

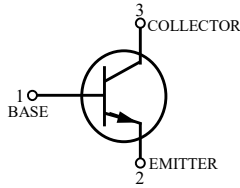
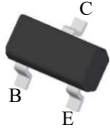


# MMBT3904H

## NPN TRANSISTOR

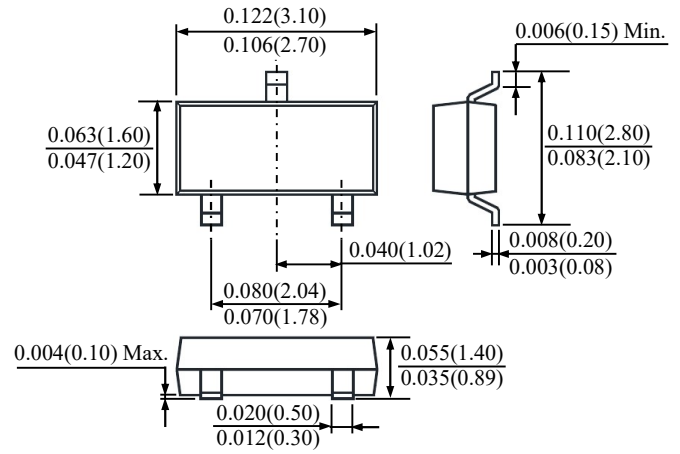
### FEATURES

· Suffix "H" indicates Halogen-free parts, ex. MMBT3904H



B	Base
C	Collector
E	Emitter

### SOT-23



Dimensions in inches and (millimeter)

### Maximum Ratings ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Collector Base Voltage	$V_{CBO}$	60	V
Collector Emitter Voltage	$V_{CEO}$	40	V
Emitter Base Voltage	$V_{EBO}$	6	V
Collector Current	$I_C$	200	mA
Power Dissipation	$P_D$	350	mW
Thermal Resistance from Junction to Ambient (Note 1)	$R_{\theta JA}$	357	$^\circ\text{C}/\text{W}$
Junction Temperature	$T_J$	150	$^\circ\text{C}$
Storage Temperature Range	$T_{STG}$	- 55 to + 150	$^\circ\text{C}$

Note :

1. Device mounted on FR-4 substrate PC board, with minimum recommended pad layout



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### *Electrical Characteristics ( $T_A = 25\text{ }^\circ\text{C}$ unless otherwise specified)*

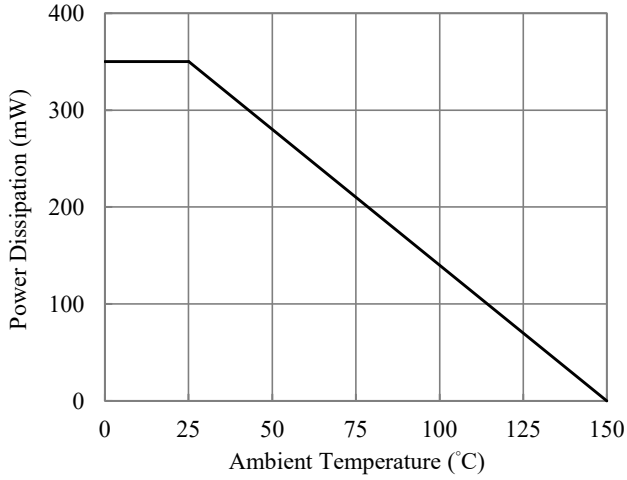
Parameter	Conditions	Symbol	Min.	Max.	Unit
DC Current Gain	$I_C=0.1\text{mA}, V_{CE}=1\text{V}$	$h_{FE}$	40	-	-
	$I_C=1\text{mA}, V_{CE}=1\text{V}$		70	-	
	$I_C=10\text{mA}, V_{CE}=1\text{V}$		100	300	
	$I_C=50\text{mA}, V_{CE}=1\text{V}$		60	-	
	$I_C=100\text{mA}, V_{CE}=1\text{V}$		30	-	
Collector Base Cutoff Current	$V_{CB}=30\text{V}$	$I_{CBO}$	-	50	nA
Emitter Base Cutoff Current	$V_{EB}=6\text{V}$	$I_{EBO}$	-	50	nA
Collector Base Breakdown Voltage	$I_C=10\mu\text{A}$	$V_{(BR)CBO}$	60	-	V
Collector Emitter Breakdown Voltage	$I_C=1\text{mA}$	$V_{(BR)CEO}$	40	-	V
Emitter Base Breakdown Voltage	$I_E=10\mu\text{A}$	$V_{(BR)EBO}$	6	-	V
Collector Emitter Saturation Voltage	$I_C=10\text{mA}, I_B=1\text{mA}$	$V_{CE(sat)}$	-	0.20	V
	$I_C=50\text{mA}, I_B=5\text{mA}$		-	0.30	
Base Emitter Saturation Voltage	$I_C=10\text{mA}, I_B=1\text{mA}$	$V_{BE(sat)}$	0.65	0.85	V
	$I_C=50\text{mA}, I_B=5\text{mA}$		-	0.95	
Transition Frequency	$I_C=10\text{mA}, V_{CE}=20\text{V},$ $f=100\text{MHz}$	$f_T$	300	-	MHz
Output Capacitance	$V_{CB}=5\text{V}, I_E=0\text{A}, f=1\text{MHz}$	$C_{ob}$	-	4	pF
Delay Time	$V_{CC}=3\text{V}, V_{BE}=0.5\text{V},$	$t_d$	-	35	ns
Rise Time	$I_C=10\text{mA}, I_{B1}=1\text{mA}$	$t_r$	-	35	
Storage Time	$V_{CC}=3\text{V}, I_C=10\text{mA},$	$t_s$	-	200	
Fall Time	$I_{B1}=-I_{B2}=1\text{mA}$	$t_f$	-	50	



