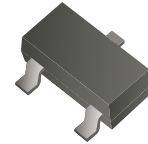


## MMBT3904T-HF (NPN)

RoHS Device

Halogen Free



### Features

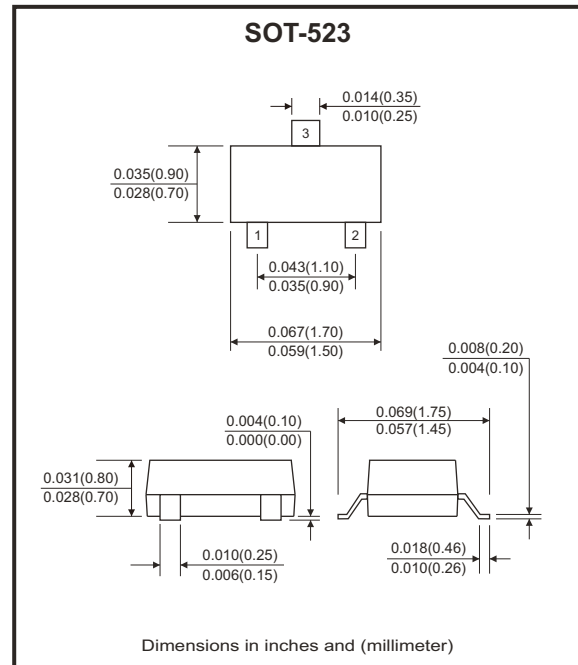
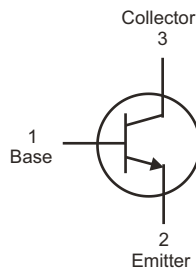
- Small package

### Mechanical data

- Case: SOT-523, molded plastic.
- Terminals: Matte tin plated, solderable per MIL-STD-750, method 2026.
- Weight: 0.002 grams (Approx.)

### Circuit Diagram

- 1.BASE
- 2.EMITTER
- 3.COLLECTOR



### Maximum Ratings (at TA=25°C unless otherwise noted)

Parameter	Conditions	Symbol	Value	Unit
Collector-Base voltage		V <sub>CB0</sub>	60	V
Collector-Emitter voltage		V <sub>CE0</sub>	40	V
Emitter-Base voltage		V <sub>EB0</sub>	6	V
Collector current-continuous		I <sub>c</sub>	200	mA
Power dissipation		P <sub>c</sub>	150	mW
Thermal resistance	Junction to ambient	R <sub>θJA</sub>	833	°C/W
Junction temperature		T <sub>J</sub>	150	°C
Storage temperature range		T <sub>stg</sub>	-55~+150	°C

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

Parameter	Symbol	Conditions	Min	Max	Unit
Collector-Base breakdown voltage	$V_{(BR)CBO}$	$I_C = 10\mu\text{A}, I_E = 0$	60		V
Collector-Emitter breakdown voltage	$V_{(BR)CEO}$	$I_C = 1\text{mA}, I_B = 0$	40		V
Emitter-Base breakdown voltage	$V_{(BR)EBO}$	$I_E = 10\mu\text{A}, I_C = 0$	6		V
Collector cut-off current	$I_{CEX}$	$V_{CE} = 30\text{V}, V_{EB(off)} = 3\text{V}$		50	nA
Emitter cut-off current	$I_{EBO}$	$V_{EB} = 5\text{V}, I_C = 0$		100	nA
DC current gain	$h_{FE(1)}$	$V_{CE} = 1\text{V}, I_C = 0.1\text{mA}$	40		
	$h_{FE(2)}$	$V_{CE} = 1\text{V}, I_C = 1\text{mA}$	70		
	$h_{FE(3)}$	$V_{CE} = 1\text{V}, I_C = 10\text{mA}$	100	300	
	$h_{FE(4)}$	$V_{CE} = 1\text{V}, I_C = 50\text{mA}$	60		
Collector-Emitter saturation voltage	$V_{CE(sat)1}$	$I_C = 10\text{mA}, I_B = 1\text{mA}$		0.2	V
	$V_{CE(sat)2}$	$I_C = 50\text{mA}, I_B = 5\text{mA}$		0.3	V
Base-Emitter saturation voltage	$V_{BE(sat)1}$	$I_C = 10\text{mA}, I_B = 1\text{mA}$	0.65	0.85	V
	$V_{BE(sat)2}$	$I_C = 50\text{mA}, I_B = 5\text{mA}$		0.95	V
Transition frequency	$f_T$	$V_{CE} = 20\text{V}, I_C = 10\text{mA}, f = 100\text{MHz}$	300		MHz
Output capacitance	$C_{ob}$	$V_{CB} = 5\text{V}, I_E = 0, f = 1\text{MHz}$		4	pF
Input capacitance	$C_{ib}$	$V_{EB} = 0.5\text{V}, I_C = 0, f = 1\text{MHz}$		8	pF
Delay time	$t_d$	$V_{CC} = 3\text{V}, V_{BE(off)} = -0.5\text{V}$		35	nS
Rise time	$t_r$	$I_C = 10\text{mA}, I_{B1} = 1\text{mA}$		35	nS
Storage time	$t_s$	$V_{CC} = 3\text{V}, I_C = 10\text{mA}$		200	nS
Fall time	$t_f$	$I_{B1} = I_{B2} = 1\text{mA}$		50	nS

