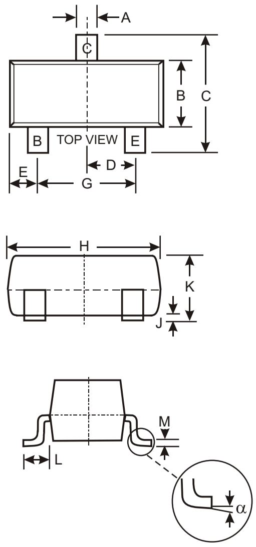
MMBT3904

NPN SMALL SIGNAL SURFACE MOUNT TRANSISTOR

Features

- Epitaxial Planar Die Construction
- Complementary PNP Type Available MMBT3906
- Ideal for Medium Power Amplification and Switching
- We declare that the material of product compliance with RoHS requirements.
- Marking Code:1AM



SOT-23		
Dim	**Min**	**Max**
A	0.37	0.51
B	1.20	1.40
C	2.30	2.50
D	0.89	1.03
E	0.45	0.60
G	1.78	2.05
H	2.80	3.00
J	0.013	0.10
K	0.903	1.10
L	0.45	0.61
M	0.085	0.180
α	0°	8°
All Dimensions in mm		

Maximum Ratings @ T_A = 25°C unless otherwise specified

Parameter	Symbol	Limits	Unit
Collector–Emitter Voltage	VCEO	40	Vdc
Collector–Base Voltage	VCBO	60	Vdc
Emitter–Base Voltage	VEBO	6	Vdc
Collector Current — Continuous	IC	200	mAdc

• THERMAL CHARACTERISTICS

Total Device Dissipation, FR−5 Board (Note 1) @ TA = 25°C Derate above 25°C	PD	225 1.8	mW mW/℃
Thermal Resistance, Junction–to–Ambient(Note 1)	RΘJA	556	℃/W
Total Device Dissipation, Alumina Substrate (Note 2) @ TA =25°C Derate above 25°C	PD	300 2.4	mW mW/℃
Thermal Resistance, Junction–to–Ambient(Note 2)	RΘJA	417	℃/W
Junction and Storage temperature	TJ,Tstg	−55～+150	℃

1. FR–5 = 1.0×0.75×0.062 in.
2. Alumina = 0.4×0.3×0.024 in. 99.5% alumina.

Electrical Characteristics @ T_A = 25°C unless otherwise specified

OFF CHARACTERISTICS

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Collector–Emitter Breakdown Voltage (IC = 1.0 mAdc, IB = 0)	VBR(CEO)	40	–	–	V
Collector–Base Breakdown Voltage (IC = 10 μAdc, IE = 0)	VBR(CBO)	60	–	–	V
Emitter–Base Breakdown Voltage (IE = 10 μAdc, IC = 0)	VBR(EBO)	6	–	–	V
Collector Cutoff Current (VCE = 30 Vdc, VEB = 3.0Vdc)	ICEX	–	–	50	nA
Base Cutoff Current (VCE = 30 Vdc, VEB = 3.0 Vdc)	IBL	–	–	50	nA

ON CHARACTERISTICS (Note 3.)

Characteristic	Symbol	Min.	Typ.	Max.	Unit
DC Current Gain	HFE				
(IC = 0.1 mAdc, VCE = 1.0 Vdc)		40	–	–	
(IC = 1.0 mAdc, VCE = 1.0 Vdc)		70	–	–	
(IC = 10 mAdc, VCE = 1.0 Vdc)		100	–	300	
(IC = 50 mAdc, VCE = 1.0 Vdc)		60	–	–	
(IC = 100 mAdc, VCE = 1.0 Vdc)		30	–	–	
Collector–Emitter Saturation Voltage(3)	VCE(sat)				V
(IC = 10 mAdc, IB = 1.0 mAdc)		–	–	0.2	
(IC = 50mAdc, IB = 5.0 mAdc)		–	–	0.3	
Base–Emitter Saturation Voltage	VBE(sat)				V
(IC = 10 mAdc, IB = 1.0 mAdc)		0.65	–	0.85	
(IC = 50mAdc, IB = 5.0 mAdc)		–	–	0.95	

