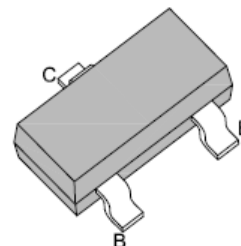


## SMD General Purpose Transistor (PNP)

### Features

- PNP Silicon Epitaxial Planar Transistor for Switching and Amplifier Applications
- RoHS compliance



SOT-23



### Mechanical Data

<b>Case:</b>	SOT-23, Plastic Package
<b>Terminals:</b>	Solderable per MIL-STD-202G, Method 208
<b>Weight:</b>	0.008 gram

### Maximum Ratings ( $T_{Ambient}=25^{\circ}C$ unless noted otherwise)

Symbol	Description	MMBT3906	Unit	Conditions
<b>V<sub>CEO</sub></b>	Collector-Emitter Voltage	-40	V	
<b>V<sub>CB0</sub></b>	Collector-Base Voltage	-40	V	
<b>V<sub>EB0</sub></b>	Emitter-Base Voltage	-5.0	V	
<b>I<sub>c</sub></b>	Collector Current	-200	mA	
<b>P<sub>D</sub></b>	Total Device Power Dissipation(Note 1)	225	mW	TA=25 °C
		1.8	mW/°C	Derate above 25 °C
<b>R<sub>θJA</sub></b>	Thermal Resistance, Junction to Ambient	556	°C /W	
<b>P<sub>D</sub></b>	Total Device Power Dissipation, Alumina Substrate (Note 2)	300	mW	TA=25 °C
		2.4	mW/°C	Derate above 25 °C
<b>R<sub>θJA</sub></b>	Thermal Resistance, Junction to Ambient	417	°C /W	
<b>T<sub>J</sub></b>	Junction Temperature	-55 to +150	°C	
<b>T<sub>STG</sub></b>	Storage Temperature Range	-55 to +150	°C	

**Note:** 1. FR-5 Board=25.4 x 19.05 x 1.58 mm (1.0 x 0.75 x 0.062 inches.)

2. Alumina Substrate=10.16 x 7.62 x 0.61 mm (0.4 x 0.3 x 0.024 inches.) 99.5% alumina.

# SMD General Purpose Transistor (PNP)

## MMBT3906

### Electrical Characteristics ( $T_{Ambient}=25^{\circ}C$ unless noted otherwise)

#### Off Characteristics

Symbol	Description	Min.	Max.	Unit	Conditions
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage (Pulse width $\leq 300\mu s$ , Duty Cycle $\leq 2.0\%$ )	-40	-	V	$I_C=-1mA, I_B=0$
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	-40	-	V	$I_C=-10\mu A, I_E=0$
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	-5.0	-	V	$I_E=-10\mu A, I_C=0$
$I_{BL}$	Base Cut-off Current	-	-50	nA	$V_{EB}=-3V, V_{CE}=-30V$
$I_{CEX}$	Collector Cut-off Current	-	-50	nA	$V_{EB}=-3V, V_{CE}=-30V$

#### On Characteristics

Symbol	Description	Min.	Max.	Unit	Conditions
$h_{FE}$	D.C. Current Gain	60	-		$V_{CE}=-1V, I_C=-0.1mA$
		80	-		$V_{CE}=-1V, I_C=-1mA$
		100	300		$V_{CE}=-1V, I_C=-10mA$
		60	-		$V_{CE}=-1V, I_C=-50mA$
		30	-		$V_{CE}=-1V, I_C=-100mA$
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	-	-0.25	V	$I_C=-10mA, I_B=-1mA$
		-	-0.4		$I_C=-50mA, I_B=-5mA$
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	-0.65	-0.85	V	$I_C=-10mA, I_B=-1mA$
		-	-0.95		$I_C=-50mA, I_B=-5mA$