## Rating and Characteristic Curves (MMBT3904T-HF)

Fig.1 - Static Characteristic

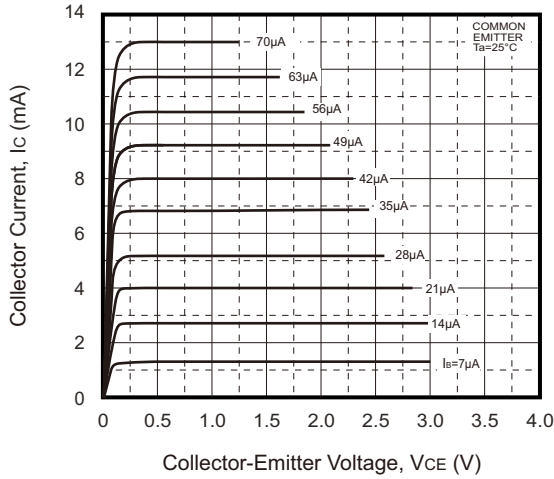


Fig.2 - h<sub>FE</sub> — I<sub>c</sub>

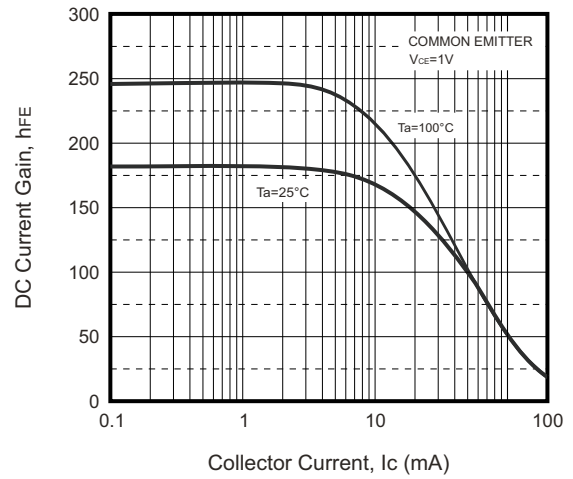


Fig.3 - V<sub>BEsat</sub> — I<sub>c</sub>

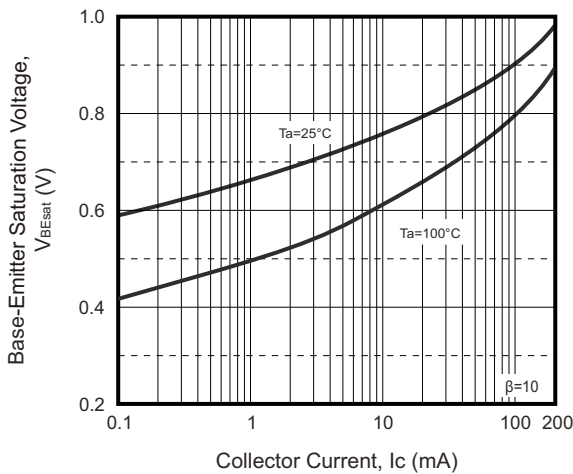


Fig.4 - V<sub>CEsat</sub> — I<sub>c</sub>

