

MMBT3906

PNP General Purpose Amplifier

Features

- Collector current capability $I_C = -200 \text{ mA}$
- Collector-emitter voltage $V_{CEO} = -40 \text{ V}$
- RoHS compliant package

Application

- General switching and amplification

Mechanical Data

Case outline: SOT-23

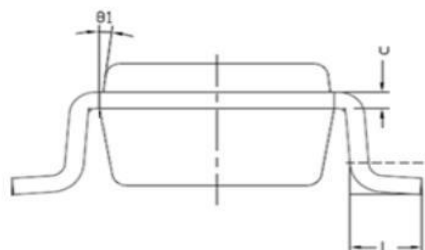
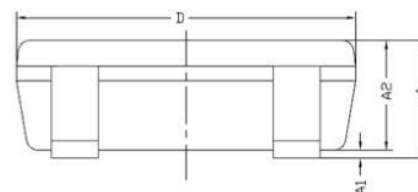
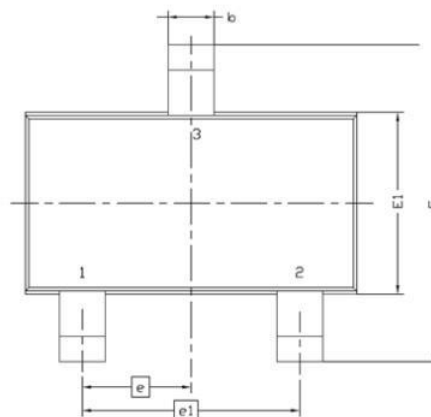
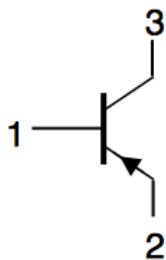
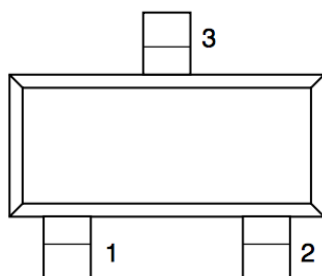
Packing & Order Information

3,000/Reel



RoHS
COMPLIANT

Graphic symbol



Symbol	MILLIMETERS	
	MIN	MAX
A	0.8	1.2
A1	0	0.1
A2	0.7	1.1
b	0.3	0.5
c	0.1	0.2
D	2.7	3.1
E	2.6	3
E1	1.4	1.8
e	0.95 BSC	
e1	1.9 BSC	
L	0.3	0.6
θ1	7° NOM	

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MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

MAXIMUM RATINGS

Symbol	Characteristic	Rating	Unit
V_{CBO}	Collector-Base Voltage	-40	Vdc
V_{CEO}	Collector-Emitter Voltage	-40	Vdc
V_{EBO}	Emitter-Base Voltage	-6	Vdc
I_C	Collector Current -Continuous	-200	mAdc

THERMAL CHARACTERISTICS

Symbol	Characteristic	Max	Unit
P_D	Total Device Dissipation	225	mW
	FR-5 Board(1)		
	TA=25°C	1.8	mW/°C
	Derate above 25°C		

THERMAL CHARACTERISTICS

Symbol	Characteristic	Rating	Unit
P_D	Total Device Dissipation	300	mW
	Alumina Substrate		
	TA=25°C	2.4	mW/°C
	Derate above 25°C		
$R_{\theta JA}$	Thermal Resistance Junction to Ambient	417	°C/W
T_J, T_{stg}	Junction and Storage Temperature	150°C, -55 to + 150°C	

ELECTRICAL CHARACTERISTICS @ Ta=25°C unless otherwise specified

OFF CHARACTERISTICS

Symbol	Characteristic	Min	Max	Unit
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage(3) ($I_C = -1.0\text{mAdc}$, $I_B = 0$)	-40	--	Vdc
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage ($I_C = -10\mu\text{Adc}$, $I_E = 0$)	-40	--	Vdc
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage ($I_E = -10\mu\text{Adc}$, $I_C = 0$)	-6.0	--	Vdc
I_{BEX}	Base Cutoff Current ($V_{CE} = -30\text{Vdc}$, $V_{EB} = -3.0\text{Vdc}$)	--	-50	nAdc
I_{CEX}	Collector Cutoff Current ($V_{CE} = -30\text{Vdc}$, $V_{EB} = -3.0\text{Vdc}$)	--	-50	nAdc

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ON CHARACTERISTICS

Symbol	Characteristic	Min	Max	Unit
h_{PE}	DC Current Gain			--
	$I_C = -0.1\text{mA}$ dc , $V_{CE} = -1.0\text{V}$ dc	40	--	
	$I_C = -1.0\text{mA}$ dc , $V_{CE} = -1.0\text{V}$ dc	70	--	
	$I_C = -10\text{mA}$ dc , $V_{CE} = -1.0\text{V}$ dc	100	300	
	$I_C = -50\text{mA}$ dc , $V_{CE} = -1.0\text{V}$ dc	60	--	
	$I_C = -100\text{mA}$ dc , $V_{CE} = -1.0\text{V}$ dc	30	--	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage ($I_C = -10\text{mA}$ dc , $V_B = -1.0\text{mA}$ dc)	--	-0.25	Vdc
	($I_C = -50\text{mA}$ dc , $V_B = -5.0\text{mA}$ dc)	--	-0.4	