#### Small-signal Characteristics

Symbol	Description	Min.	Max.	Unit	Conditions
$f_T$	Current Gain-Bandwidth Product	250	-	MHz	$V_{CE}=-20V, I_C=-10mA, f=100MHz$
$C_{OBO}$	Output Capacitance	-	4.5	pF	$V_{CB}=-5V, f=1.0MHz, I_E=0$
$C_{IBO}$	Input Capacitance	-	10	pF	$V_{EB}=-0.5V, f=1.0MHz, I_C=0$
$h_{ie}$	Input Impedance	2.0	12	kohms	$V_{CE}=-10V, I_C=-1mA, f=1kHz$
$h_{re}$	Voltage Feedback Ratio	0.1	10	$\times 10^{-4}$	$V_{CE}=-10V, I_C=-1mA, f=1kHz$
$h_{fe}$	Small-Signal Current Gain	100	400	-	$V_{CE}=10V, I_C=-1mA, f=1kHz$
$h_{oe}$	Output Admittance	3.0	60	UMHOS	$V_{CE}=-10V, I_C=-1mA, f=1kHz$
$NF$	Noise Figure	-	4.0	dB	$V_{CE}=-5V, I_C=-100\mu A, R_s=1.0kohms, f=1kHz$

# SMD General Purpose Transistor (PNP)

## MMBT3906

### Switching Characteristics

Symbol	Description	Min.	Max.	Unit	Conditions
$t_d$	Delay Time	-	35	ns	$V_{CC}=-3V, V_{BE}=0.5V$ $I_C=-10mA, I_{B1}=-1mA$
$t_r$	Rise Time	-	35		
$t_s$	Storage Time	-	225		$V_{CC}=-3V, I_C=-10mA,$ $I_{B1}= I_{B2}=-1mA$
$t_f$	Fall Time	-	75		

### Equivalent Test Circuit

Fig.1- Delay and Rise Time

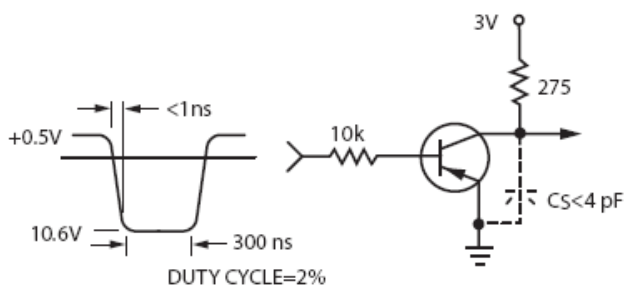
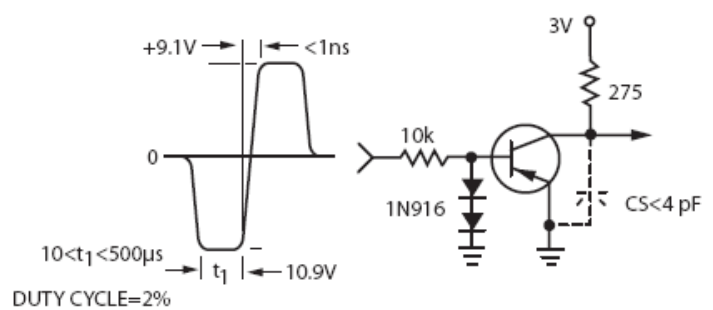


Fig.2- Storage and Fall Time



Total Shunt Capacitance of test jig and connectors

# SMD General Purpose Transistor (PNP)

## MMBT3906

Typical Characteristics Curves ( —  $T_J = 25^\circ\text{C}$  ---  $T_J = 125^\circ\text{C}$  )

