MMBT3906

PNP General Purpose Amplifier

Features

- Collector current capability IC = -200 mA
- Collector-emitter voltage VCEO = -40 V
- RoHS compliant package

Application

- General switching and amplification

Mechanical Data

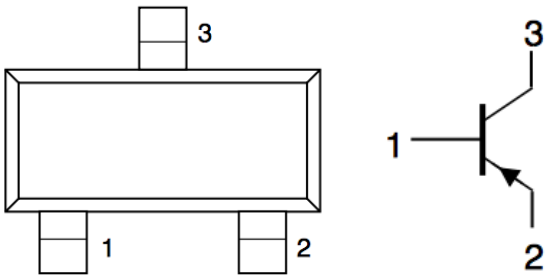
Case outline: SOT-23

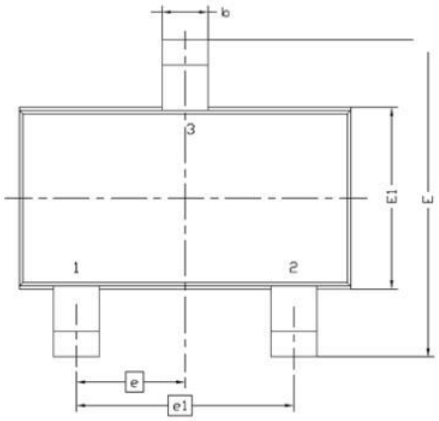
Packing & Order Information

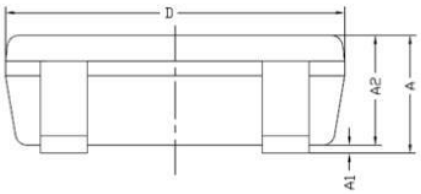
3,000/Reel

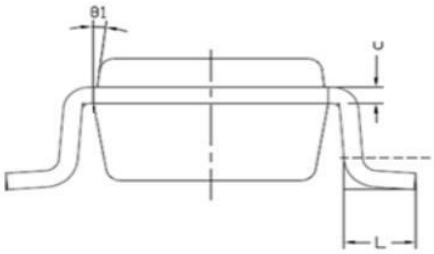
RoHS
COMPLIANT

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 FR-5 Board(1) TA=25°C Derate above 25°C	 225 1.8	 mW mW/°C

THERMAL CHARACTERISTICS			
Symbol	Characteristic	Rating	Unit
P_D	Total Device Dissipation Alumina Substrate TA=25°C Derate above 25°C	 300 2.4	 mW mW/°C
$R_{\theta JA}$	Thermal Resistance Junction to Ambient	417	°C/W
T_J,Tstg	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 = -1.0mAdc , I_B = 0)	-40	--	Vdc
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage (I_C = -10μAdc , I_E = 0)	-40	--	Vdc
$V_{(BR)CEO}$	Emitter-Base Breakdown Voltage (I_E = -10μAdc , I_C = 0)	-6.0	--	Vdc
I_{BEX}	Base Cutoff Current (V_{CE} = -30Vdc , V_{EB} = -3.0 Vdc)	--	-50	nAdc
I_{CEX}	Collector Cutoff Current (V_{CE}= -30Vdc , V_{EB} = -3.0 Vdc)	--	-50	nAdc

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

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

SMALL-SIGNAL CHARACTERISTICS				
Symbol	Characteristic	Min	Max	Unit
f_T	Current-Gain-Bandwidth Product (I_C = -10mAdc , V_{CE} = -20Vdc , f= 100MHz)	300	--	MHZ
C_{obo}	Output Capacitance (V_{CB} = -5.0Vdc , I_E = 0 , f = 1.0MHz)	--	4.0	pF
C_{ibo}	Input Capacitance (V_{EB} = -0.5Vdc , I_C=0 , f = 1.0MHz)	--	8.0	pF
Hie	Input Impedance (V_{CE} = -10Vdc , I_C= -1.0mAdc , f = 1.0KHz)	1.0	10	kΩ
Hre	Voltage Feedback Ration (V_{CE} = -10Vdc , I_C= -1.0mAdc , f = 1.0KHz)	0.5	8.0	$\times 10^{-4}$
Hfe	Small-Signal Current Gain (V_{CE} = -10Vdc , I_C= -1.0mAdc , f = 1.0KHz)	100	400	--
Hoe	Output Admittance (V_{CE} = -10Vdc , I_C= -1.0mAdc , f = 1.0KHz)	1.0	40	μmhos
NF	Noise Figure (V_{CE} = -5.0Vdc , I_C = -100μAdc , Rs = 1.0kΩf = 1.0KHz)	--	5.0	dB

