NPN Silicon Epitaxial Planar Transistor

MMBT3904

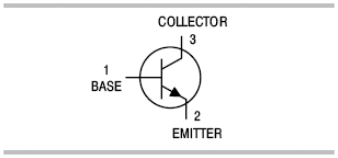
Features

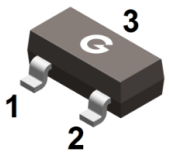
HF

- Epitaxial planar die construction
- Complimentary to MMBT3906
- Ultra-small surface mount package
- RoHS compliant with Halogen-free

Mechanic al Data

- Case: SOT-23
- Molding compound: UL flammability classification rating 94V-0
- Terminals: Tin-plated; solderability per MIL-STD-202, Method 208





SOT-23

Ordering Information

Part Number	Package	Shipping Quantity	Marking Code
MMBT3904	SOT-23	3000 pcs / Tape & Reel	1AM

Maximum Ratings (@ T_A = 25°C unless otherwise specified)

Parameter	Symbol	Value	Unit
Collector-Base Breakdown Voltage	V_{CBO}	60	V
Collector-Emitter Breakdown Voltage	V_{CEO}	40	V
Emitter-Base Breakdown Voltage	V_{EBO}	6	V
Continuous Collector Current	I_C	0.2	A
Peak Collector Current	I_{CM}	0.2	A
Peak Base Current	I_{BM}	0.1	A

Thermal Characteristics

Parameter	Symbol	Value	Unit
Power Dissipation	P_D	250	mW
Thermal Resistance Junction-to-Air *1	$R_{\theta JA}$	386	°C/W
Thermal Resistance Junction-to-Case *1	$R_{\theta JC}$	221	°C/W
Thermal Resistance Junction-to-Lead *1	$R_{\theta JL}$	168	°C/W
Ambient Temperature	T_A	-55 ~ +150	°C
Operating junction Temperature	T_J	-65 ~ +150	°C
Storage Temperature Range	T_{STG}	-65 ~ +150	°C

Note 1: The data tested by surface mounted on a 15mm * 15mm * 1mm FR4-epoxy P.C.B

Electrical Characteristics (@ T_A = 25°C unless otherwise specified)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	I_C = 10μA, I_E = 0	60	-	-	V
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	I_C = 100μA, I_B = 0	40	-	-	V
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	I_E = 10μA, I_C = 0	6	-	-	V
Collector Cut-off Current	I_{CBO}	V_{CB} = 30V, I_E = 0	-	-	50	nA
Emitter Cut-off Current	I_{EBO}	V_{EB} = 6V, I_C = 0	-	-	50	nA
DC Current Gain	h_{FE}	V_{CE} = 1V, I_C = 0.1mA	60	-	-	-
		V_{CE} = 1V, I_C = 1mA	80	-	-	-
		V_{CE} = 1V, I_C = 10mA	100	-	300	-
		V_{CE} = 1V, I_C = 50mA	60	-	-	-
		V_{CE} = 1V, I_C = 100mA	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	V
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	V
Transition Frequency	f_T	I_C = 10mA, V_{CE} = 20V	300	-	-	MHz
Collector Output Capacitance	C_{OBO}	V_{CB} = 5V, I_E = 0, f = 1MHZ	-	-	4	pF
Input Capacitance	C_{IBO}	V_{EB} = 0.5V, I_C = 0, f = 1MHz	-	-	8	pF
Noise Figure	N_F	V_{CE} = 5V, I_C = 100μA, R_S = 1kΩ f = 10Hz to15.7kHz	-	-	5	dB
Delay Time	t_d	V_{CC} = 3V, I_C = 10mA $V_{BE(OFF)}$ = -0.5V, I_{B1} = 1mA	-	-	35	ns
Rise Time	t_r		-	-	35	ns
Storang Time	t_s	V_{CC} = 3V, I_C = 10mA I_{B1} = I_{B2} = 1mA	-	-	200	ns
Fall Time	t_f		-	-	50	ns