Fig.3- Capacitance

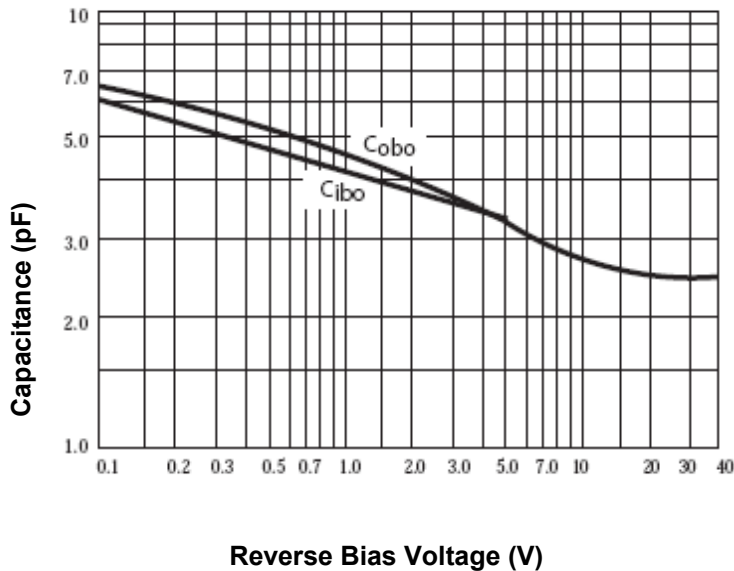


Fig.4- Charge Data

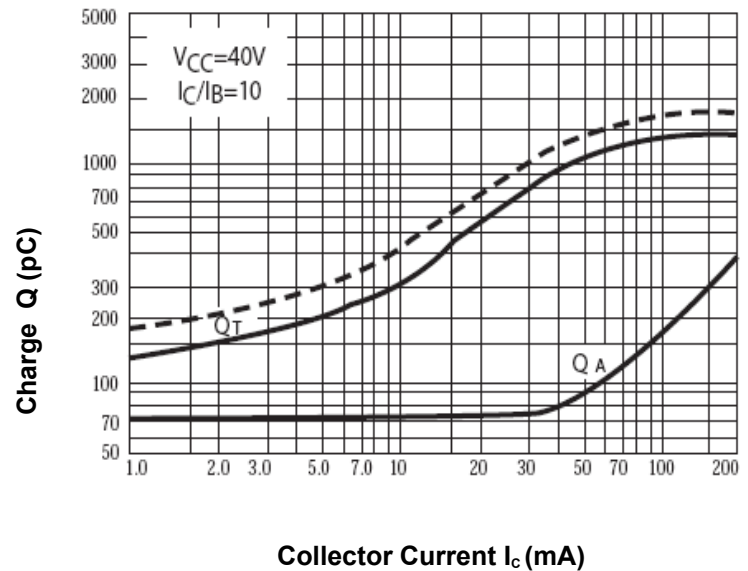


Fig.5- Turn-On Time

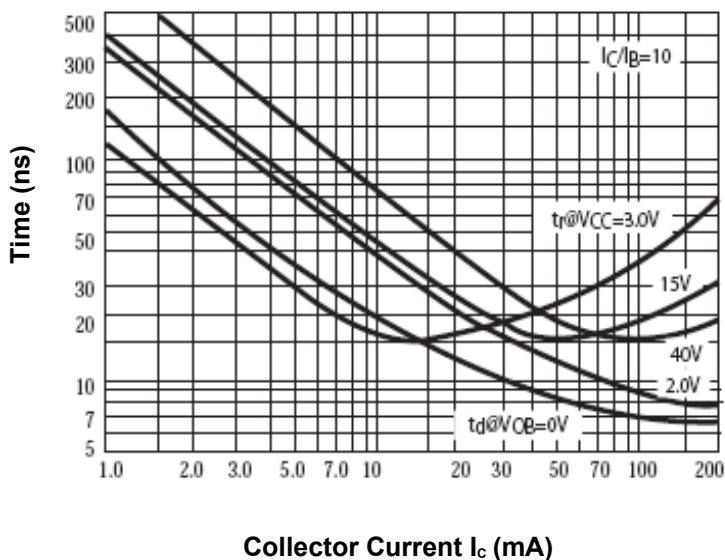
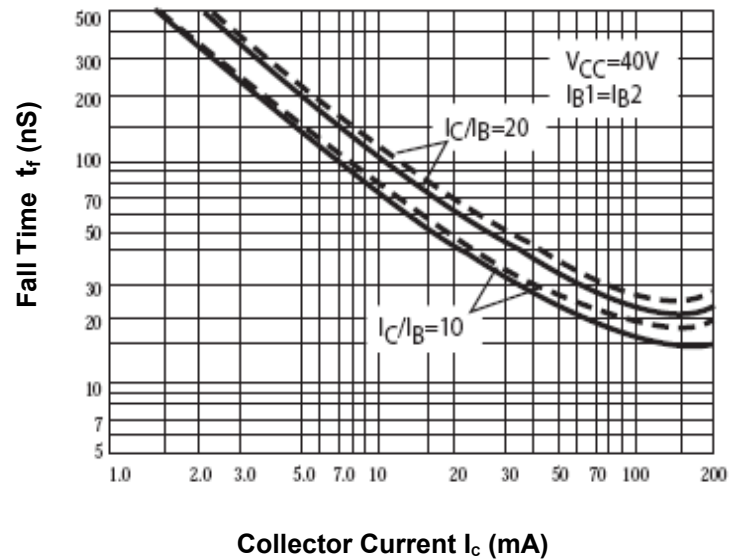


Fig.6- Fall Time