ON CHARACTERISTICS

Symbol	Characteristic	Min	Max	Unit
$V_{CE(sat)}$	Base-Emitter Saturation Voltage			
	($I_C = -10\text{mA}$ dc , $V_B = -1.0\text{mA}$ dc)	-0.65	-0.85	Vdc
	($I_C = -50\text{mA}$ dc , $V_B = -5.0\text{mA}$ dc)	--	-0.95	

SMALL-SIGNAL CHARACTERISTICS

Symbol	Characteristic	Min	Max	Unit
f_T	Current-Gain-Bandwidth Product ($I_C = -10\text{mA}$ dc , $V_{CE} = -20\text{V}$ dc , $f = 100\text{MHz}$)	300	--	MHZ
C_{obo}	Output Capacitance ($V_{CB} = -5.0\text{V}$ dc , $I_E = 0$, $f = 1.0\text{MHz}$)	--	4.0	pF
C_{ibo}	Input Capacitance ($V_{EB} = -0.5\text{V}$ dc , $I_C = 0$, $f = 1.0\text{MHz}$)	--	8.0	pF
H_{ie}	Input Impedance ($V_{CE} = -10\text{V}$ dc , $I_C = -1.0\text{mA}$ dc , $f = 1.0\text{KHz}$)	1.0	10	k Ω
H_{re}	Voltage Feedback Ration ($V_{CE} = -10\text{V}$ dc , $I_C = -1.0\text{mA}$ dc , $f = 1.0\text{KHz}$)	0.5	8.0	$\times 10^{-4}$
H_{fe}	Small-Signal Current Gain ($V_{CE} = -10\text{V}$ dc , $I_C = -1.0\text{mA}$ dc , $f = 1.0\text{KHz}$)	100	400	--
H_{oe}	Output Admittance ($V_{CE} = -10\text{V}$ dc , $I_C = -1.0\text{mA}$ dc , $f = 1.0\text{KHz}$)	1.0	40	μmhos
NF	Noise Figure ($V_{CE} = -5.0\text{V}$ dc , $I_C = -100\mu\text{A}$ dc , $R_s = 1.0\text{k}\Omega$ $f = 1.0\text{KHz}$)	--	5.0	dB

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SMALL-SIGNAL CHARACTERISTICS

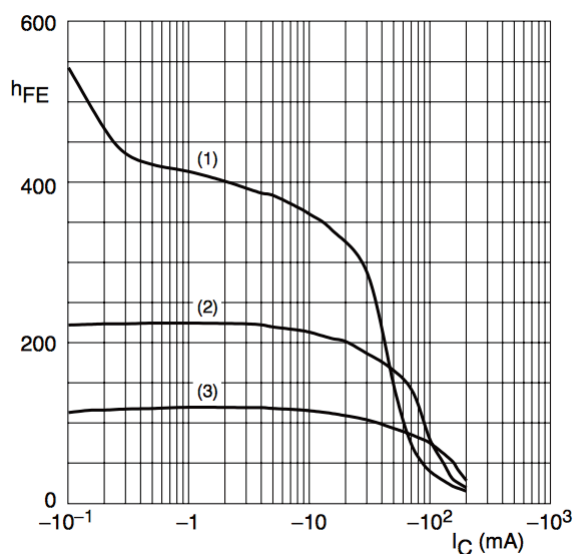
Symbol	Characteristic		Min	Max	Unit
t_d	Delay Time	$(V_{CC} = -3.0V_{dc}, V_{BE} = -0.5V_{dc}, I_C = -10mA_{dc}, I_{B1} = -1.0mA_{dc})$	--	35	ns
t_r	Rise Time		--	35	ns
t_s	Storage Time	$(V_{CC} = -3.0V_{dc}, I_C = -10 mA_{dc}, I_{B1} = I_{B2} = -1.0mA_{dc})$	--	225	ns
t_f	Fall Time		--	75	ns

1. FR-5=1.0 × 0.75 × 0.062in.
2. Alumina=0.4 × 0.3 × 0.024in. 99.5% alumina.
3. Pulse Width ≤ 300us,Duty Cycle ≤2.0%
4. Pulse Test : Pulse Width ≤ 300us ; Duty Cycle 2.0%

