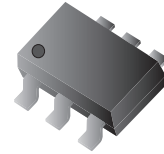


## MMBT3904D-HF (NPN+NPN)

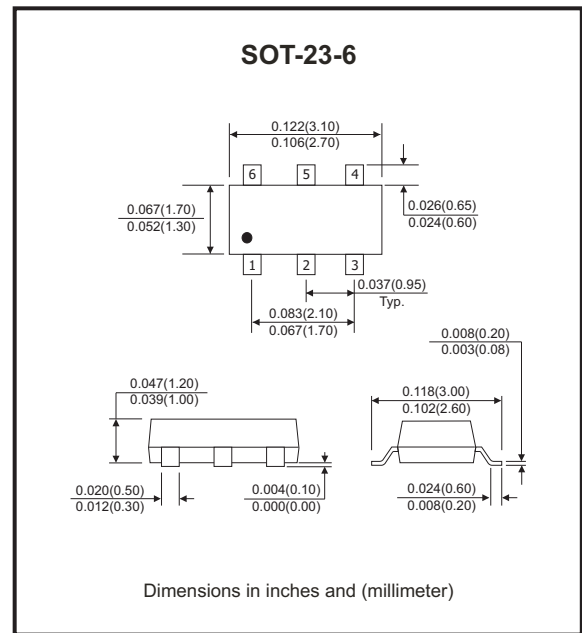
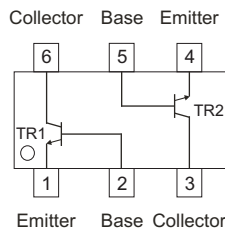
RoHS Device  
Halogen Free



### Features

- For switching and amplifier applications.
- Case: Molded plastic, SOT-23-6
- Marking: .1E

### Circuit diagram



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

Parameter	Symbol	Value	Unit
Collector-Base Voltage	$V_{CBO}$	60	V
Collector-Emitter Voltage	$V_{CEO}$	40	V
Emitter-Base Voltage	$V_{EBO}$	6.0	V
Collector Current	$I_C$	200	mA
Power Dissipation	$P_D$	350	mW
Junction Temperature	$T_J$	150	$^\circ\text{C}$
Storage Temperature Range	$T_{STG}$	-55 to +150	$^\circ\text{C}$

## Electrical Characteristics (at TA=25°C unless otherwise noted)

Parameter	Conditions	Symbol	Min.	Max.	Unit
Collector-Emitter Breakdown Voltage	I <sub>c</sub> = 1mA	V <sub>(BR)CEO</sub>	40	-	V
Collector-Base Breakdown Voltage	I <sub>c</sub> = 10μA	V <sub>(BR)CBO</sub>	60	-	V
Emitter-Base Breakdown Voltage	I <sub>E</sub> = 10μA	V <sub>(BR)EBO</sub>	6	-	V
Collector-Base Cut-off Current	V <sub>CB</sub> =30V	I <sub>CBO</sub>	-	50	nA
Emitter-Base Cut-off Current	V <sub>EB</sub> =6V	I <sub>EBO</sub>	-	50	nA
DC Current Gain	V <sub>CE</sub> =1V , I <sub>c</sub> =0.1mA	h <sub>FE</sub>	40	-	
	V <sub>CE</sub> =1V , I <sub>c</sub> =1.0mA		70	-	
	V <sub>CE</sub> =1V , I <sub>c</sub> =10mA		100	300	
	V <sub>CE</sub> =1V , I <sub>c</sub> =50mA		60	-	
	V <sub>CE</sub> =1V , I <sub>c</sub> =100mA		30	-	
Collector-Emitter Saturation Voltage	I <sub>c</sub> =10mA , I <sub>B</sub> =1.0mA	V <sub>CE(sat)</sub>	-	0.2	V
	I <sub>c</sub> =50mA , I <sub>B</sub> =5.0mA		-	0.3	
Base-Emitter Saturation Voltage	I <sub>c</sub> =10mA , I <sub>B</sub> =1.0mA	V <sub>BE(sat)</sub>	0.65	0.85	V
	I <sub>c</sub> =50mA , I <sub>B</sub> =5mA		-	0.95	
Current Gain Bandwidth Product	V <sub>CE</sub> =20V , I <sub>c</sub> =10mA , f=100MHz	f <sub>r</sub>	300	-	MHZ
Collector Output Capacitance	V <sub>CB</sub> =5.0V , I <sub>E</sub> =0 , f=1.0MHz	C <sub>ob</sub>	-	4	pF
Delay Time	V <sub>CC</sub> =3.0V , V <sub>BE</sub> =0.5V	t <sub>d</sub>	-	35	nS
Rise Time	I <sub>c</sub> =10mA , I <sub>B1</sub> =1.0mA	t <sub>r</sub>	-	35	nS
Storage Time	V <sub>CC</sub> =3.0V ,	t <sub>s</sub>	-	200	nS
Fall Time	I <sub>c</sub> =10mA , I <sub>B1</sub> =-I <sub>B2</sub> =1.0mA	t <sub>f</sub>	-	50	nS