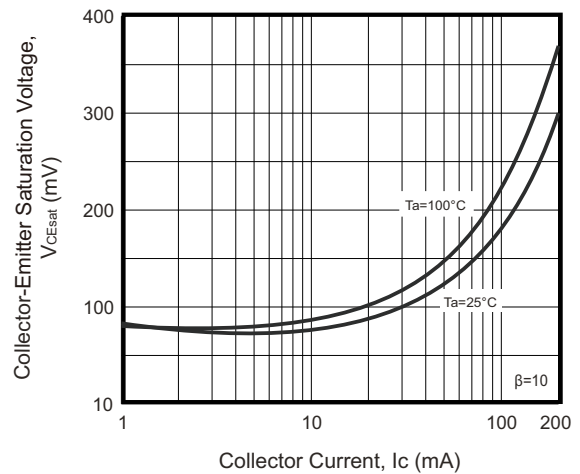


Fig.5 - I<sub>c</sub> — V<sub>BE</sub>

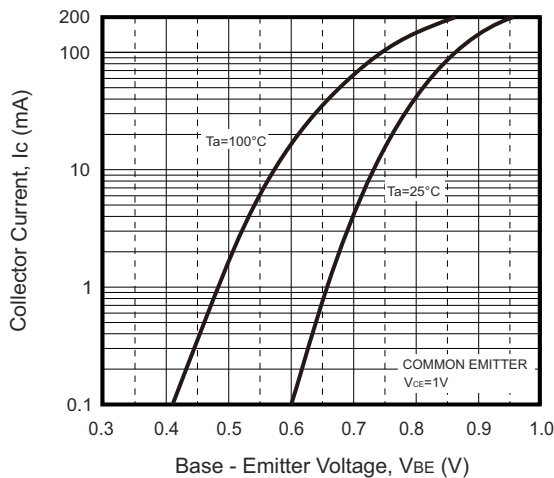
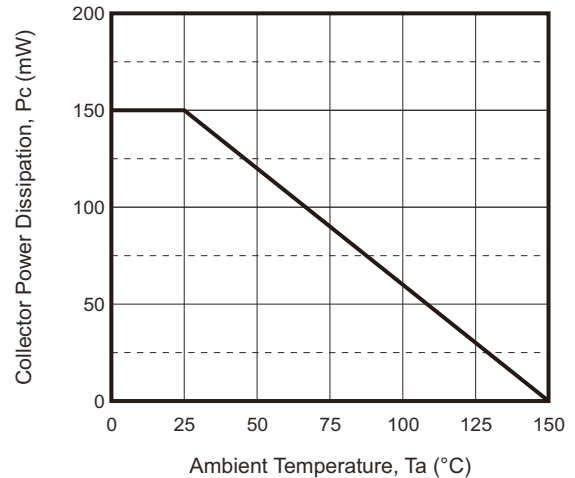


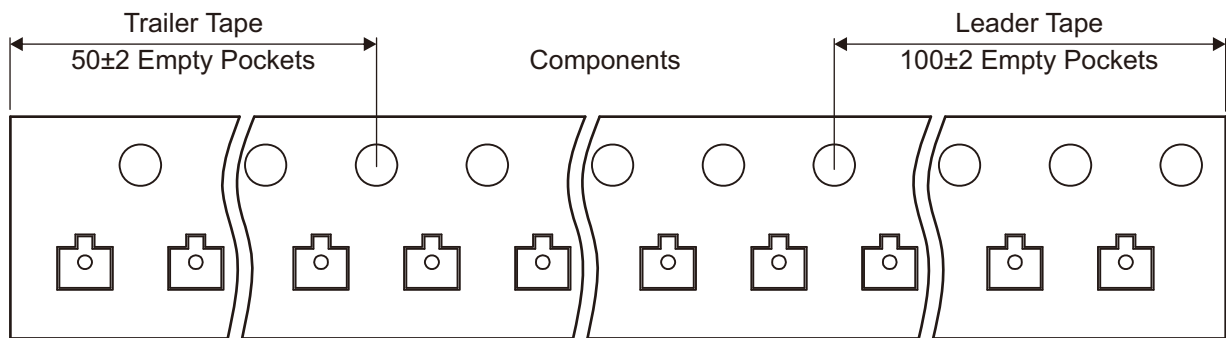
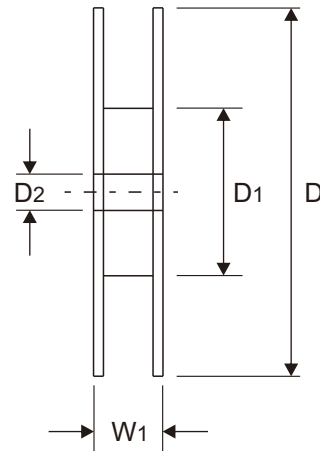
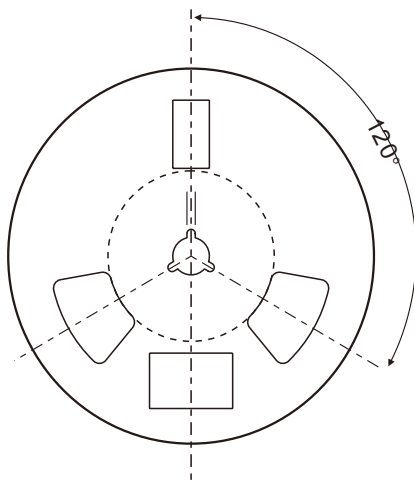
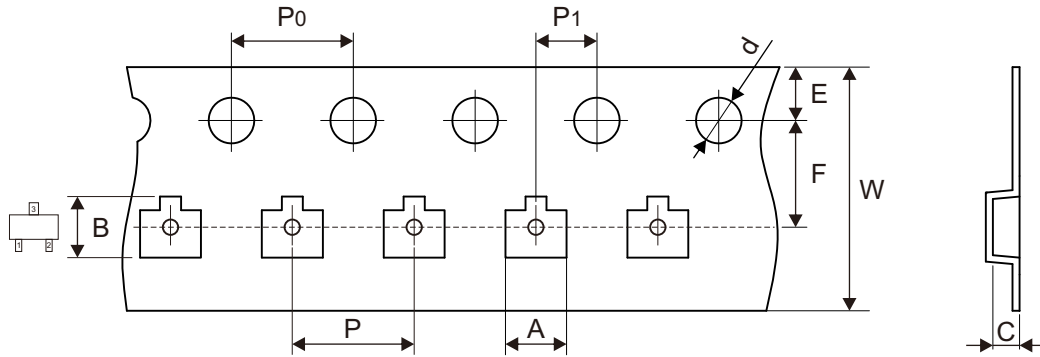
Fig.6 - P<sub>c</sub> — T<sub>a</sub>



