



# MMBT3904

## SMALL SIGNAL NPN TRANSISTOR

PRELIMINARY DATA

Type	Marking
MMBT3904	34

- SILICON EPITAXIAL PLANAR NPN TRANSISTOR
- MINIATURE SOT-23 PLASTIC PACKAGE FOR SURFACE MOUNTING CIRCUITS
- TAPE AND REEL PACKING
- THE PNP COMPLEMENTARY TYPE IS MMBT3906

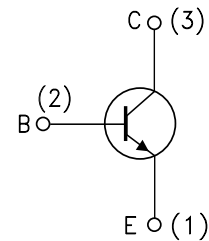
### APPLICATIONS

- WELL SUITABLE FOR PORTABLE EQUIPMENT
- SMALL LOAD SWITCH TRANSISTOR WITH HIGH GAIN AND LOW SATURATION VOLTAGE



SOT-23

### INTERNAL SCHEMATIC DIAGRAM



### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
$V_{CBO}$	Collector-Base Voltage ( $I_E = 0$ )	60	V
$V_{CEO}$	Collector-Emitter Voltage ( $I_B = 0$ )	40	V
$V_{EBO}$	Emitter-Base Voltage ( $I_C = 0$ )	6	V
$I_C$	Collector Current	200	mA
$P_{tot}$	Total Dissipation at $T_C = 25\text{ }^\circ\text{C}$	350	mW
$T_{stg}$	Storage Temperature	-65 to 150	$^\circ\text{C}$
$T_j$	Max. Operating Junction Temperature	150	$^\circ\text{C}$

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### THERMAL DATA

$R_{thj-amb}$ •	Thermal Resistance Junction-Ambient	Max	357.1	°C/W
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• Device mounted on a PCB area of 1 cm<sup>2</sup>

