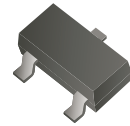


MMBT3904-HF (NPN)

RoHS Device

Halogen Free

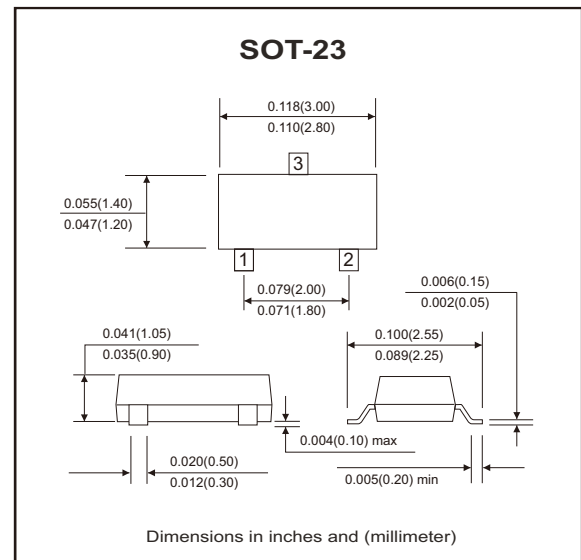


Features

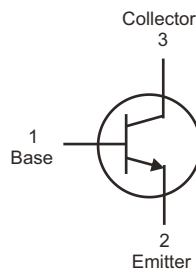
- Epitaxial planar die construction
- As complementary type, the PNP transistor MMBT3906-HF is recommended

Mechanical data

- Case: SOT-23, molded plastic.



Circuit Diagram



Maximum Ratings (at TA=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-Continuous	I_C	200	mA
Collector power dissipation	P_C	200	mW
Thermal resistance from junction to ambient	$R_{\theta JA}$	625	°C/W
Junction temperature	T_J	150	°C
Storage temperature range	T_{STG}	-55 to +150	°C

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

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

Rating and Characteristic Curves (MMBT3904-HF)

Fig.1 - Static Characteristic

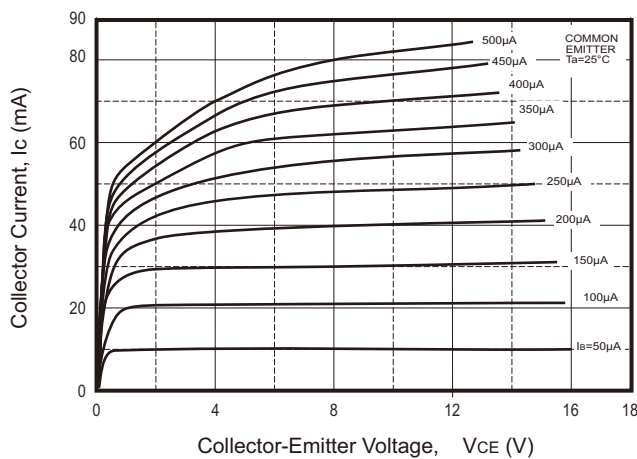
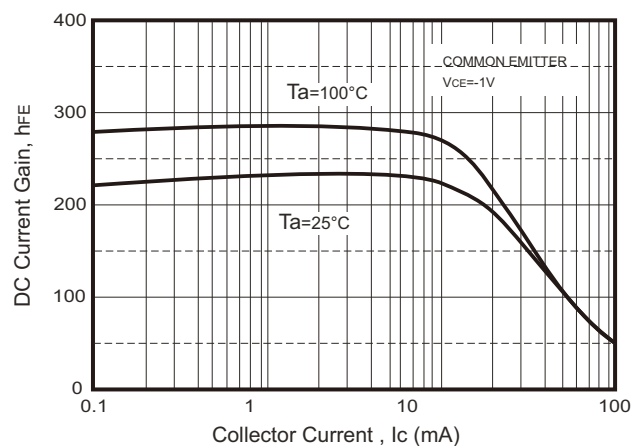


Fig.2 - $h_{FE} - I_C$



Rating and Characteristic Curves (MMBT3904-HF)