Company reserves the right to improve product design, functions and reliability without notice.

REV:C

## Reel Taping Specification



SOT-523	SYMBOL	A	B	C	d	D	D1	D2
	(mm)	1.85 ± 0.05	1.85 ± 0.05	0.875 ± 0.05	1.50 ± 0.10	178.00 ± 2.00	54.40 ± 1.00	13.00 ± 1.00
	(inch)	0.073 ± 0.002	0.073 ± 0.002	0.034 ± 0.002	0.059 ± 0.004	7.008 ± 0.079	2.142 ± 0.039	0.512 ± 0.039

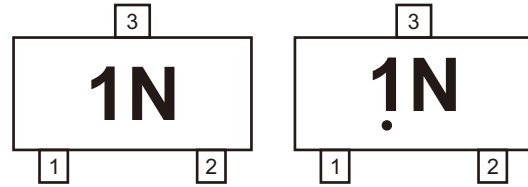
SOT-523	SYMBOL	E	F	P	P0	P1	W	W1
	(mm)	1.75 ± 0.10	3.50 ± 0.10	4.00 ± 0.10	4.00 ± 0.10	2.00 ± 0.10	8.00 + 0.30 - 0.10	12.30 ± 1.00
	(inch)	0.069 ± 0.004	0.138 ± 0.004	0.157 ± 0.004	0.157 ± 0.004	0.079 ± 0.004	0.315 + 0.012 - 0.004	0.484 ± 0.039

Company reserves the right to improve product design, functions and reliability without notice.

REV:C

## Marking Code

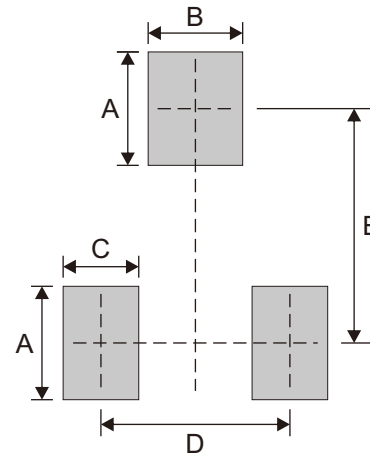
Part Number	Marking Code
MMBT3904T-HF	1N



Solid dot = Control code

## Suggested P.C.B. PAD Layout

SIZE	SOT-523	
	(mm)	(inch)
A	0.60	0.024
B	0.50	0.020
C	0.40	0.016
D	1.00	0.039
E	1.24	0.049



Note: 1. The pad layout is for reference purposes only.

## Standard Packaging

Case Type	REEL PACK	
	REEL ( pcs )	Reel Size (inch)
SOT-523	3,000	7