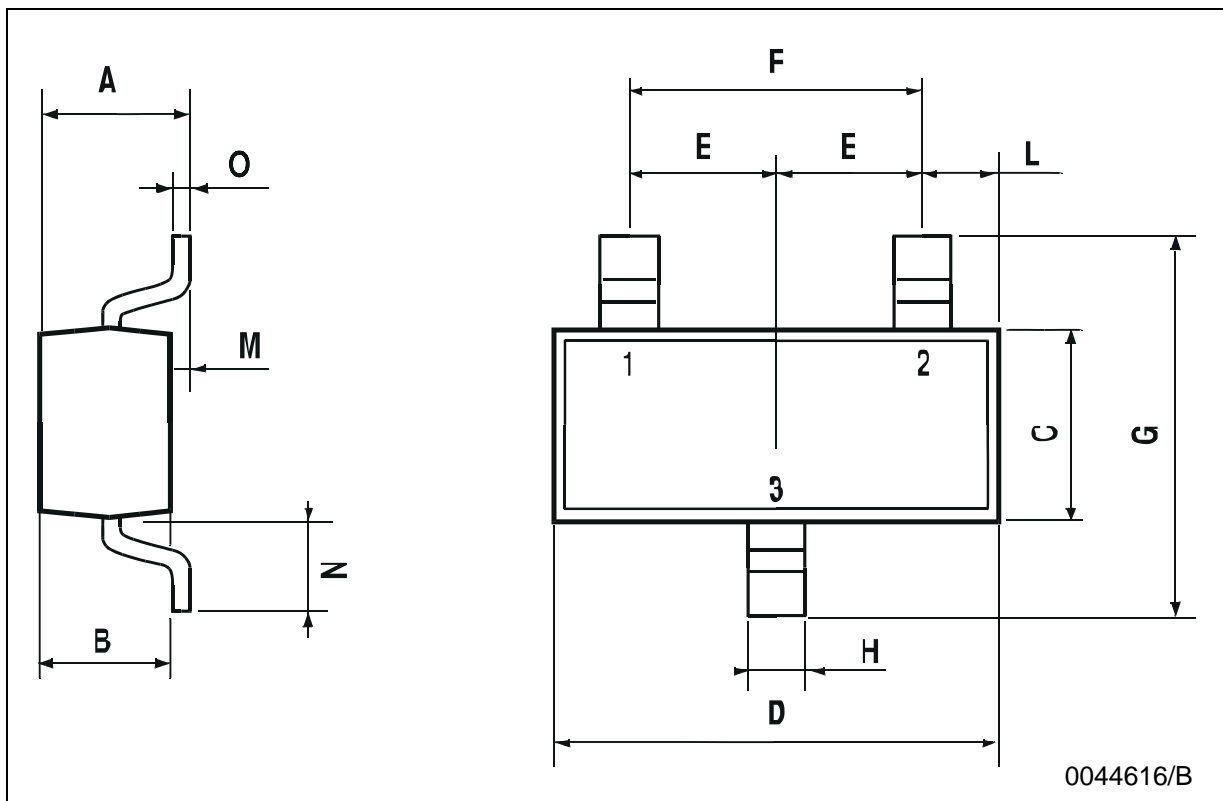
### ELECTRICAL CHARACTERISTICS (T<sub>case</sub> = 25 °C unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I <sub>CEX</sub>	Collector Cut-off Current (V <sub>BE</sub> = -3 V)	V <sub>CE</sub> = 30 V			50	nA
I <sub>BEX</sub>	Base Cut-off Current (V <sub>BE</sub> = -3 V)	V <sub>CE</sub> = 30 V			50	nA
V <sub>(BR)CEO</sub> *	Collector-Emitter Breakdown Voltage (I <sub>B</sub> = 0)	I <sub>C</sub> = 1 mA	40			V
V <sub>(BR)CBO</sub>	Collector-Base Breakdown Voltage (I <sub>E</sub> = 0)	I <sub>C</sub> = 10 μA	60			V
V <sub>(BR)EBO</sub>	Emitter-Base Breakdown Voltage (I <sub>C</sub> = 0)	I <sub>E</sub> = 10 μA	6			V
V <sub>CE(sat)</sub> *	Collector-Emitter Saturation Voltage	I <sub>C</sub> = 10 mA    I <sub>B</sub> = 1 mA I <sub>C</sub> = 50 mA    I <sub>B</sub> = 5 mA			0.2 0.2	V V
V <sub>BE(sat)</sub> *	Base-Emitter Saturation Voltage	I <sub>C</sub> = 10 mA    I <sub>B</sub> = 1 mA I <sub>C</sub> = 50 mA    I <sub>B</sub> = 5 mA	0.65		0.85 0.95	V V
h <sub>FE</sub> *	DC Current Gain	I <sub>C</sub> = 0.1 mA    V <sub>CE</sub> = 1 V I <sub>C</sub> = 1 mA       V <sub>CE</sub> = 1 V I <sub>C</sub> = 10 mA      V <sub>CE</sub> = 1 V I <sub>C</sub> = 50 mA      V <sub>CE</sub> = 1 V I <sub>C</sub> = 100 mA     V <sub>CE</sub> = 1 V	60 80 100 60 30		300	
f <sub>T</sub>	Transition Frequency	I <sub>C</sub> = 10 mA    V <sub>CE</sub> = 20 V    f = 100 MHz	250	270		MHz
C <sub>CB0</sub>	Collector-Base Capacitance	I <sub>E</sub> = 0    V <sub>CB</sub> = 10 V    f = 1 MHz		4		pF
C <sub>EBO</sub>	Emitter-Base Capacitance	I <sub>C</sub> = 0    V <sub>EB</sub> = 0.5 V    f = 1 MHz		18		pF
NF	Noise Figure	V <sub>CE</sub> = 5 V    I <sub>C</sub> = 0.1 mA    f = 10 Hz to 15.7 KHz    R <sub>G</sub> = 1 KΩ		5		dB
t <sub>d</sub>	Delay Time	I <sub>C</sub> = 10 mA    I <sub>B</sub> = 1 mA			35	ns
t <sub>r</sub>	Rise Time	V <sub>CC</sub> = 30 V			35	ns
t <sub>s</sub>	Storage Time	I <sub>C</sub> = 10 mA    I <sub>B1</sub> = -I <sub>B2</sub> = 1 mA			200	ns
t <sub>f</sub>	Fall Time	V <sub>CC</sub> = 30 V			50	ns

\* Pulsed: Pulse duration = 300 μs, duty cycle ≤ 2 %

## SOT-23 MECHANICAL DATA

DIM.	mm			mils		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	0.85		1.1	33.4		43.3
B	0.65		0.95	25.6		37.4
C	1.20		1.4	47.2		55.1
D	2.80		3	110.2		118
E	0.95		1.05	37.4		41.3
F	1.9		2.05	74.8		80.7
G	2.1		2.5	82.6		98.4
H	0.38		0.48	14.9		18.8
L	0.3		0.6	11.8		23.6
M	0		0.1	0		3.9
N	0.3		0.65	11.8		25.6
O	0.09		0.17	3.5		6.7



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