SMALL–SIGNAL CHARACTERISTICS

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Current–Gain — Bandwidth Product (IC = 10mAdc, VCE= 20Vdc, f = 100MHz)	fT	300	–	–	MHz
Output Capacitance (VCB = 5.0 Vdc, IE = 0, f = 1.0 MHz)	Cobo	–	–	4	pF
Input Capacitance (VEB = 0.5 Vdc, IC = 0, f = 1.0 MHz)	Cibo	–	–	8	pF
Input Impedance (VCE= 10 Vdc, IC = 1.0 mAdc, f = 1.0 kHz)	hie	1	–	10	k Ω
Voltage Feedback Ratio (VCE= 10 Vdc, IC = 1.0 mAdc, f = 1.0 kHz)	hre	0.5	–	8	X 10^{-4}
Small–Signal Current Gain (VCE= 10 Vdc, IC = 1.0 mAdc, f = 1.0 kHz)	hfe	100	–	400	
Output Admittance (VCE= 10 Vdc, IC = 1.0 mAdc, f = 1.0 kHz)	hoe	1	–	40	μmhos
Noise Figure (VCE=5V, IC=100μA, RS=1.0kΩ ,f =1.0kHz)	NF	–	–	5	dB

SWITCHING CHARACTERISTICS

Characteristic	Conditions	Symbol	Min.	Typ.	Max.	Unit
Delay Time	(VCC = 3.0 Vdc, VBE= – 0.5Vdc, IC = 10 mAdc, IB1 = 1.0 mAdc)	td	–	–	35	ns
Rise Time		tr	–	–	35	
Storage Time	(VCC = 3.0 Vdc, IC = 10 mAdc, IB1 = I B2 = 1.0 mAdc)	ts	–	–	200	
Fall Time		tf	–	–	50	