## Rating and Characteristics Curves (MMBT3904D-HF)

Fig.1 - Typical Pulsed Current Gain vs. Collector Current

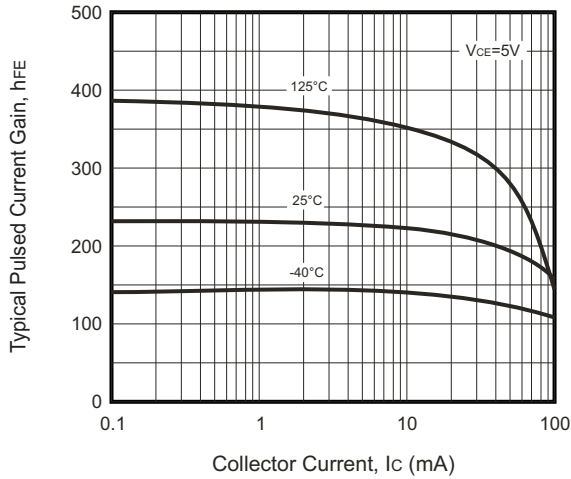


Fig.2 - Collector-Emitter Saturation Voltage vs. Collector Current

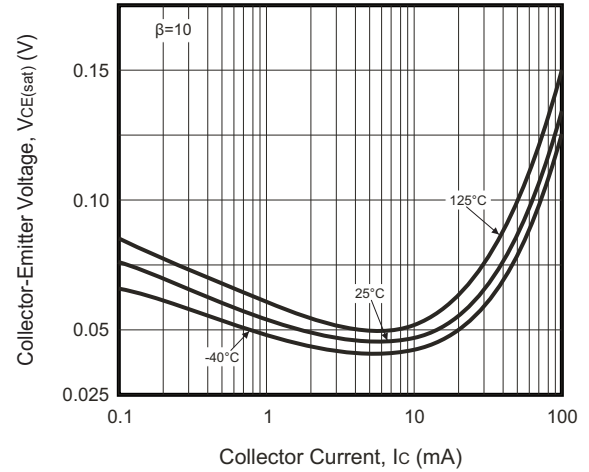


Fig.3 - Base-Emitter Saturation Voltage vs. Collector Current