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SMALL-SIGNAL CHARACTERISTICS					
Symbol	Characteristic		Min	Max	Unit
t_d	Delay Time	(V_{CC} = -3.0Vdc , V_{BE} = -0.5Vdc,	--	35	ns
t_r	Rise Time	I_C = -10mAdc , I_{B1} = -1.0mAdc)	--	35	ns
t_s	Storage Time	(V_{CC} = -3.0Vdc, I_C = -10 mAdc,	--	225	ns
t_f	Fall Time	I_{B1} = I_{B2} = -1.0mAdc)	--	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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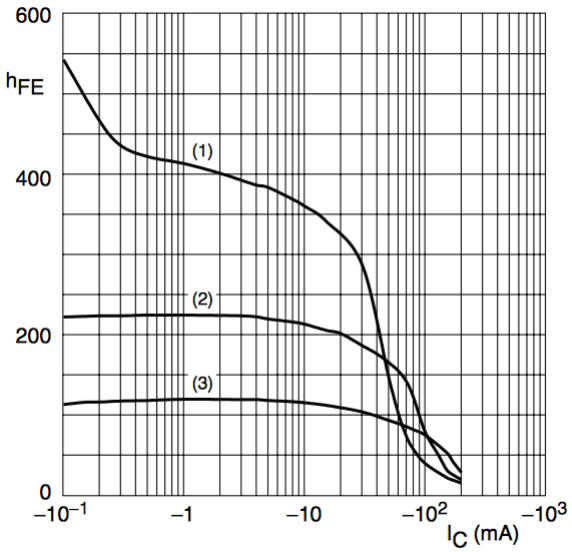
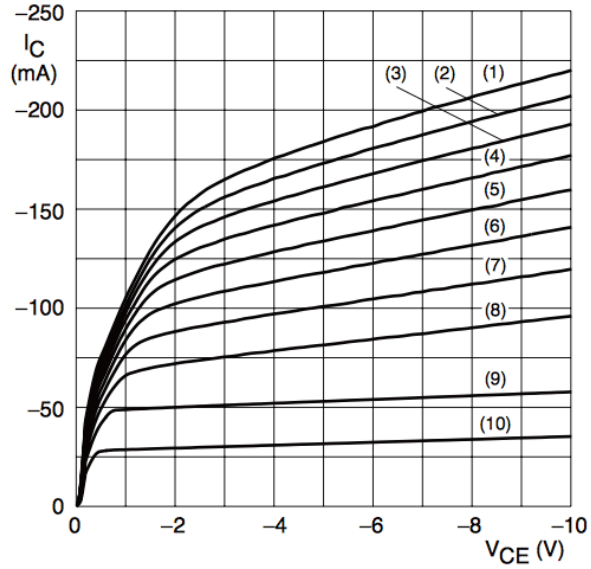
Characteristics Curve



V_{CE} = −1 V.
(1) T_{amb} = 150 °C.
(2) T_{amb} = 25 °C.
(3) T_{amb} = −55 °C.

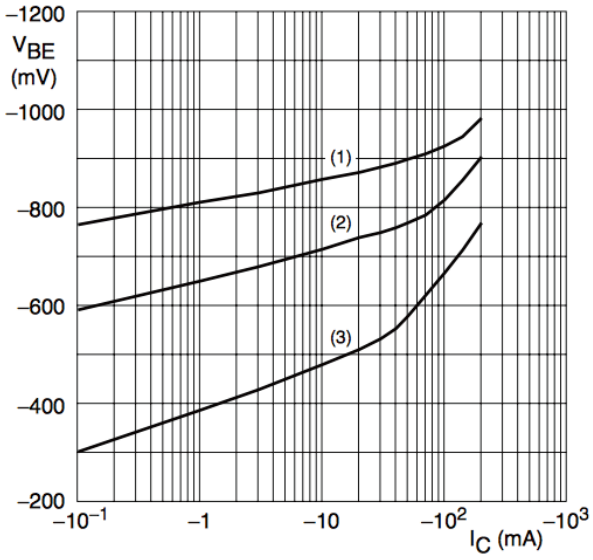
FIG.1-DC current gain; typical values



T_{amb} = 25 °C.

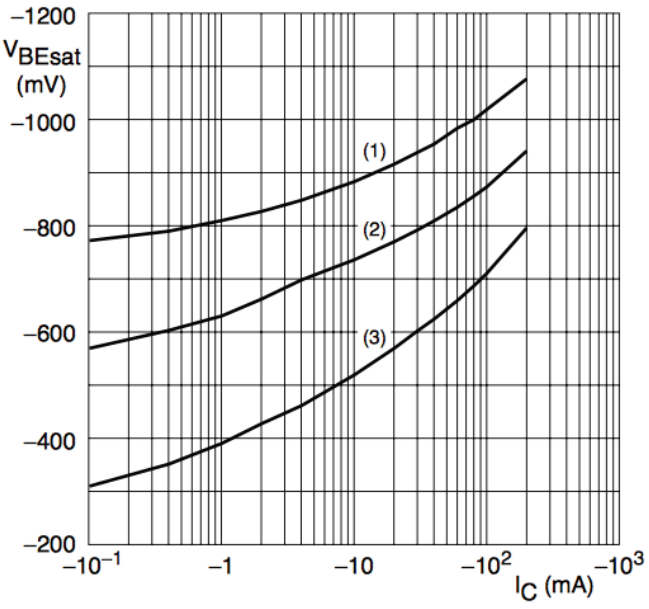
(1) I_B = −1.5 mA.
(2) I_B = −1.35 mA.
(3) I_B = −1.2 mA.
(4) I_B = −1.05 mA.
(5) I_B = −0.9 mA.
(6) I_B = −0.75 mA.
(7) I_B = −0.6 mA.
(8) I_B = −0.45 mA.
(9) I_B = −0.3 mA.
(10) I_B = −0.15 mA.

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



V_{CE} = −1 V.
(1) T_{amb} = −55 °C.
(2) T_{amb} = 25 °C.
(3) T_{amb} = 150 °C.

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



I_C/I_B = 10.
(1) T_{amb} = −55 °C.
(2) T_{amb} = 25 °C.
(3) T_{amb} = 150 °C.

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

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