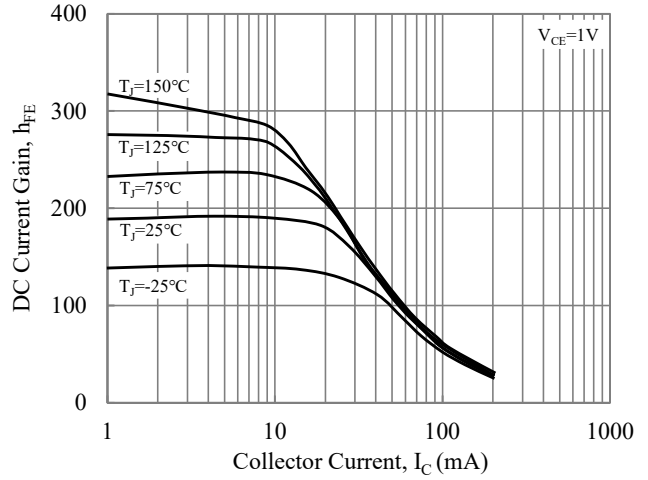
# MMBT3904H

## NPN TRANSISTOR

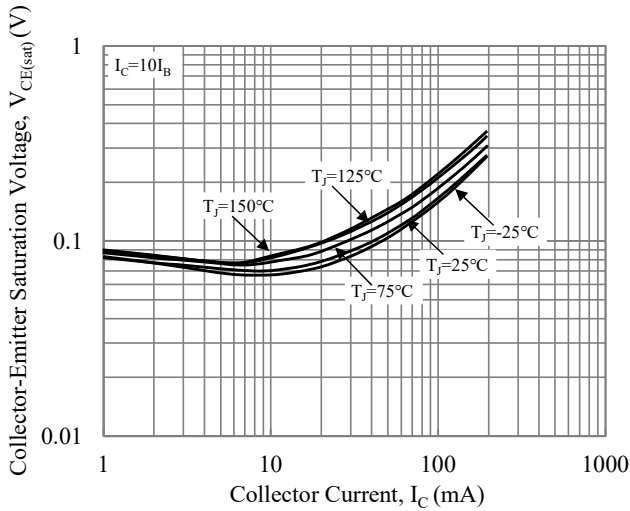
### RATINGS AND CHARACTERISTIC CURVES



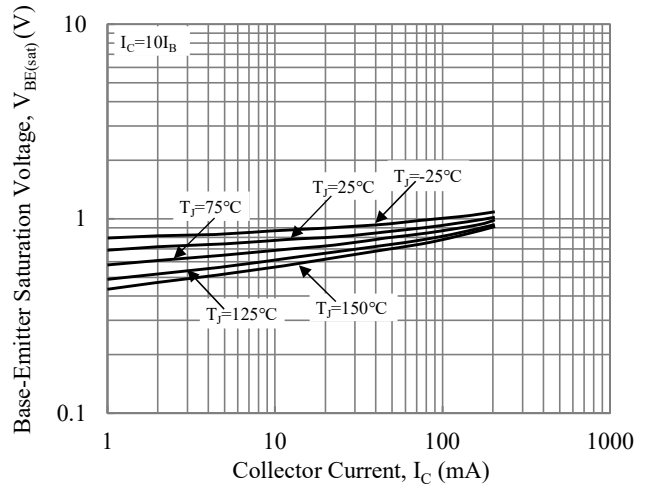
**Fig. 1 Power Derating Curves**



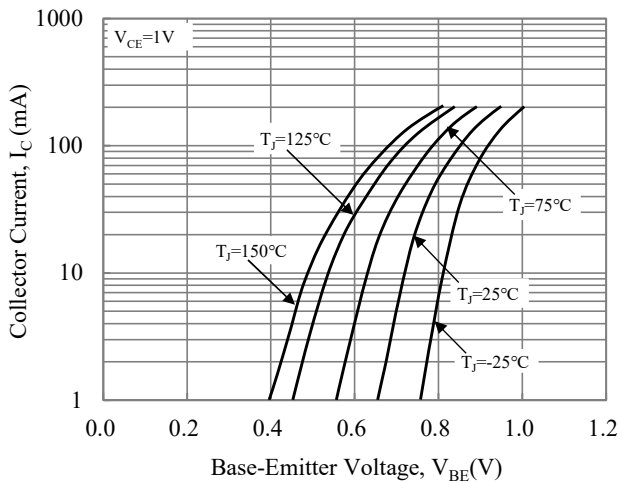
**Fig. 2 Current Gain vs. Collector Current**



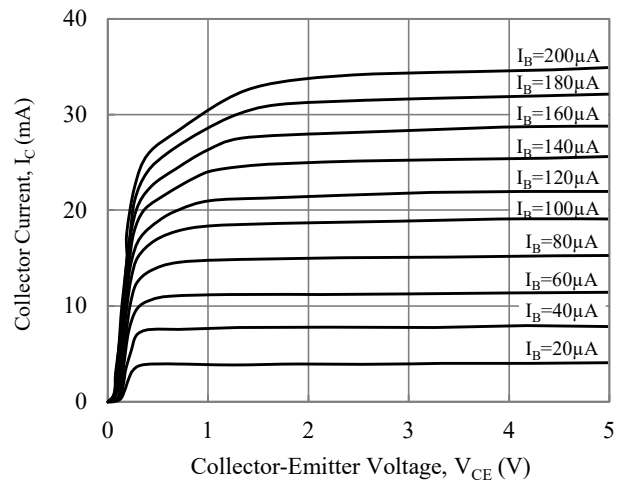
**Fig. 3 Collector-Emitter Saturation Voltage vs. Collector Current**