# SMD General Purpose Transistor (PNP)

## MMBT3906

### Typical Audio Small-Signal Characteristics Noise Figure Variations ( $V_{CE} = -5.0$ V, $T_A = 25^\circ\text{C}$ , Bandwidth = 1.0 Hz)

Fig.7- Noise Figure

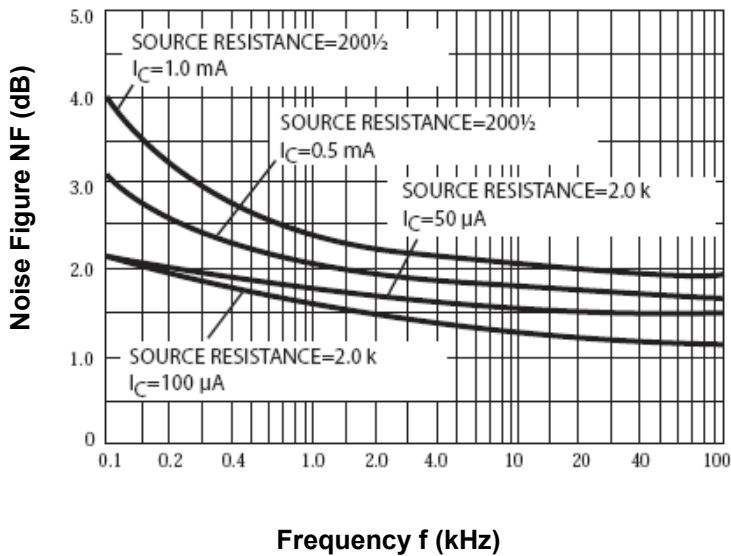
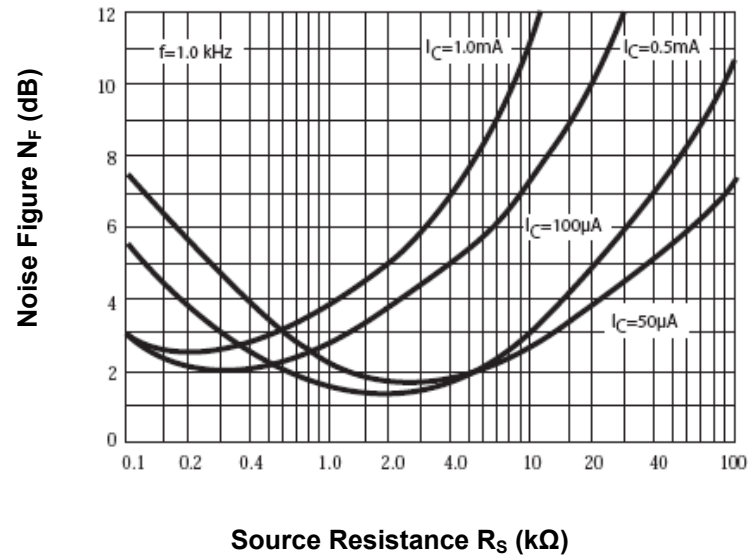


Fig.8- Noise Figure

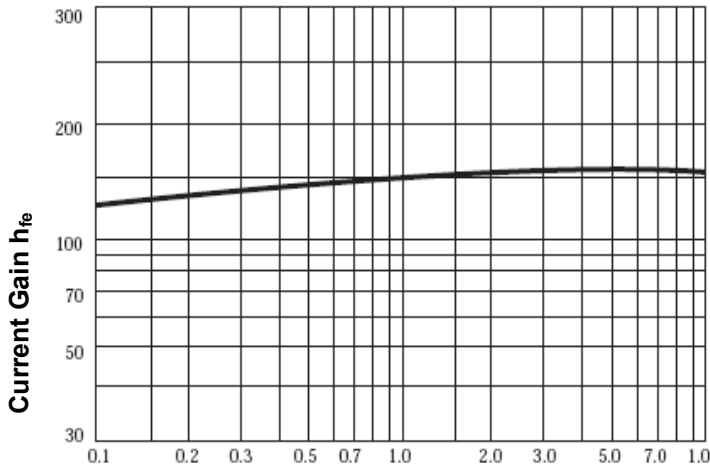


# SMD General Purpose Transistor (PNP)

## MMBT3906

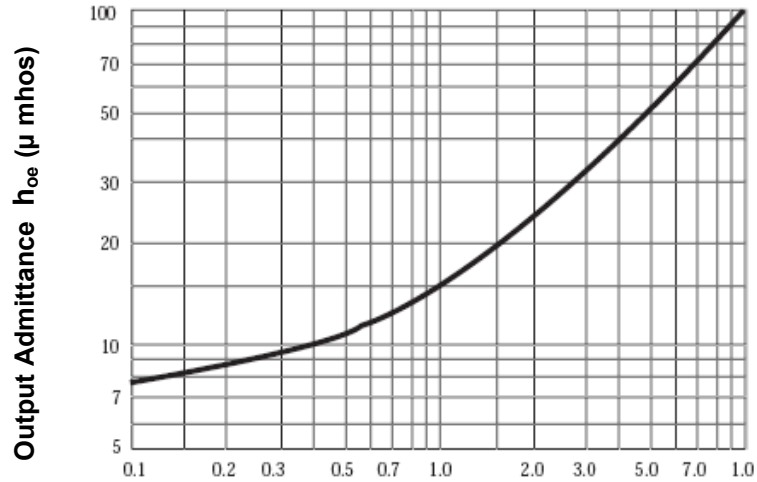
**h Parameters** ( $V_{CE}=-10V$ ,  $f=1.0kHz$ ,  $T_A=25^\circ C$ )

**Fig.9- Current Gain**



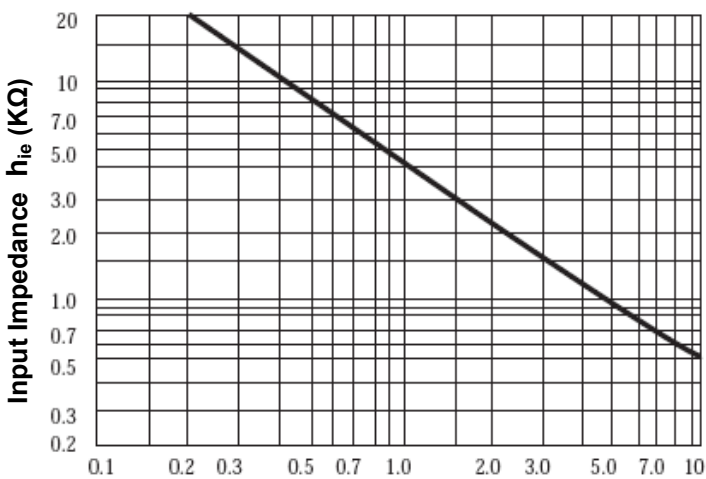
Collector Current  $I_c$  (mA)

**Fig.10- Output Admittance**



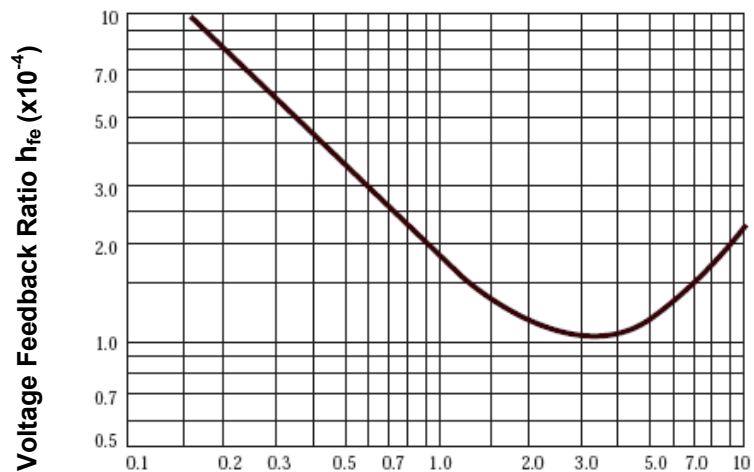
Collector Current  $I_c$  (mA)

**Fig.11- Input Impedance**



Collector Current  $I_c$  (mA)

**Fig.12- Voltage Feedback Ratio**



Collector Current  $I_c$  (mA)