3. Pulse Test: Pulse Width <300 μs, Duty Cycle <2.0%.

TYPICAL TRANSIENT CHARACTERISTICS

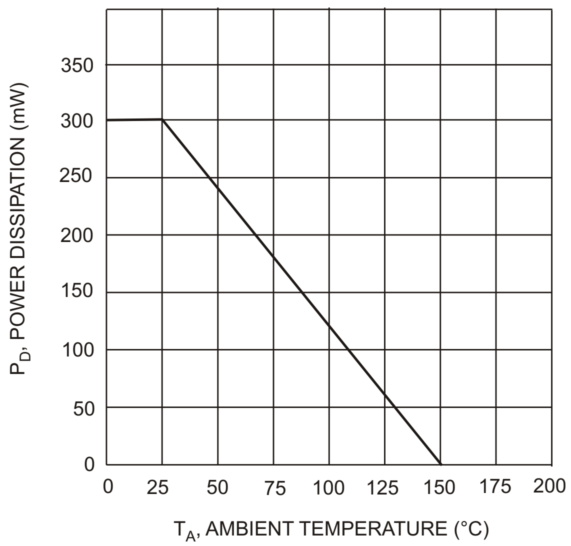


Fig. 1, Max Power Dissipation vs
Ambient Temperature

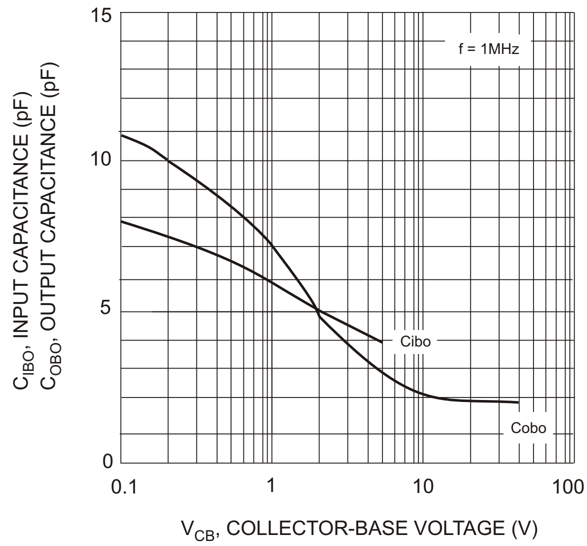


Fig. 2, Input and Output Capacitance vs.
Collector-Base Voltage

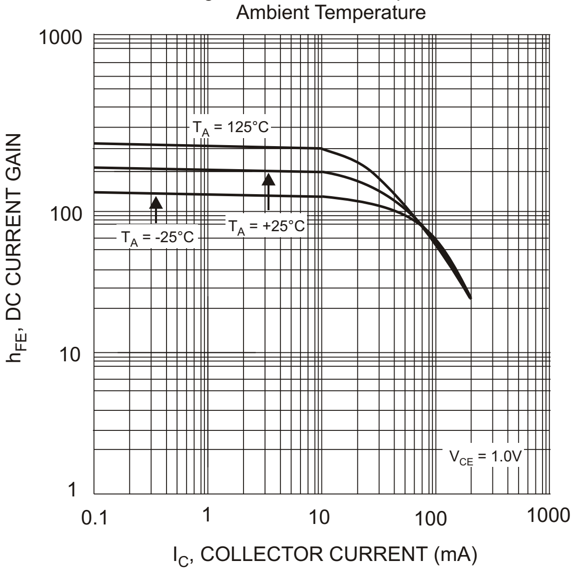


Fig. 3, Typical DC Current Gain vs
Collector Current

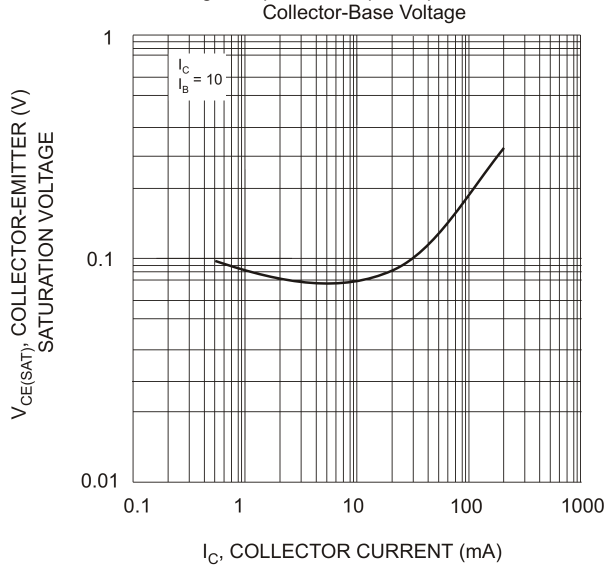


Fig. 4, Typical Collector-Emitter
Saturation Voltage vs. Collector Current

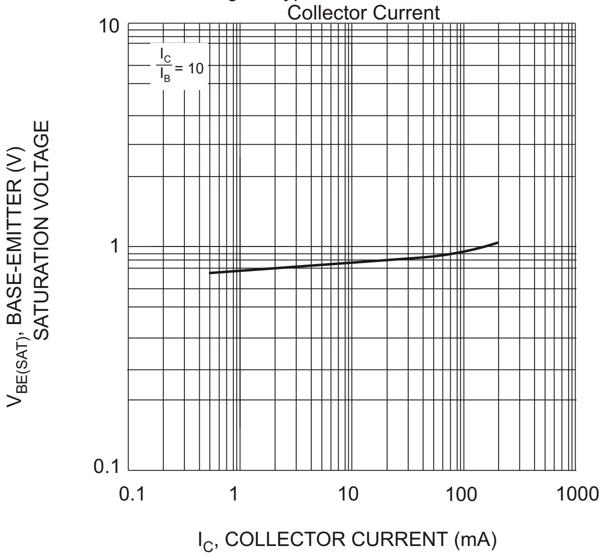


Fig. 5, Typical Base-Emitter
Saturation Voltage vs. Collector Current

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