**Fig. 4 Base-Emitter Saturation Voltage vs. Collector Current**



**Fig. 5 Base-Emitter Voltage vs. Collector Current**

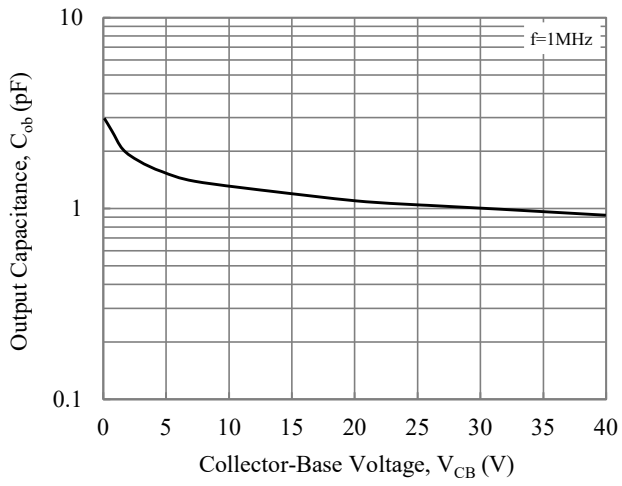


**Fig. 6 Output Characteristics**



# MMBT3904H

## NPN TRANSISTOR



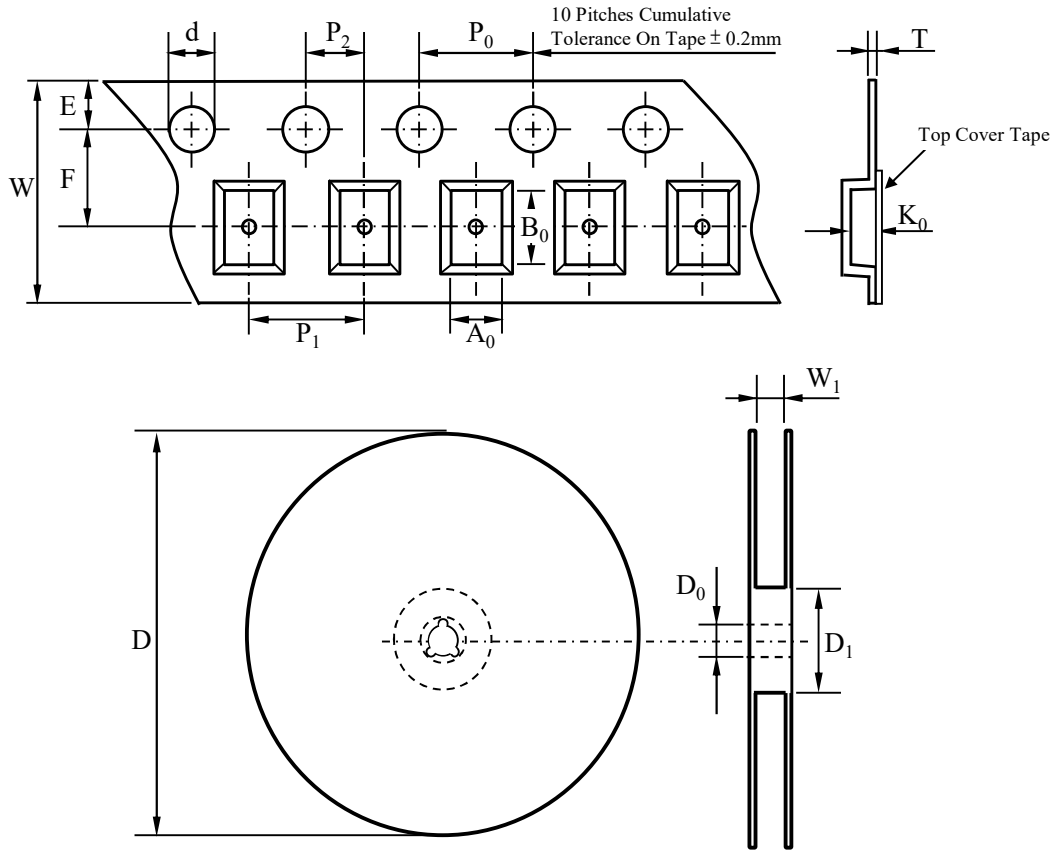
**Fig. 7 Output Capacitance**



# MMBT3904H

## NPN TRANSISTOR

### TAPE & REEL SPECIFICATION



Item	Symbol	SOT-23
Carrier width	A <sub>0</sub>	*
Carrier length	B <sub>0</sub>	
Carrier depth	K <sub>0</sub>	
Sprocket hole	d	1.50 ± 0.10
Reel outside diameter	D	178.00 ± 2.00
Feed hole width	D <sub>0</sub>	13.00 ± 0.50
Reel inner diameter	D <sub>1</sub>	MIN. 50.00
Sprocket hole position	E	1.75 ± 0.10
Punch hole position	F	3.50 ± 0.10