# SMD General Purpose Transistor (PNP)

## MMBT3906

### Typical Static Characteristics

Fig.13- DC Current Gain

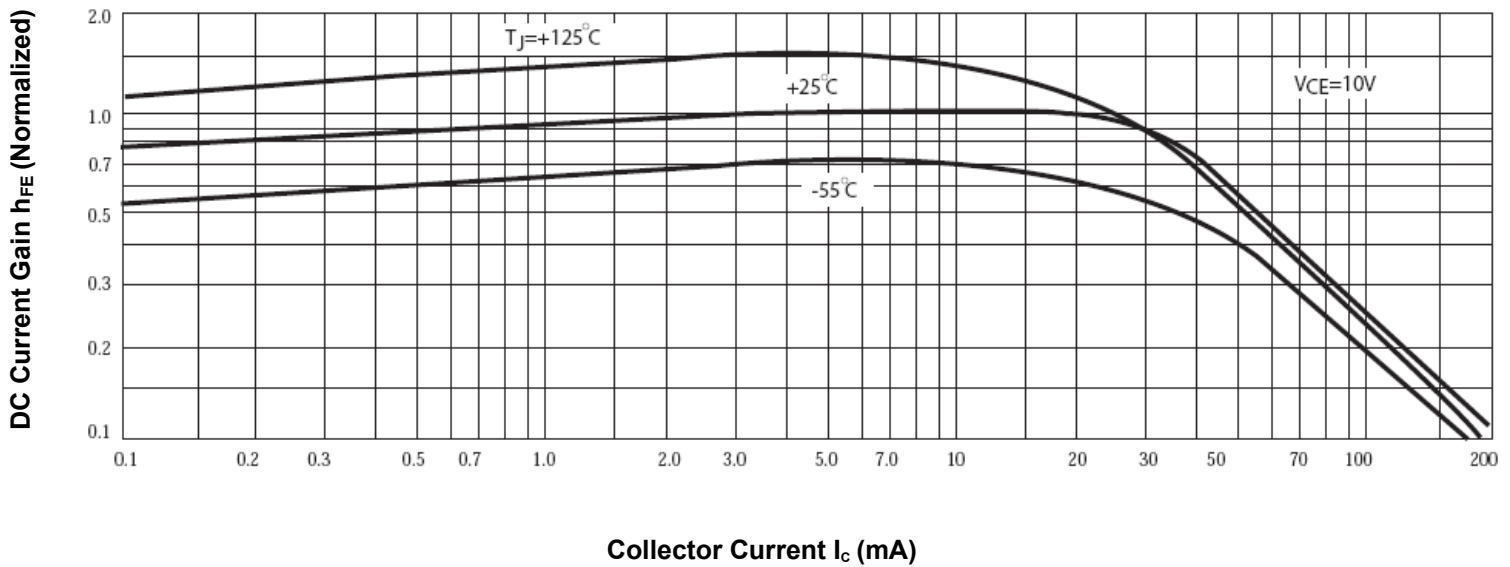
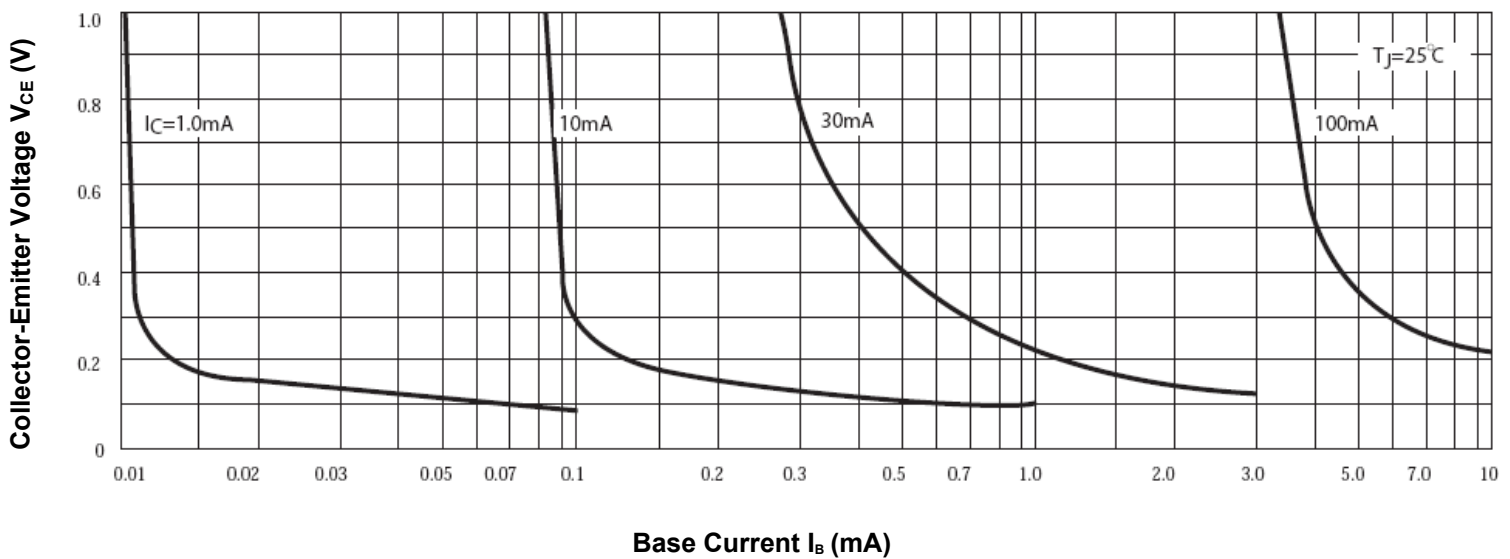


