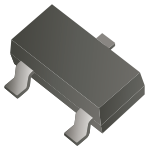
MMBT3904-P2-HF (NPN)

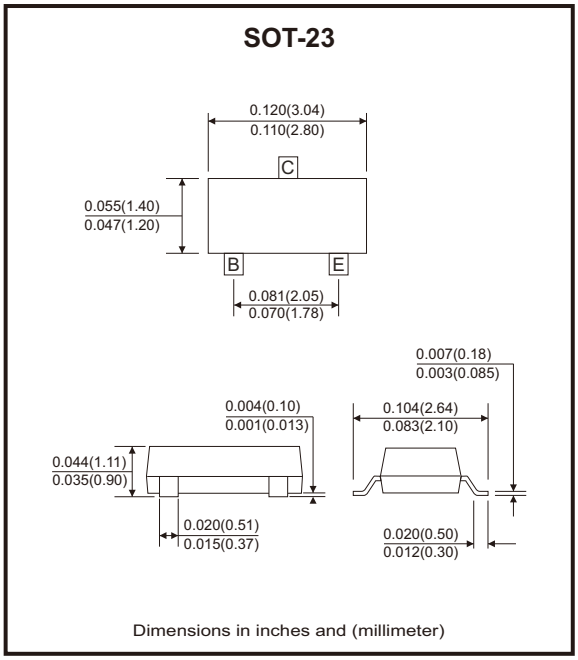
RoHS Device

Halogen Free



Features

- Capable of 225mW of power dissipation.
- Surface mount SOT-23 package.

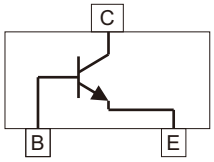


Mechanical data

- Case: SOT-23, molded plastic.
- Terminals: Solderable per MIL-STD-750, method 2026.
- Mounting position: Any.

Circuit Diagram

B: Base
E: Emitter
C: Collector



Maximum Ratings (at T_A=25°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
Collector power dissipation (Note 1)	P_D	225	mW
Thermal resistance from junction to ambient	$R_{\theta JA}$	556	°C/W
Junction temperature	T_J	150	°C
Storage temperature range	T_{STG}	-55 to +150	°C

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

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

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Collector-emitter breakdown voltage	V_{CEO}	I_C = 1mA, I_B = 0	40			V
Collector-base breakdown voltage	V_{CBO}	I_C = 10μA, I_E = 0	60			V
Emitter-base breakdown voltage	V_{EBO}	I_E = 10μA, I_C = 0	6			V
Collector-base cut-off current	I_{CBO}	V_{CB} = 30V, I_E = 0			50	nA
Collector cut-off current	I_{CEX}	V_{CE} = 30V, V_{BE} = 3V			50	nA
DC current gain	$h_{FE(1)}$	I_C = 0.1mA, V_{CE} = 1V	40			
	$h_{FE(2)}$	I_C = 1mA, V_{CE} = 1V	70			
	$h_{FE(3)}$	I_C = 10mA, V_{CE} = 1V	100		300	
	$h_{FE(4)}$	I_C = 50mA, V_{CE} = 1V	60			
	$h_{FE(5)}$	I_C = 100mA, V_{CE} = 1V	30			
Collector-emitter saturation voltage	$V_{CE(sat)}$	I_C = 10mA, I_B = 1mA			0.2	V
		I_C = 50mA, I_B = 5mA			0.3	
Base-emitter saturation voltage	$V_{BE(sat)}$	I_C = 10mA, I_B = 1mA	0.65		0.85	V
		I_C = 50mA, I_B = 5mA			0.95	
Transition frequency	f_T	I_C = 10mA, V_{CE} = 20V, f = 100MHz	300			MHz
Collector output capacitance	C_{ob}	V_{CB} = 5V, I_E = 0, f = 1MHz			4	pF
Collector input capacitance	C_{ib}	V_{BE} = 0.5V, I_C = 0, f = 1MHz			8	pF
Noise figure	NF	I_C = 100μA, V_{CE} = 5V, R_S = 1kΩ, f = 10Hz to 15.7kHz			5	dB
Switching Characteristics						
Delay time	t_d	V_{CC} = 3V, V_{BE} = 0.5V, I_C = 10mA I_{B1} = 1mA			35	ns
Rise time	t_r				35	ns
Storage time	t_s	V_{CC} = 3V, I_C = 10mA, I_{B1} = I_{B2} = 1mA			200	ns
Fall time	t_f				50	ns

Typical Rating and Characteristic Curves (MMBT3904-P2-HF)

Fig.1 - Static Characteristic

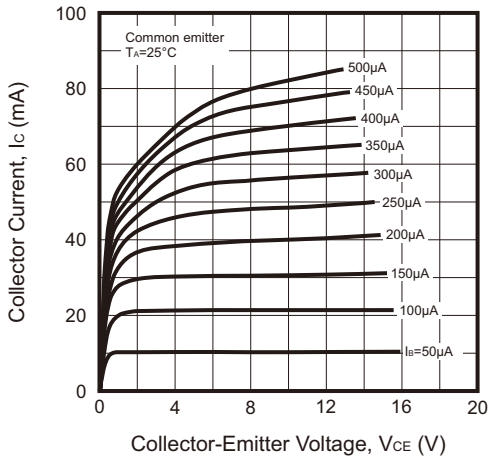


Fig.2 - DC Current Gain Characteristics

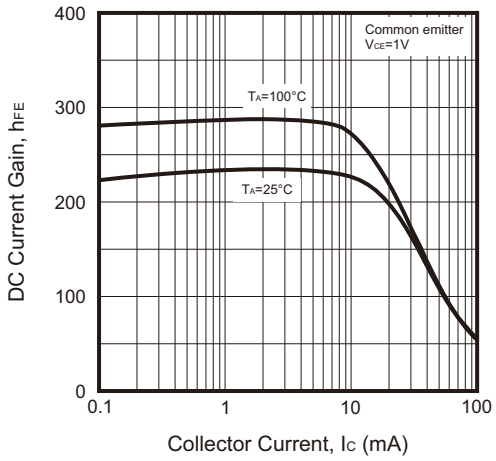


Fig.3 - Collector-Emitter Saturation Voltage Characteristic

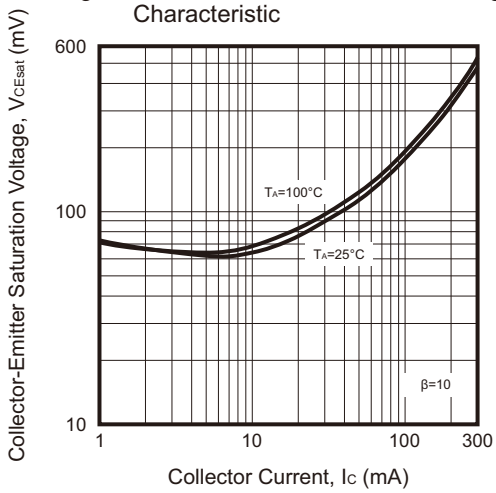