Fig. 3 - $V_{CEsat} - I_C$

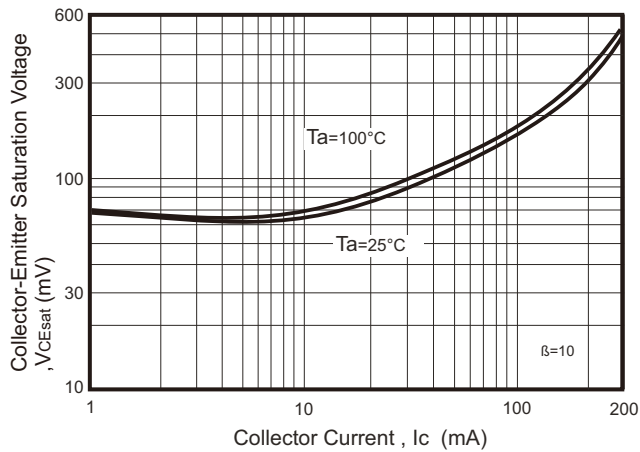


Fig. 4 - $V_{BEsat} - I_C$

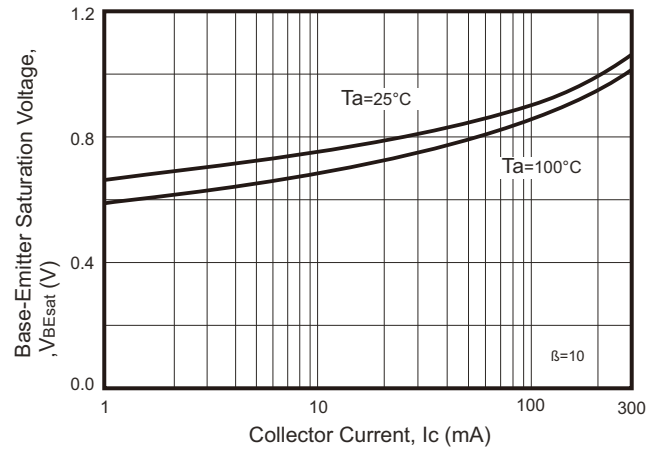


Fig. 5 - $I_C - V_{BE}$

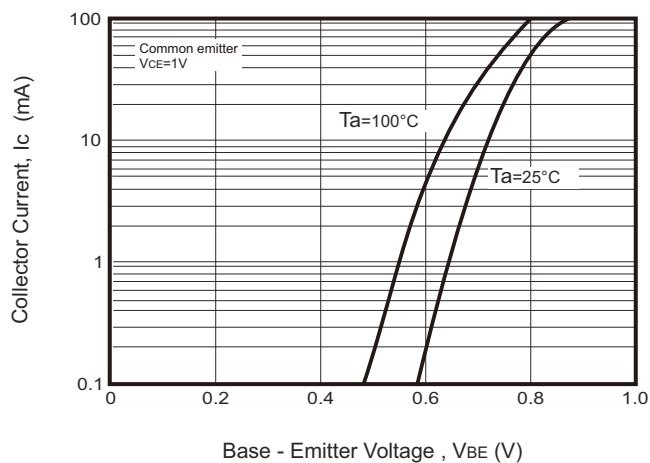