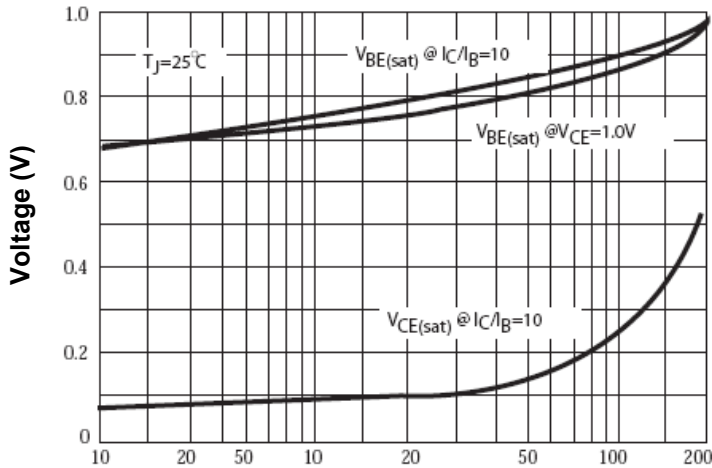
Fig.14- Collector Saturation Region



# SMD General Purpose Transistor (PNP)

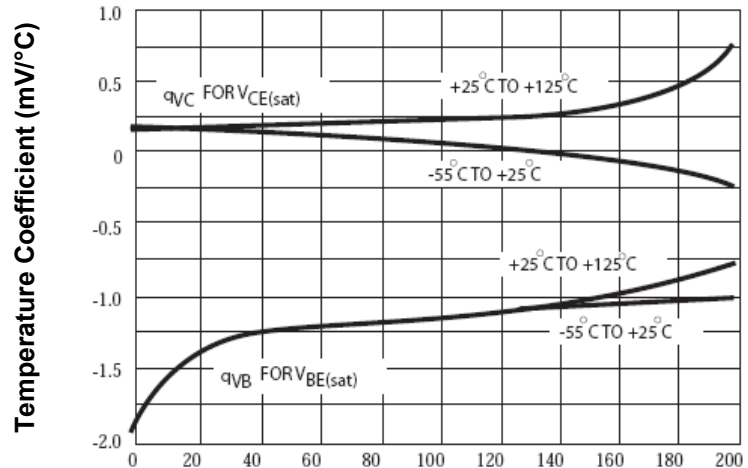
## MMBT3906

Fig.15- "On" Voltage



Collector Current  $I_c$  (mA)

Fig.16- Temperature Coefficients



Collector Current  $I_c$  (mA)

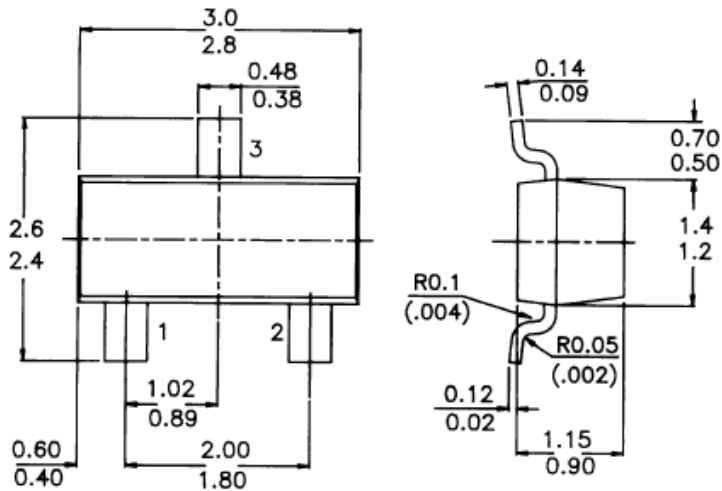
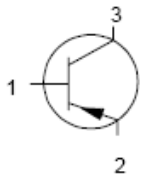
Device Marking: MMBT3906=2A

Dimensions in mm

SOT-23

Pin configuration

- 1 = BASE
- 2 = EMITTER
- 3 = COLLECTOR





# SMD General Purpose Transistor (PNP)

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MMBT3906

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