Fig.4 - Base-Emitter Saturation Voltage Characteristic

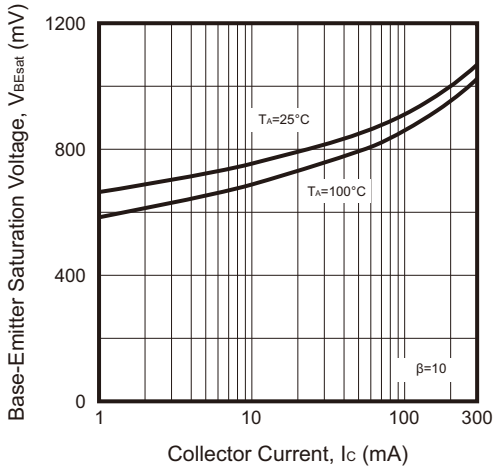


Fig.5 - Base-Emitter Voltage Characteristics

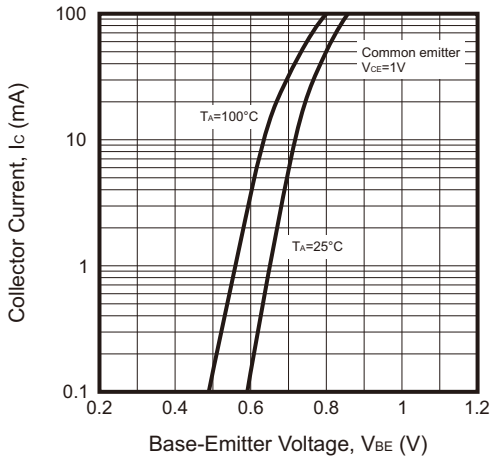
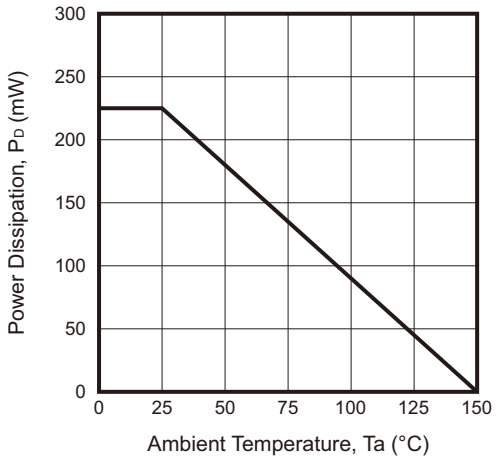
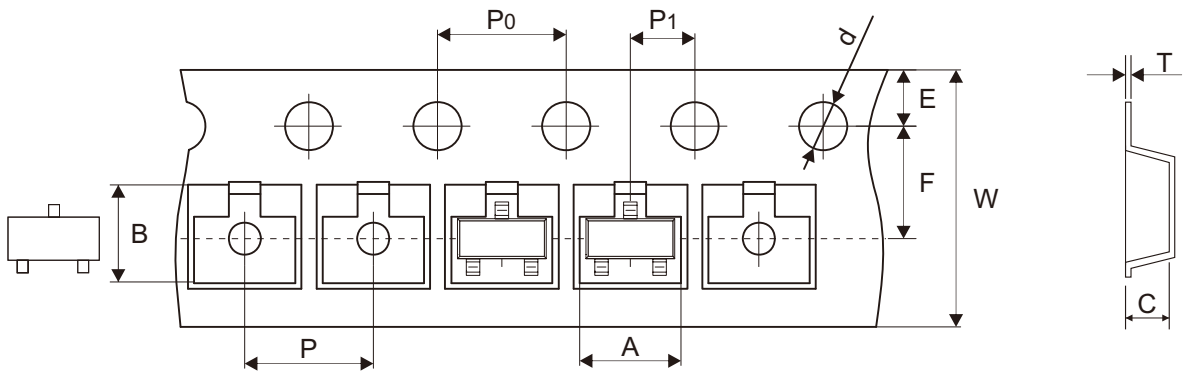
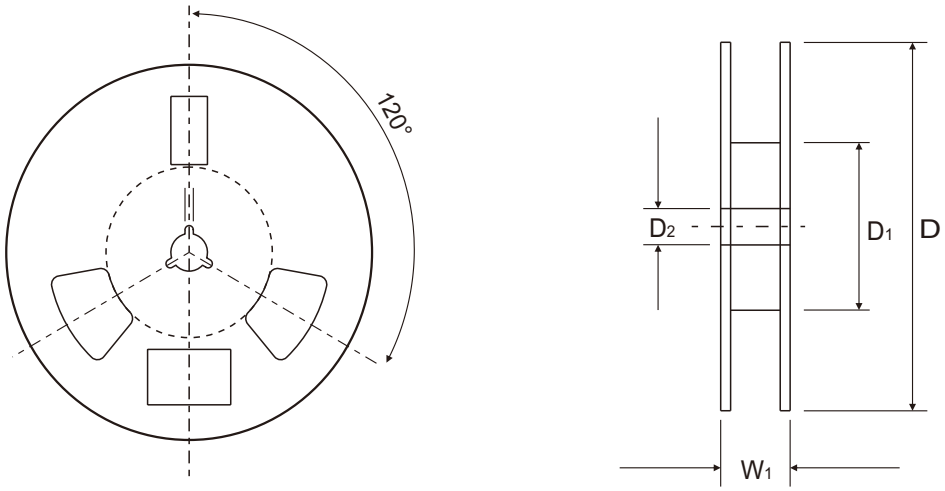