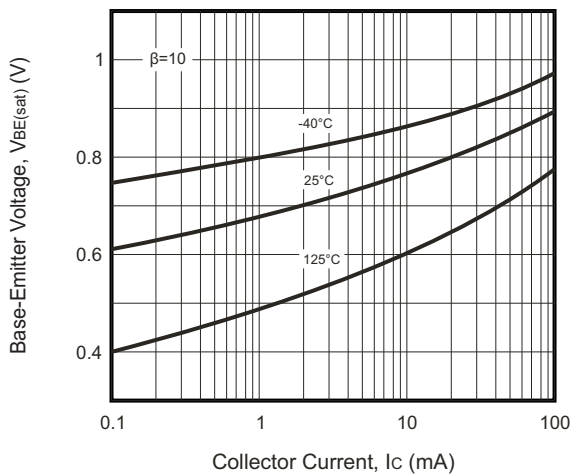


Fig.4 - Base-Emitter ON Voltage vs. Collector Current

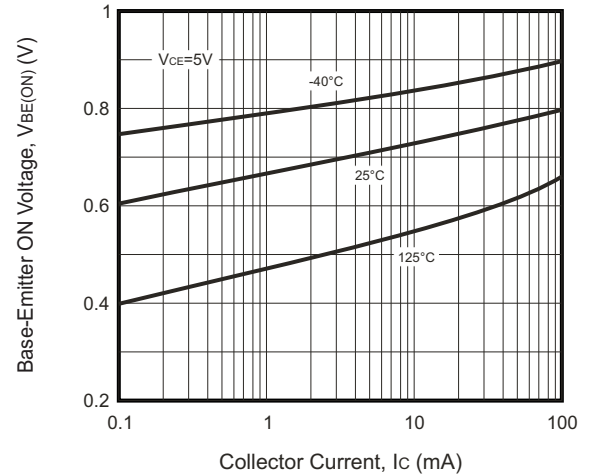


Fig.5 - Capacitance vs. Reverse Bias Voltage

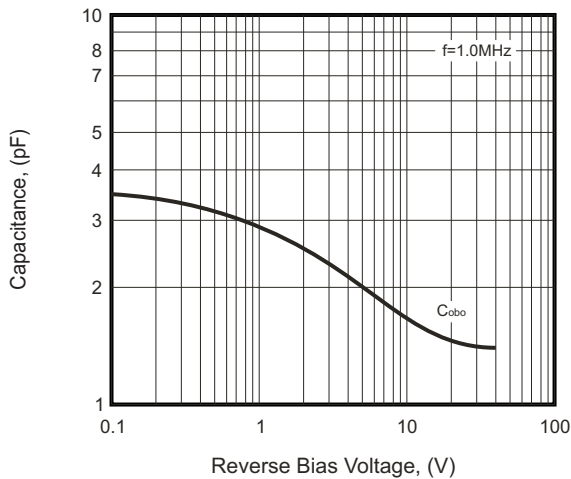
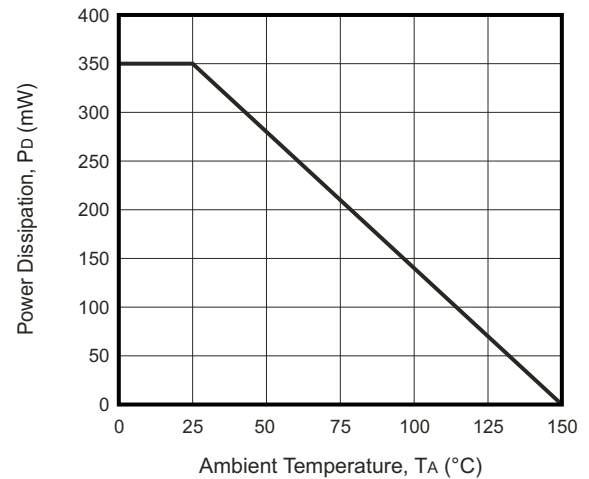


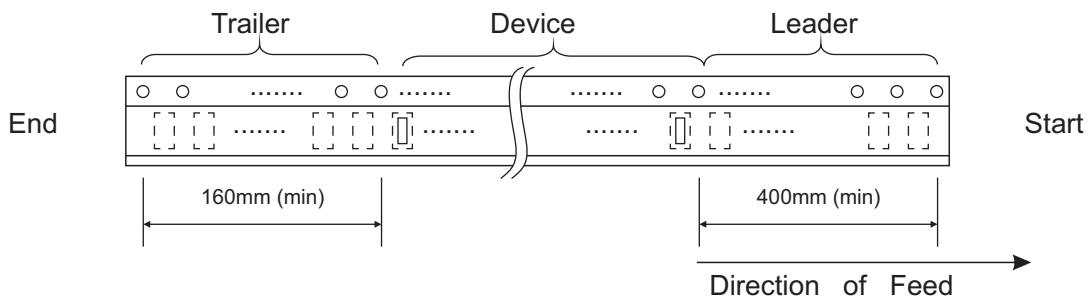
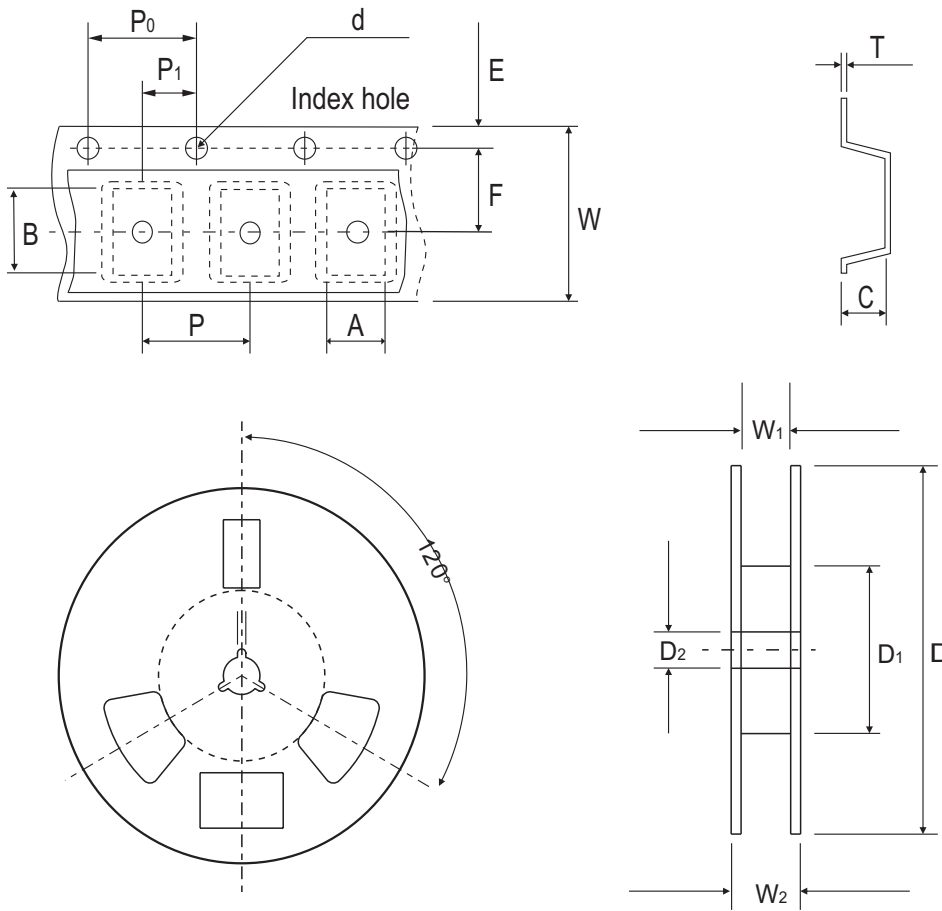
Fig.6 - PD - TA