Sprocket hole pitch	P <sub>0</sub>	4.00 ± 0.10
Punch hole pitch	P <sub>1</sub>	4.00 ± 0.10
Embossment center	P <sub>2</sub>	2.00 ± 0.10
Overall tape thickness	T	0.20 ± 0.05
Tape width	W	8.00 ± 0.20
Reel width	W <sub>1</sub>	MAX. 14.50

Note \*: A<sub>0</sub>, B<sub>0</sub>, and K<sub>0</sub> are determined by component size. The clearance between the components and the cavity must be within 0.05 mm min. to 0.5 mm max.

### ORDER INFORMATION

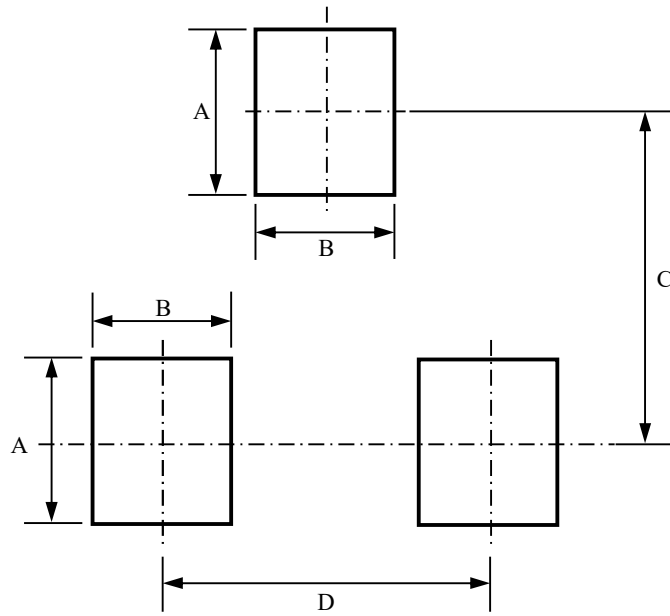
Part Number	Marking Code	Reel Size	Quantity
MMBT3904H	1AM / 1E	7"	3,000



# MMBT3904H

## NPN TRANSISTOR

### SUGGESTED SOLDER PAD LAYOUT



Unit :mm

PACKAGE	A	B	C	D
SOT-23	1.00	0.80	2.00	1.90