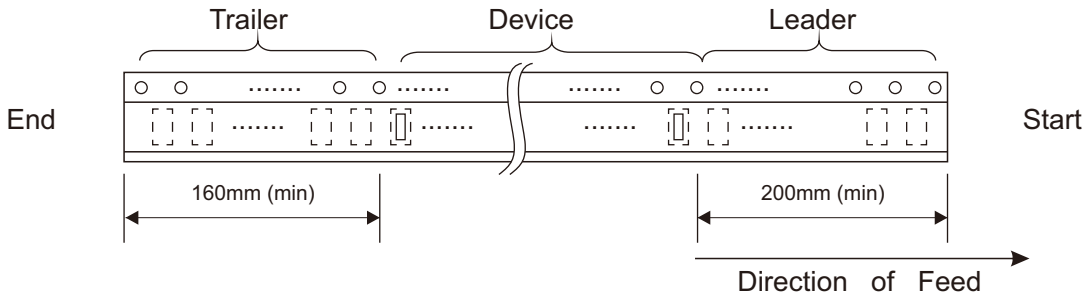
Fig.6 - Collector Power Derating Curve



Reel Taping Specification





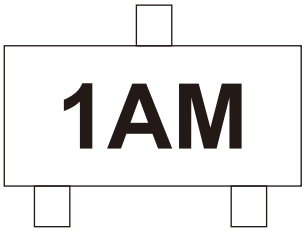


	SYMBOL	A	B	C	d	D	D1	D2
SOT-23	(mm)	3.15 ± 0.10	2.77 ± 0.10	1.22 + 0.08 − 0.10	1.50 + 0.10 − 0.00	178.00 ± 2.00	50.00 ± 0.50	13.00 ± 0.25
	(inch)	0.124 ± 0.004	0.109 ± 0.004	0.048 + 0.003 − 0.004	0.059 + 0.004 − 0.000	7.008 ± 0.079	1.969 ± 0.020	0.512 ± 0.010

	SYMBOL	E	F	P	P0	P1	T	W	W1
SOT-23	(mm)	1.75 ± 0.10	3.50 ± 0.10	4.00 ± 0.10	4.00 ± 0.10	2.00 ± 0.05	0.20 ± 0.02	8.00 + 0.30 − 0.10	9.50 ± 0.50
	(inch)	0.069 ± 0.004	0.138 ± 0.004	0.157 ± 0.004	0.157 ± 0.004	0.079 ± 0.002	0.008 ± 0.001	0.315 + 0.012 − 0.004	0.374 ± 0.020

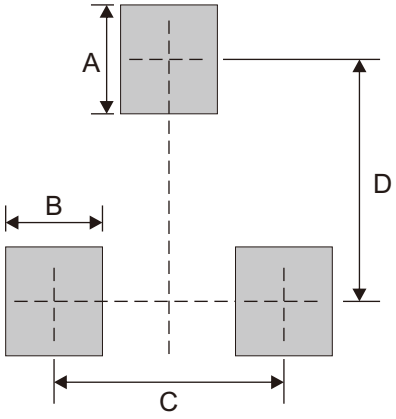
Marking Code

Part Number	Marking Code
MMBT3904-P2-HF	1AM



Suggested P.C.B. PAD Layout

SIZE	SOT-23	
	(mm)	(inch)
A	0.90	0.035
B	0.80	0.031
C	1.90	0.075
D	2.00	0.079



Standard Packaging

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