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

REV: A

## Reel Taping Specification



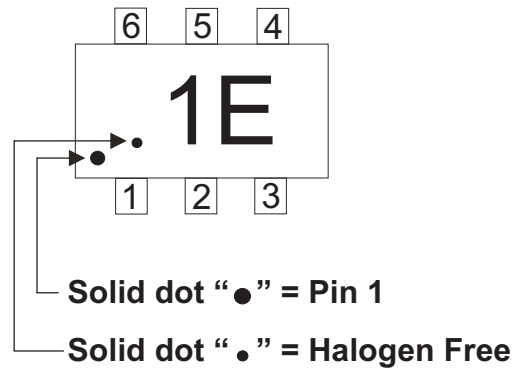
SOT-23-6	SYMBOL	A	B	C	d	T	D	D <sub>1</sub>	D <sub>2</sub>
	(mm)	3.30 ± 0.10	3.20 ± 0.10	1.50 ± 0.10	1.50 ± 0.10	0.25 ± 0.05	177.80 Max.	57.00 Max.	13.50 Max.
	(inch)	0.130 ± 0.004	0.126 ± 0.004	0.059 ± 0.004	0.059 ± 0.004	0.010 ± 0.002	7.000 Max.	2.244 Max.	0.531 Max.

SOT-23-6	SYMBOL	E	F	P	P <sub>0</sub>	P <sub>1</sub>	W	W <sub>1</sub>	W <sub>2</sub>
	(mm)	1.75 ± 0.10	3.50 ± 0.05	4.00 ± 0.10	4.00 ± 0.10	2.00 ± 0.05	8.00 ± 0.30	9.00 Max.	11.00 Max.
	(inch)	0.069 ± 0.004	0.138 ± 0.002	0.157 ± 0.004	0.157 ± 0.004	0.079 ± 0.002	0.315 ± 0.012	0.354 Max.	0.433 Max.

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

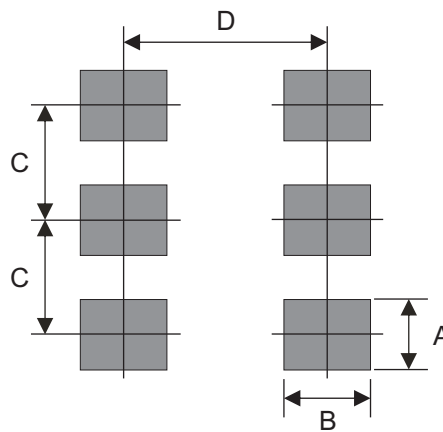
## Marking Code

Part Number	Marking Code
MMBT3904D-HF	.1E



## Suggested PAD Layout

SIZE	SOT-23-6	
	(mm)	(inch)
A	0.70	0.028
B	1.00	0.039
C	0.95	0.037
D	2.40	0.094



## Standard Packaging

Case Type	REEL PACK	
	REEL ( pcs )	Reel Size (inch)
SOT-23-6	3,000	7