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Characteristics Curve

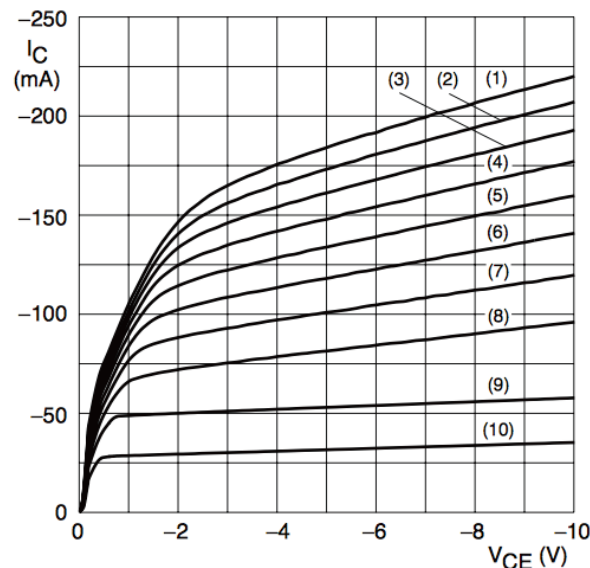


$V_{CE} = -1 \text{ V.}$

(1) $T_{amb} = 150 \text{ °C.}$

(2) $T_{amb} = 25 \text{ °C.}$

(3) $T_{amb} = -55 \text{ °C.}$



$T_{amb} = 25 \text{ °C.}$

(1) $I_B = -1.5 \text{ mA.}$

(5) $I_B = -0.9 \text{ mA.}$

(9) $I_B = -0.3 \text{ mA.}$

(2) $I_B = -1.35 \text{ mA.}$

(6) $I_B = -0.75 \text{ mA.}$

(10) $I_B = -0.15 \text{ mA.}$

(3) $I_B = -1.2 \text{ mA.}$

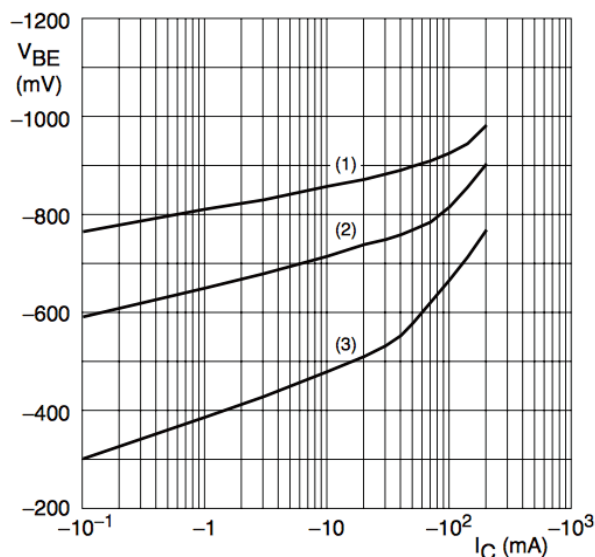
(7) $I_B = -0.6 \text{ mA.}$

(4) $I_B = -1.05 \text{ mA.}$

(8) $I_B = -0.45 \text{ mA.}$

FIG.1-DC current gain; typical values

FIG.2-Collector current as a function of collector-emitter voltage.

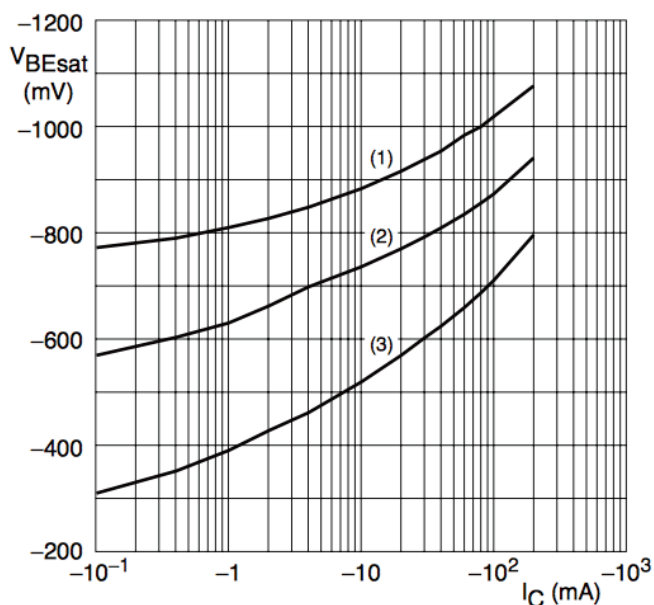


$V_{CE} = -1 \text{ V.}$

(1) $T_{amb} = -55 \text{ °C.}$

(2) $T_{amb} = 25 \text{ °C.}$

(3) $T_{amb} = 150 \text{ °C.}$



$I_C/I_B = 10.$

(1) $T_{amb} = -55 \text{ °C.}$

(2) $T_{amb} = 25 \text{ °C.}$

(3) $T_{amb} = 150 \text{ °C.}$

FIG.3-Base-emitter voltage as a function of collector current.

FIG.4-Base-emitter saturation voltage as a function of collector current.

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