Fig. 6 - $C_{ob}/C_{ib} - V_{CB}/V_{EB}$

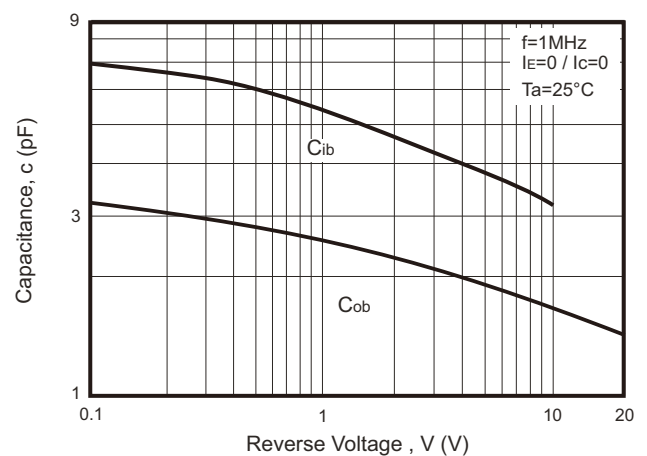


Fig. 7- $f_T - I_C$

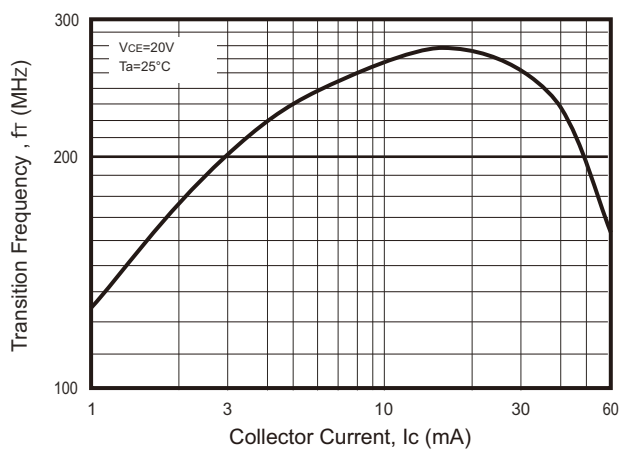
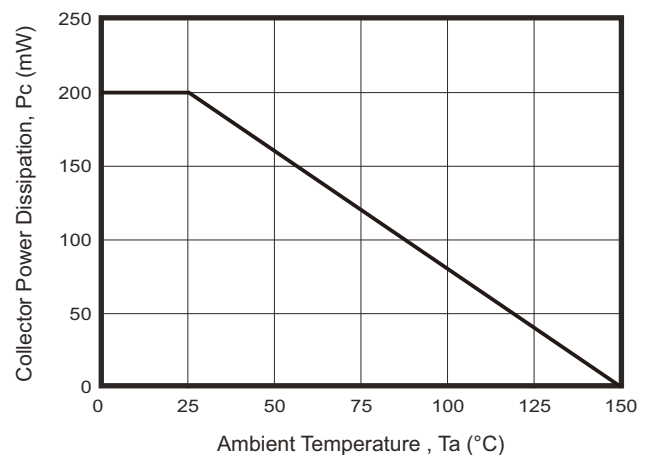
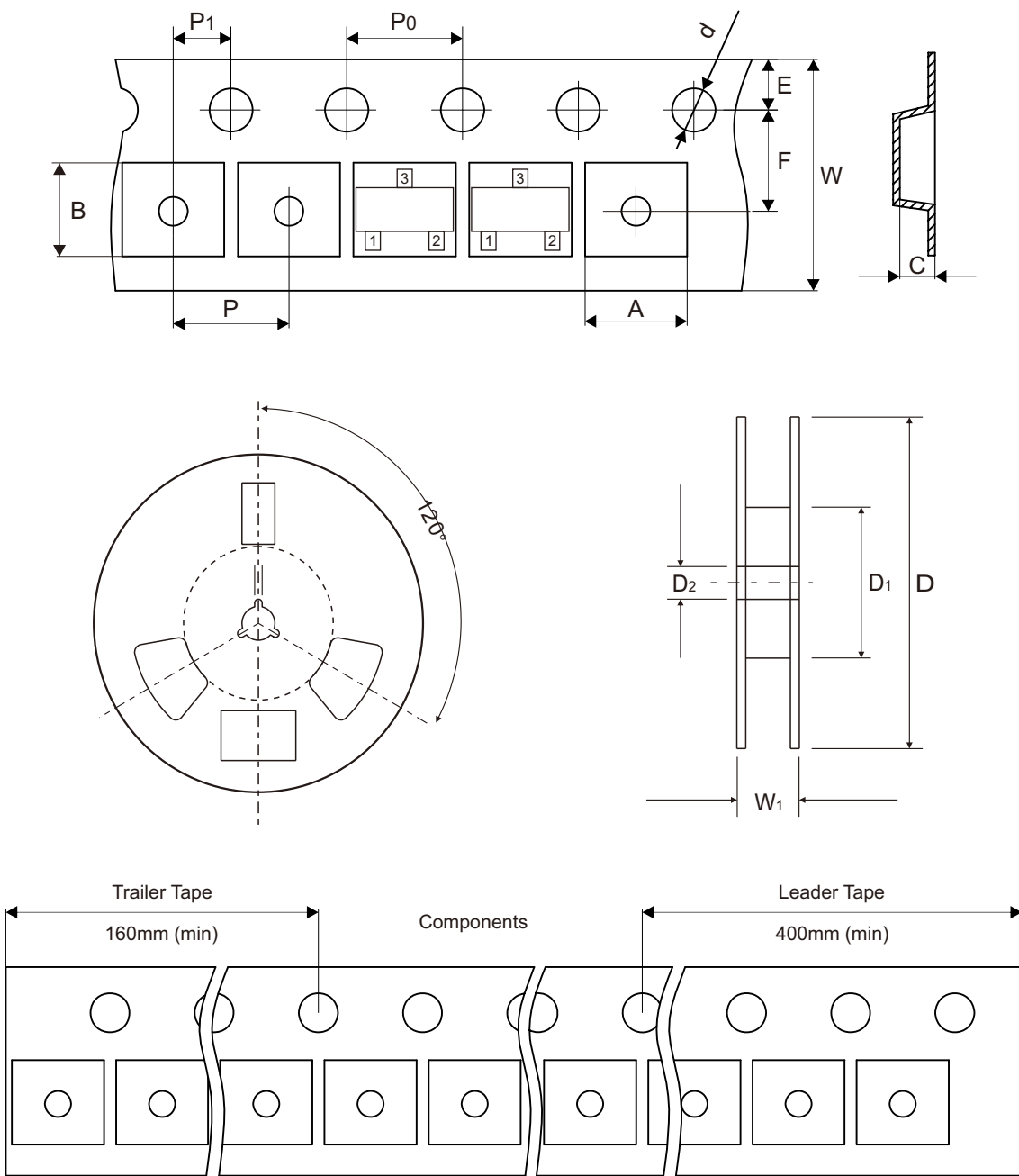