Ratings and Characteristics Curves (@ T_A = 25°C unless otherwise specified)

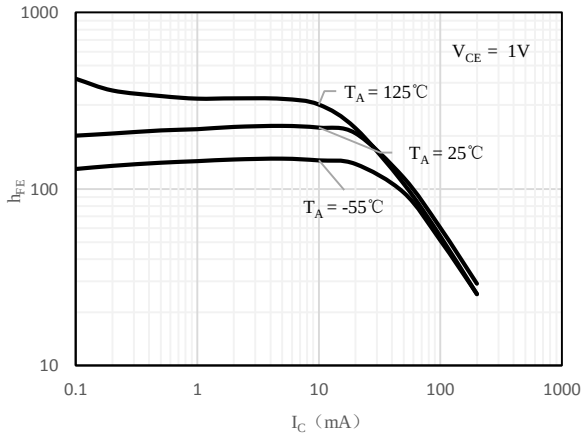


Fig 1 h_{FE} vs. I_C

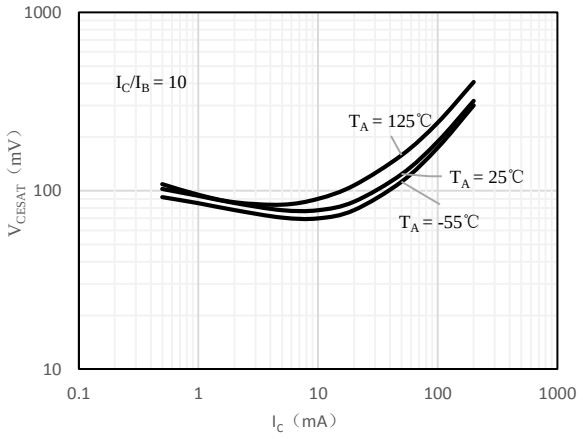


Fig 2 $V_{CE(sat)}$ vs. I_C

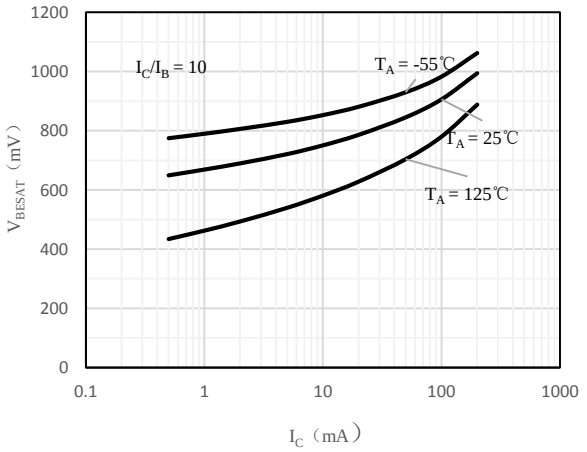


Fig 3 $V_{BE(sat)}$ vs. I_C

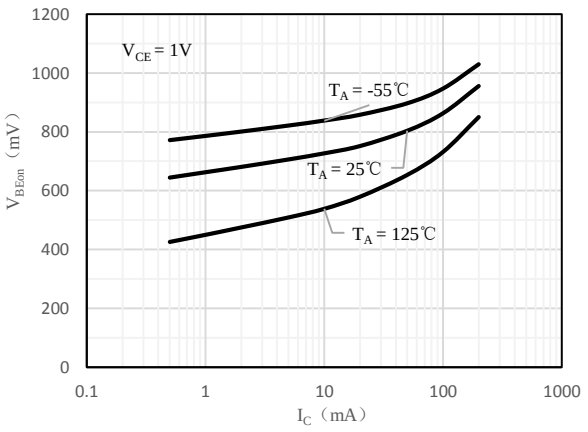


Fig 4 $V_{BE(ON)}$ vs. I_C

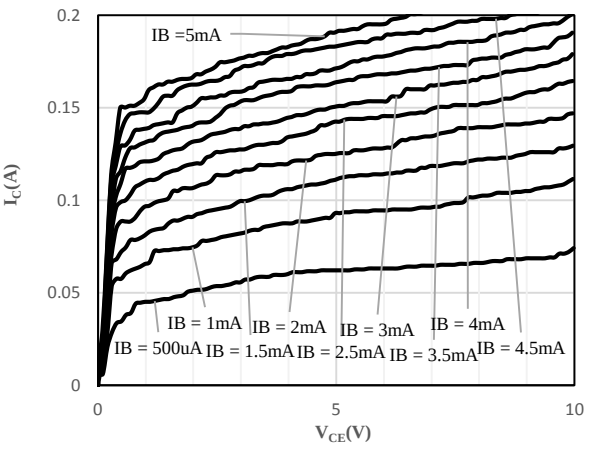


