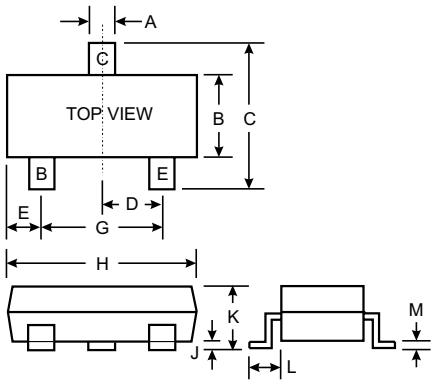
MMBT3904

NPN SMALL SIGNAL SURFACE MOUNT TRANSISTOR

Features

- Epitaxial Planar Die Construction
- Complementary PNP Type Available (MMBT3906)
- Ideal for Medium Power Amplification and Switching



SOT-23		
Dim	**Min**	**Max**
A	0.37	0.51
B	1.19	1.40
C	2.10	2.50
D	0.89	1.05
E	0.45	0.61
G	1.78	2.05
H	2.65	3.05
J	0.013	0.15
K	0.89	1.10
L	0.45	0.61
M	0.076	0.178
All Dimensions in mm		

Mechanical Data

- Case: SOT-23, Molded Plastic
- Terminals: Solderable per MIL-STD-202, Method 208
- Terminal Connections: See Diagram
- Marking: K1N, R1A, 1AM
- Weight: 0.008 grams (approx.)

Maximum Ratings @ $T_A = 25°C$ unless otherwise specified

Characteristic	Symbol	MMBT3904	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 - Continuous (Note 1)	I_C	200	mA
Power Dissipation (Note 1)	P_d	350	mW
Thermal Resistance, Junction to Ambient (Note 1)	$R_{\theta JA}$	357	K/W
Operating and Storage and Temperature Range	T_j, T_{STG}	-55 to +150	°C

Notes: 1. Valid provided that terminals are kept at ambient temperature.
2. Pulse test: Pulse width ≤ 300μs, duty cycle ≤ 2%.

Electrical Characteristics @ $T_A = 25°C$ unless otherwise specified

Characteristic	Symbol	Min	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 2)					
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	60	—	V	$I_C = 10\mu A$, $I_E = 0$
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	40	—	V	$I_C = 1.0mA$, $I_B = 0$
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5.0	—	V	$I_E = 10\mu A$, $I_C = 0$
Collector Cutoff Current	I_{CEX}	—	50	nA	$V_{CE} = 30V$, $V_{EB(OFF)} = 3.0V$
Base Cutoff Current	I_{BL}	—	50	nA	$V_{CE} = 30V$, $V_{EB(OFF)} = 3.0V$
ON CHARACTERISTICS (Note 2)					
DC Current Gain	h_{FE}	40 70 100 60 30	— — 300 — —	—	$I_C = 100\mu A$, $V_{CE} = 1.0V$ $I_C = 1.0mA$, $V_{CE} = 1.0V$ $I_C = 10mA$, $V_{CE} = 1.0V$ $I_C = 50mA$, $V_{CE} = 1.0V$ $I_C = 100mA$, $V_{CE} = 1.0V$
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$	—	0.20 0.30	V	$I_C = 10mA$, $I_B = 1.0mA$ $I_C = 50mA$, $I_B = 5.0mA$
Base- Emitter Saturation Voltage	$V_{BE(SAT)}$	0.65 —	0.85 0.95	V	$I_C = 10mA$, $I_B = 1.0mA$ $I_C = 50mA$, $I_B = 5.0mA$
SMALL SIGNAL CHARACTERISTICS					
Output Capacitance	C_{obo}	—	4.0	pF	$V_{CB} = 5.0V$, f = 1.0MHz, $I_E = 0$
Input Capacitance	C_{ibo}	—	8.0	pF	$V_{EB} = 0.5V$, f = 1.0MHz, $I_C = 0$
Input Impedance	h_{ie}	1.0	10	kΩ	$V_{CE} = 10V$, $I_C = 1.0mA$, f = 1.0kHz
Voltage Feedback Ratio	h_{re}	0.5	8.0	$x\ 10^{-4}$	
Small Signal Current Gain	h_{fe}	100	400	—	
Output Admittance	h_{oe}	1.0	40	μS	
Current Gain-Bandwidth Product	f_T	300	—	MHz	$V_{CE} = 20V$, $I_C = 10mA$, f = 100MHz
Noise Figure	NF	—	5.0	dB	$V_{CE} = 5.0V$, $I_C = 100\mu A$, $R_S = 1.0k\Omega$, f = 1.0kHz
SWITCHING CHARACTERISTICS					
Delay Time	t_d	—	35	ns	$V_{CC} = 3.0V$, $I_C = 10mA$, $V_{BE(off)} = -0.5V$, $I_{B1} = 1.0mA$
Rise Time	t_r	—	35	ns	
Storage Time	t_s	—	200	ns	$V_{CC} = 3.0V$, $I_C = 10mA$, $I_{B1} = I_{B2} = 1.0mA$
Fall Time	t_f	—	50	ns	

Notes: 1. Valid provided that terminals are kept at ambient temperature.
2. Pulse test: Pulse width ≤ 300μs, duty cycle ≤ 2%.