Fig. 8 - $P_c - T_a$



Reel Taping Specification



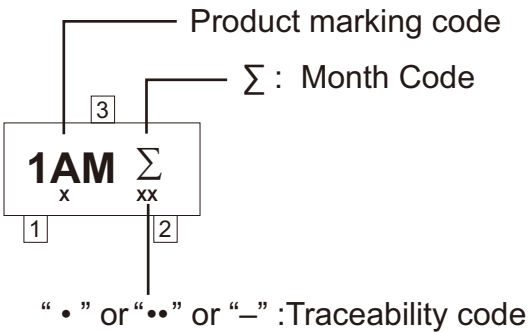
SOT-23	SYMBOL	A	B	C	d	D	D ₁	D ₂
	(mm)	3.10 ± 0.10	2.85 ± 0.10	1.40 ± 0.10	1.55 ± 0.10	178 ± 1	50.0 MIN.	13.0 ± 0.20
	(inch)	0.122 ± 0.004	0.112 ± 0.004	0.055 ± 0.004	0.061 ± 0.004	7.008 ± 0.04	1.969 MIN.	0.512 ± 0.008

SOT-23	SYMBOL	E	F	P	P ₀	P ₁	W	W ₁
	(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	14.4 MAX.
	(inch)	0.069 ± 0.004	0.138 ± 0.002	0.157 ± 0.004	0.157 ± 0.004	0.079 ± 0.004	0.315 ± 0.008	0.567 MAX.

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

Marking Code

Part Number	Marking Code	
MMBT3904-HF	1AM	1AM Σ



Month Code:

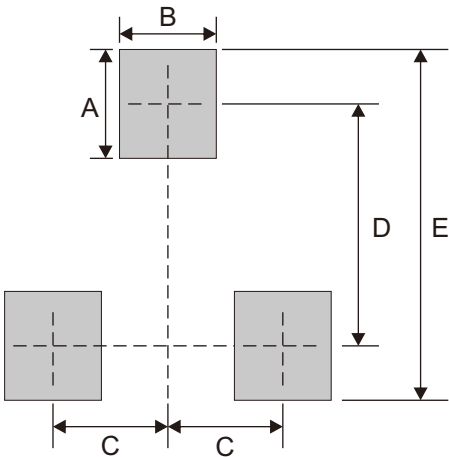
Month	Odd Year (per A.D.)	Even Year (per A.D.)
Jan	1	E
Feb	2	F
Mar	3	H
Apr	4	J
May	5	K
Jun	6	L

Month	Odd Year (per A.D.)	Even Year (per A.D.)
Jul	7	N
Aug	8	P
Sep	9	U
Oct	T	X
Nov	V	Y
Dec	C	Z

Suggested PAD Layout

SIZE	SOT-23	
	(mm)	(inch)
A	0.90	0.035
B	0.80	0.031
C	0.95	0.037
D	2.00	0.079
E	2.90	0.114

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



Standard Packaging

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

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