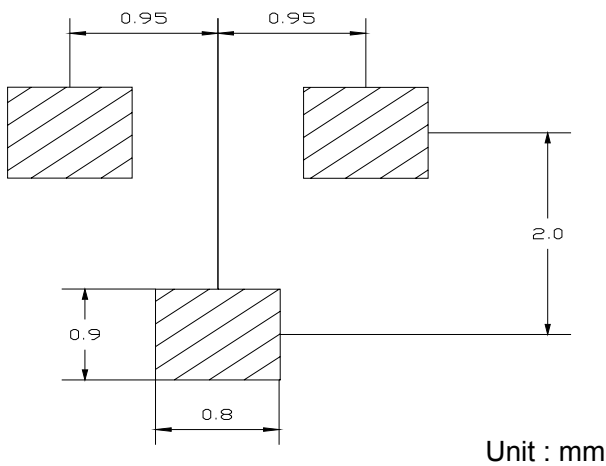
### PACKAGE OUTLINE

Plastic surface mounted package

SOT-23



### SOLDERING FOOTPRINT



### PACKAGE INFORMATION

Device	Package	Shipping
MMBT3904	SOT-23	3000/Tape&Reel