Fig 5 I_C vs. V_{CE}

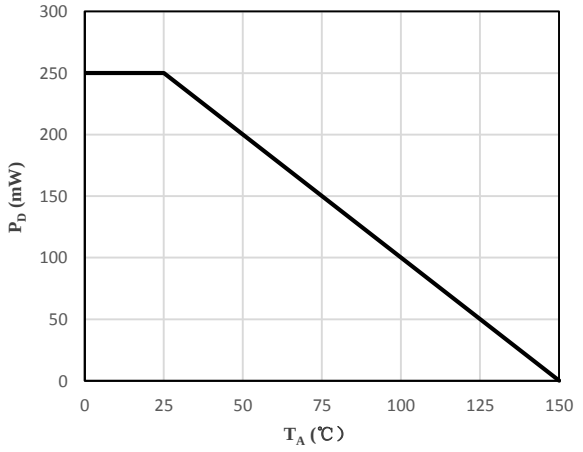


Fig 6 P_D vs. T_A

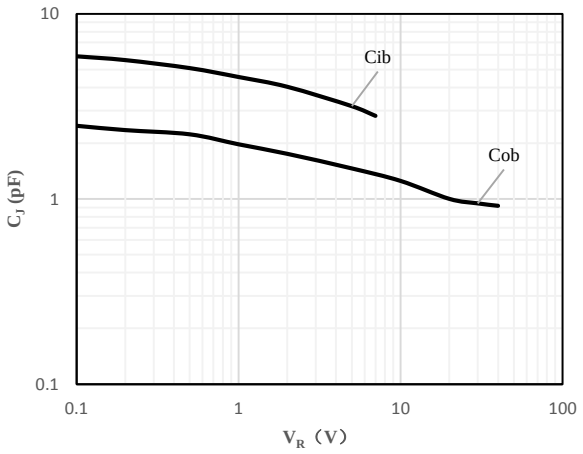
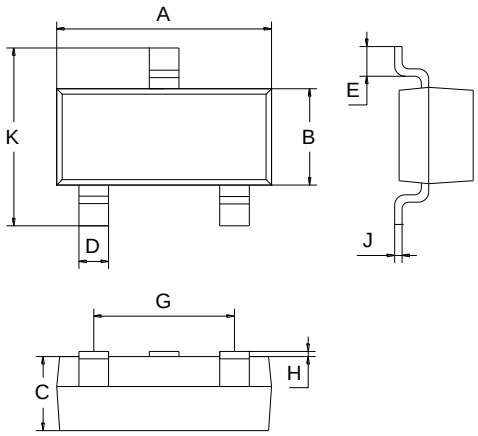


Fig 7 C_J vs. V_R

Package Outline Dimensions (Unit: mm)



SOT-23		
Dimension	**Min.**	**Max.**
A	2.70	3.10
B	1.10	1.50
C	0.9	1.1
D	0.3	0.5
E	0.35	0.48
G	1.80	2.00
H	0.02	0.1
J	0.05	0.15
K	2.20	2.60

Package Outline Dimensions (Unit: mm)

SOT-23

