

## MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V <sub>CEO</sub>	40	Vdc
Collector-Base Voltage	V <sub>CBO</sub>	40	Vdc
Emitter-Base Voltage	V <sub>EBO</sub>	5.0	Vdc
Collector Current — Continuous	I <sub>C</sub>	200	mA <sub>dc</sub>

## THERMAL CHARACTERISTICS

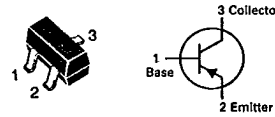
Characteristic	Symbol	Max	Unit
Total Device Dissipation FR-5 Board,* T <sub>A</sub> = 25°C Derate above 25°C	P <sub>D</sub>	225	mW
Thermal Resistance Junction to Ambient	R <sub>θJA</sub>	556	°C/W
Total Device Dissipation Alumina Substrate,** T <sub>A</sub> = 25°C Derate above 25°C	P <sub>D</sub>	300	mW
Thermal Resistance Junction to Ambient	R <sub>θJA</sub>	417	°C/W
Junction and Storage Temperature	T <sub>J</sub> , T <sub>stg</sub>	-55 to +150	°C

\*FR-5 = 1.0 x 0.75 x 0.062 in.

\*\*Alumina = 0.4 x 0.3 x 0.024 in. 99.5% alumina.

## DEVICE MARKING

MMBT3906L = 2A

T-27-09  
**MMBT3906L**CASE 318-03, STYLE 6  
SOT-23 (TO-236AB)

GENERAL PURPOSE TRANSISTOR

PNP SILICON

Refer to 2N3905 for graphs.

ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C unless otherwise noted.)

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector-Emitter Breakdown Voltage(1) (I <sub>C</sub> = 1.0 mA <sub>dc</sub> , I <sub>B</sub> = 0)	V <sub>(BR)CEO</sub>	40	—	Vdc
Collector-Base Breakdown Voltage (I <sub>C</sub> = 10 μA <sub>dc</sub> , I <sub>E</sub> = 0)	V <sub>(BR)CBO</sub>	40	—	Vdc
Emitter-Base Breakdown Voltage (I <sub>E</sub> = 10 μA <sub>dc</sub> , I <sub>C</sub> = 0)	V <sub>(BR)EBO</sub>	5.0	—	Vdc
Base Cutoff Current (V <sub>CE</sub> = 30 Vdc, V <sub>BE</sub> = 3.0 Vdc)	I <sub>BL</sub>	—	50	nA <sub>dc</sub>
Collector Cutoff Current (V <sub>CE</sub> = 30 Vdc, V <sub>BE</sub> = 3.0 Vdc)	I <sub>CEx</sub>	—	50	nA <sub>dc</sub>

## ON CHARACTERISTICS(1)

DC Current Gain (I <sub>C</sub> = 0.1 mA <sub>dc</sub> , V <sub>CE</sub> = 1.0 Vdc) (I <sub>C</sub> = 1.0 mA <sub>dc</sub> , V <sub>CE</sub> = 1.0 Vdc) (I <sub>C</sub> = 10 mA <sub>dc</sub> , V <sub>CE</sub> = 1.0 Vdc) (I <sub>C</sub> = 50 mA <sub>dc</sub> , V <sub>CE</sub> = 1.0 Vdc) (I <sub>C</sub> = 100 mA <sub>dc</sub> , V <sub>CE</sub> = 1.0 Vdc)	h <sub>FE</sub>	60 80 100 60 30	— — 300 — —	—
Collector-Emitter Saturation Voltage (I <sub>C</sub> = 10 mA <sub>dc</sub> , I <sub>B</sub> = 1.0 mA <sub>dc</sub> ) (I <sub>C</sub> = 50 mA <sub>dc</sub> , I <sub>B</sub> = 5.0 mA <sub>dc</sub> )	V <sub>CE(sat)</sub>	— —	0.25 0.4	Vdc
Base-Emitter Saturation Voltage (I <sub>C</sub> = 10 mA <sub>dc</sub> , I <sub>B</sub> = 1.0 mA <sub>dc</sub> ) (I <sub>C</sub> = 50 mA <sub>dc</sub> , I <sub>B</sub> = 5.0 mA <sub>dc</sub> )	V <sub>BE(sat)</sub>	0.65 —	0.85 0.95	Vdc

## SMALL-SIGNAL CHARACTERISTICS

Current-Gain — Bandwidth Product (I <sub>C</sub> = 10 mA <sub>dc</sub> , V <sub>CE</sub> = 20 Vdc, f = 100 MHz)	f <sub>T</sub>	250	—	MHz
Output Capacitance (V <sub>CB</sub> = 5.0 Vdc, I <sub>E</sub> = 0, f = 100 kHz)	C <sub>obo</sub>	—	4.5	pF
Input Capacitance (V <sub>BE</sub> = 0.5 Vdc, I <sub>C</sub> = 0, f = 100 kHz)	C <sub>ibo</sub>	—	10.0	pF
Input Impedance (I <sub>C</sub> = 1.0 mA <sub>dc</sub> , V <sub>CE</sub> = 10 Vdc, f = 1.0 kHz)	h <sub>ie</sub>	2.0	12	k ohms
Voltage Feedback Ratio (I <sub>C</sub> = 1.0 mA <sub>dc</sub> , V <sub>CE</sub> = 10 Vdc, f = 1.0 kHz)	h <sub>re</sub>	0.1	10	X 10 <sup>-4</sup>
Small-Signal Current Gain (I <sub>C</sub> = 1.0 mA <sub>dc</sub> , V <sub>CE</sub> = 10 Vdc, f = 1.0 kHz)	h <sub>fe</sub>	100	400	—

MOTOROLA SMALL-SIGNAL TRANSISTORS, FETs AND DIODES

2-224

T-27-09

**ELECTRICAL CHARACTERISTICS** (continued) ( $T_A = 25^\circ\text{C}$  unless otherwise noted.)

Characteristic	Symbol	Min	Max	Unit
Output Admittance ( $I_C = 1.0 \text{ mAdc}$ , $V_{CE} = 10 \text{ Vdc}$ , $f = 1.0 \text{ kHz}$ )	$h_{oe}$	3.0	60	$\mu\text{mhos}$
Noise Figure ( $I_C = 100 \mu\text{A}$ , $V_{CE} = 5.0 \text{ Vdc}$ , $R_S = 1.0 \text{ k ohm}$ , $f = 10 \text{ Hz to } 15.7 \text{ kHz}$ )	NF	—	4.0	dB
<b>SWITCHING CHARACTERISTICS</b>				
Delay Time	$t_d$	—	35	ns
Rise Time				
Storage Time	$t_s$	—	225	ns
Fall Time				

(1) Pulse Width  $\leq 300 \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .

