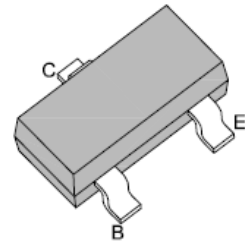
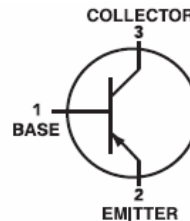


## SMD General Purpose Transistor (PNP)

### 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<sub>Ambient</sub>=25°C unless noted otherwise)*

Symbol	Description	MMBT4403	Unit
	Marking Code	2T	
<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>EBO</sub></b>	Emitter-Base Voltage	-5	V
<b>I<sub>c</sub></b>	Collector Current-Continuous	-600	mA

### Thermal Characteristics

Symbol	Description	MMBT4403	Unit
<b>P<sub>tot</sub></b>	Total Device Dissipation FR-5 Board, (Note 1) T <sub>A</sub> = 25°C	225	mW
	Derate above 25°C	1.8	mW/° C
<b>R<sub>θJA</sub></b>	Thermal Resistance from Junction to Ambient	556	° C/W
<b>P<sub>tot</sub></b>	Total Device Dissipation Alumina Substrate, (Note 2) T <sub>A</sub> = 25°C,	300	mW
	Derate above 25°C	2.4	mW/° C
<b>R<sub>θJA</sub></b>	Thermal Resistance from Junction to Ambient	417	° C/W
<b>T<sub>J</sub>, T<sub>STG</sub></b>	Junction and Storage Temperature Range	-55 to +150	° C

# SMD General Purpose Transistor (PNP)

## MMBT4403

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

#### Off Characteristics

Symbol	Description	MMBT4403		Unit	Conditions
		Min.	Max.		
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage (Note 3)	-40	-	V	$I_C=-1\text{mA}, I_B=0$
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	-40	-	V	$I_C=-100\mu\text{A}, I_E=0$
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	-5	-	V	$I_E=-100\mu\text{A}, I_C=0$
$I_{BEV}$	Base Cut-off Current	-	-0.1	$\mu\text{A}$	$V_{CE}=-35\text{V}, V_{EB}=-0.4\text{V}$
$I_{CEX}$	Collector Cut-off Current	-	-0.1	$\mu\text{A}$	$V_{CE}=-35\text{V}, V_{EB}=-0.4\text{V}$

#### On Characteristics

Symbol	Description	MMBT4403		Unit	Conditions
		Min.	Max.		
$h_{FE}$	D.C. Current Gain	30	-		$V_{CE}=-1\text{V}, I_C=-0.1\text{mA}$
		60	-		$V_{CE}=-1\text{V}, I_C=-1\text{mA}$
		100	-		$V_{CE}=-1\text{V}, I_C=-10\text{mA}$
		100	300		$V_{CE}=-2\text{V}, I_C=-150\text{mA},$ (Note 3)
		20	-		$V_{CE}=-2\text{V}, I_C=-500\text{mA},$ (Note 3)
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage (Note 3)	-	-0.4	V	$I_C=-150\text{mA}, I_B=-15\text{mA}$
		-	-0.75	V	$I_C=-500\text{mA}, I_B=-50\text{mA}$
$V_{BE(sat)}$	Base-Emitter Saturation Voltage (Note 3)	-0.75	-0.95	V	$I_C=-150\text{mA}, I_B=-15\text{mA}$
		-	-1.3	V	$I_C=-500\text{mA}, I_B=-50\text{mA}$

# SMD General Purpose Transistor (PNP)

## MMBT4403

### Small – Signal Characteristics

Symbol	Description	MMBT4403		Unit	Conditions
		Min.	Max.		
<b>f<sub>T</sub></b>	Current Gain-Bandwidth Product (Note 4)	200	-	MHz	V <sub>CE</sub> =-10V, I <sub>C</sub> =-20mA, f=100MHz
<b>C<sub>CB0</sub></b>	Collector-Base Capacitance	-	8.5	pF	V <sub>CB</sub> =-10V, I <sub>E</sub> =0, f=1MHz
<b>C<sub>EB0</sub></b>	Emitter-Base Capacitance	-	30	pF	V <sub>EB</sub> =-0.5V, I <sub>C</sub> =0, f=1MHz
<b>h<sub>ie</sub></b>	Input Impedance	1.5	15	kΩ	V <sub>CE</sub> =-10V, I <sub>C</sub> =-1mA, f=1KHz
<b>h<sub>re</sub></b>	Voltage Feedback Ratio	0.1	8	x10 <sup>-4</sup>	V <sub>CE</sub> =-10V, I <sub>C</sub> =-1mA, f=1KHz
<b>h<sub>fe</sub></b>	Small Signal Current Gain	60	500		V <sub>CE</sub> =-10V, I <sub>C</sub> =-1mA, f=1KHz
<b>h<sub>oe</sub></b>	Output Admittance	1	100	μS	V <sub>CE</sub> =-10V, I <sub>C</sub> =-1mA, f=1KHz

### Switching Characteristics

Symbol	Description	MMBT4403		Unit	Conditions
		Min.	Max.		
<b>t<sub>d</sub></b>	Delay Time	-	15	nS	V <sub>CC</sub> =-30V, V <sub>EB</sub> =-2V, I <sub>C</sub> =-150mA, I <sub>B1</sub> =-15mA
<b>t<sub>r</sub></b>	Rise Time	-	20	nS	
<b>t<sub>s</sub></b>	Storage Time	-	225	nS	V <sub>CC</sub> =-30V, I <sub>C</sub> =-150mA, I <sub>B1</sub> =I <sub>B2</sub> =-15mA
<b>t<sub>f</sub></b>	Fall Time	-	30	nS	

- Note:**
- FR-5=1.0x0.75x0.062 in.
  - Alumina=0.4x0.3x0.024 in, 99.5% alumina.
  - Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2.0%.
  - f<sub>T</sub> is defined as the frequency at which h<sub>fe</sub> x trapolates to unity.

# SMD General Purpose Transistor (PNP)

## MMBT4403

Typical Characteristics Curves (— 25°C    - - - 105°C)

### Switching Time Test Circuits

Fig.1-Turn-On Time

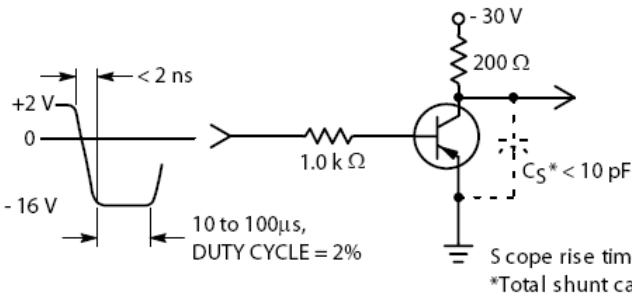


Fig.2-Turn-Off Time

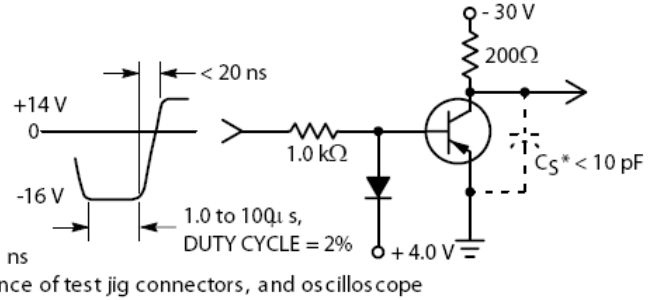


Fig.3- Capacitance

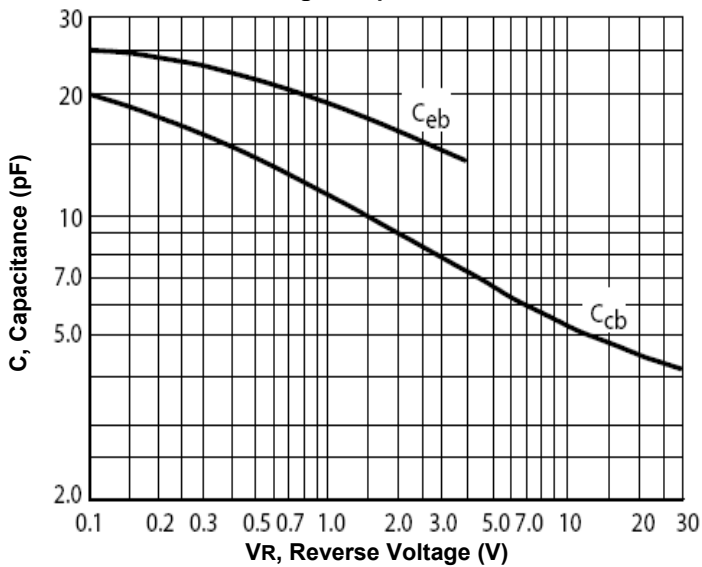
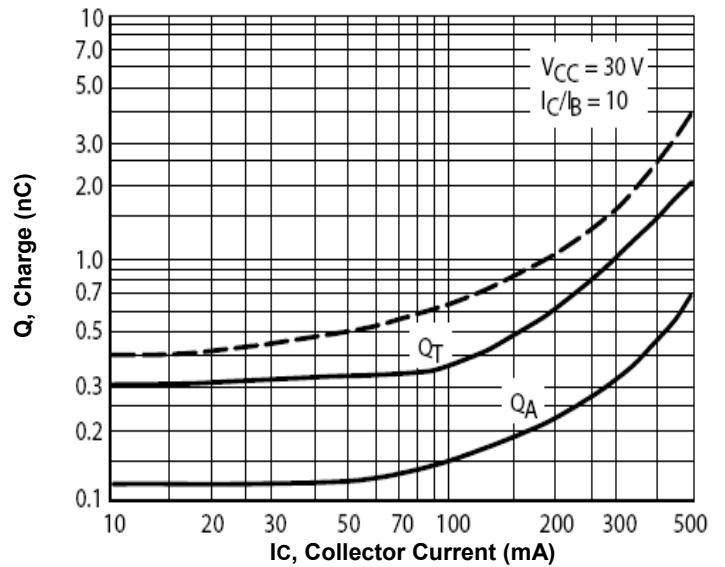


Fig.4- Charge Data



# SMD General Purpose Transistor (PNP)

## MMBT4403

Fig.5- Turn-On Time

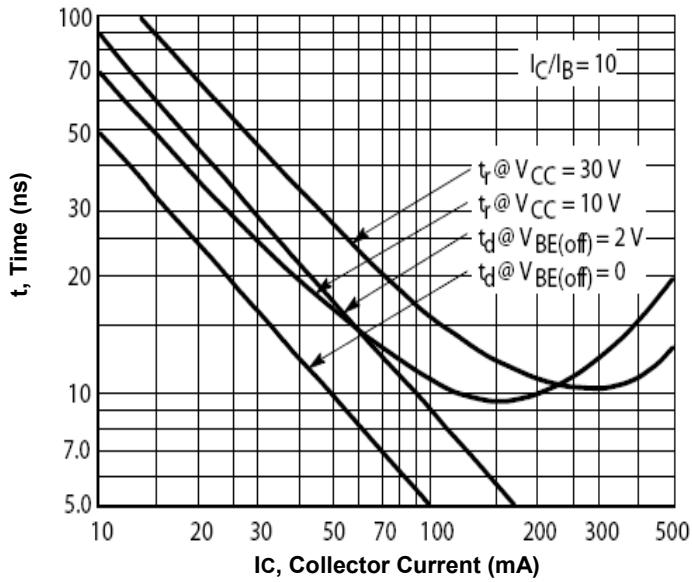


Fig.6- Rise Time

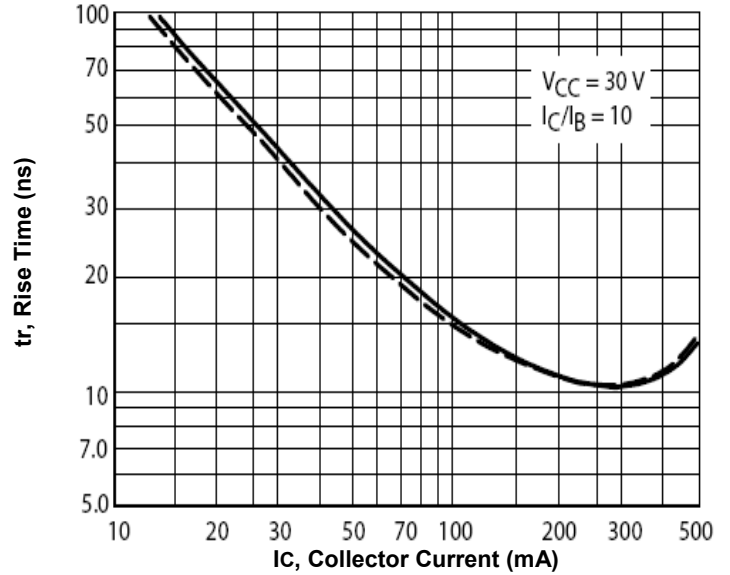
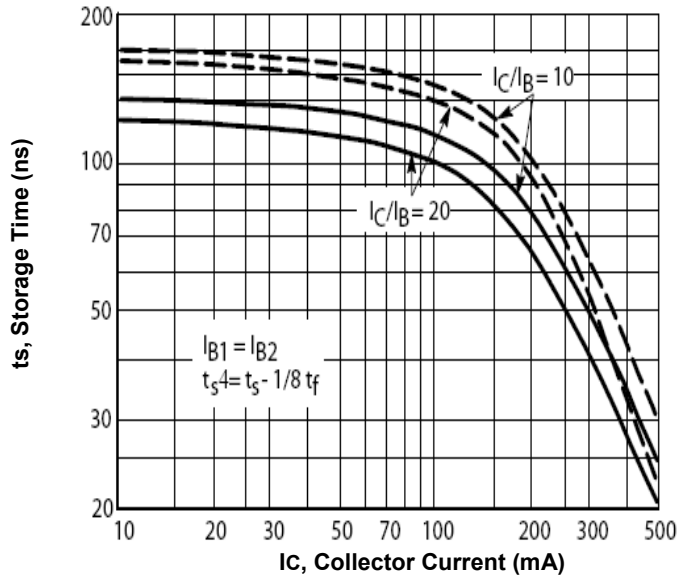


Fig.7- Storage Time



# SMD General Purpose Transistor (PNP)

## MMBT4403

### h PARAMETERS

$V_{CE} = \pm 10 \text{ Vdc}$ ,  $f = 1 \text{ kHz}$ ,  $T_A = 25^\circ \text{ C}$

This group of graphs illustrates the relationship between  $h_{fe}$  and other h parameters for this series of transistors. To obtain these curves, a high±gain and a low±gain unit were selected from the MMBT4403 lines, and the same units were used to develop the correspondingly±numbered curves on each graph.

Fig.8- Current-Gain

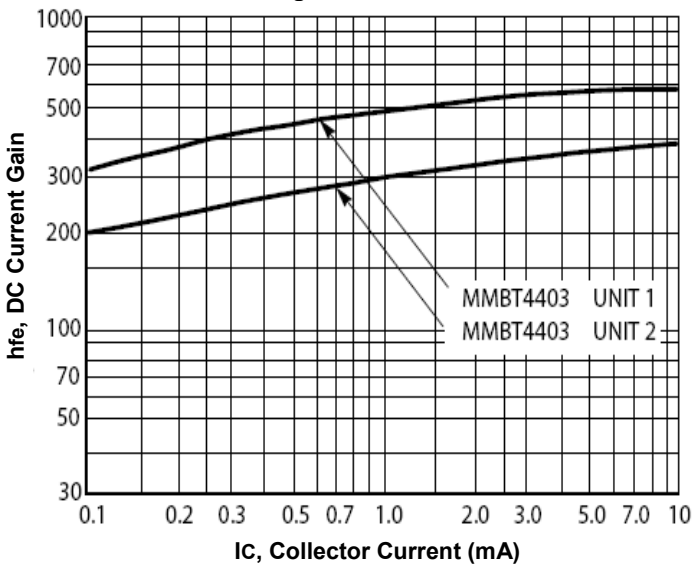


Fig.9- Input Impedance

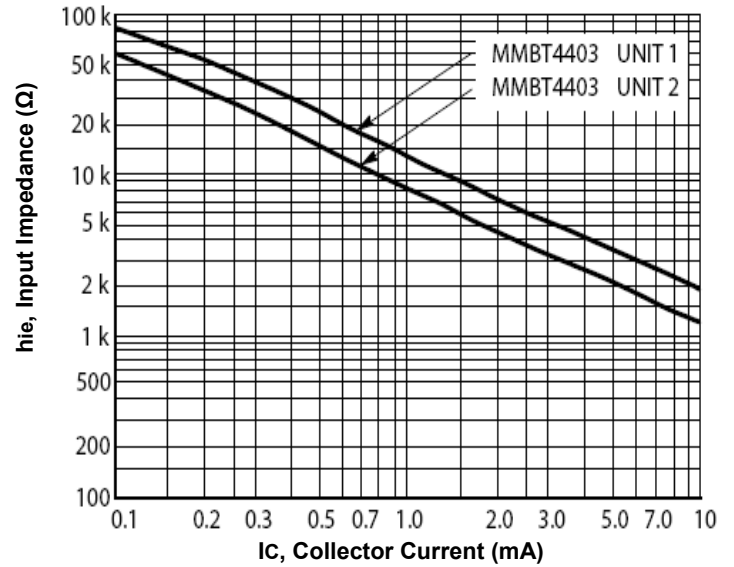


Fig.10- Voltage Feedback Ratio

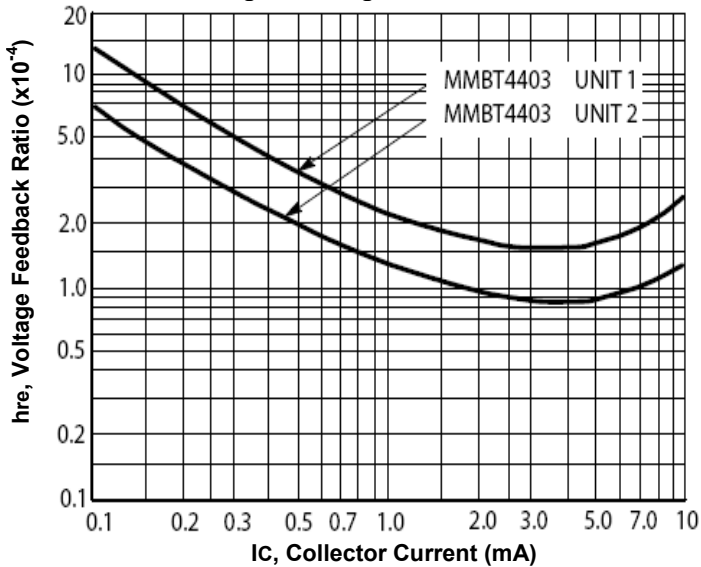
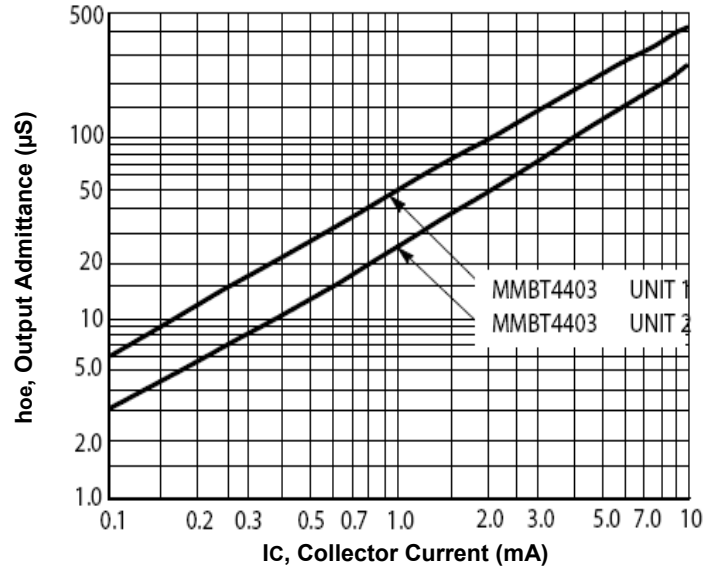


Fig.11- Output Admittance



# SMD General Purpose Transistor (PNP)

## MMBT4403

Fig.12- DC Current Gain

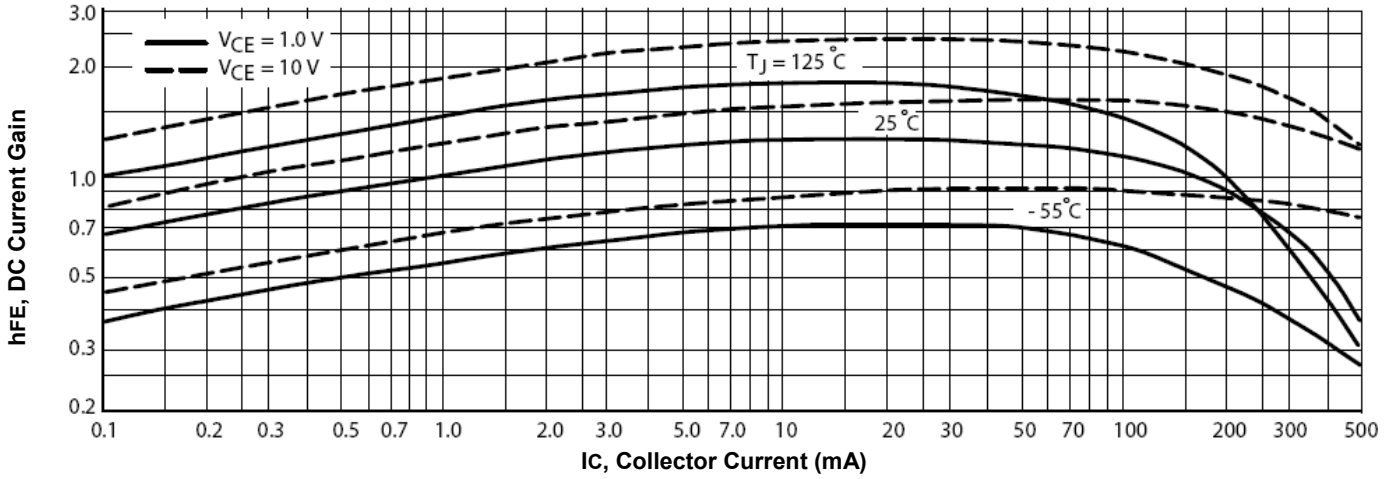
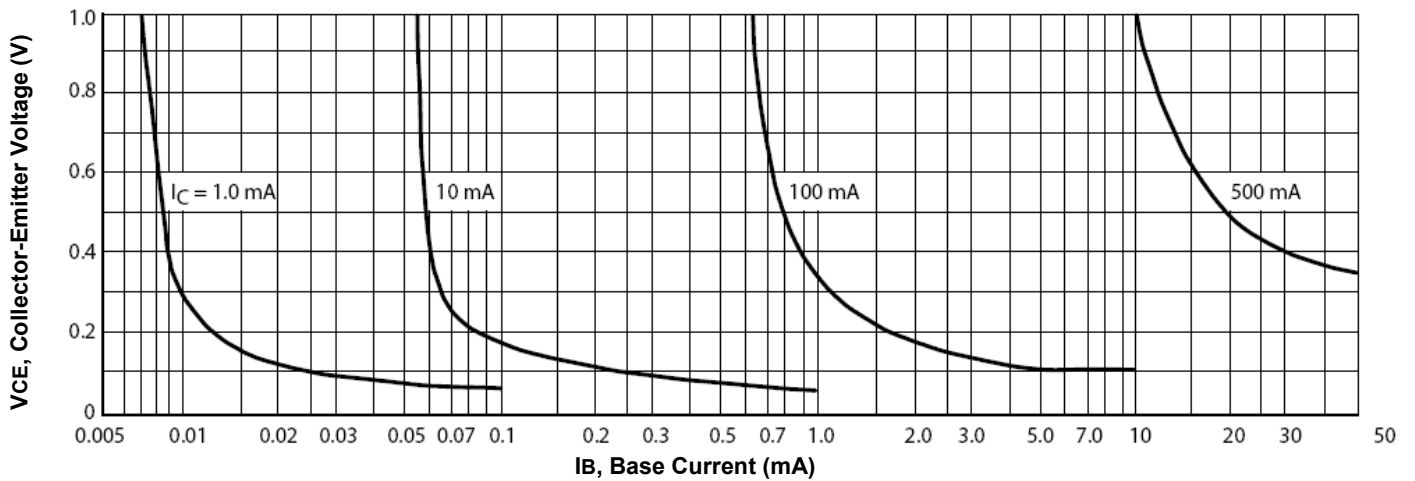


Fig.13- Collector Saturation Region



# SMD General Purpose Transistor (PNP)

## MMBT4403

Fig.14- "ON" Voltages

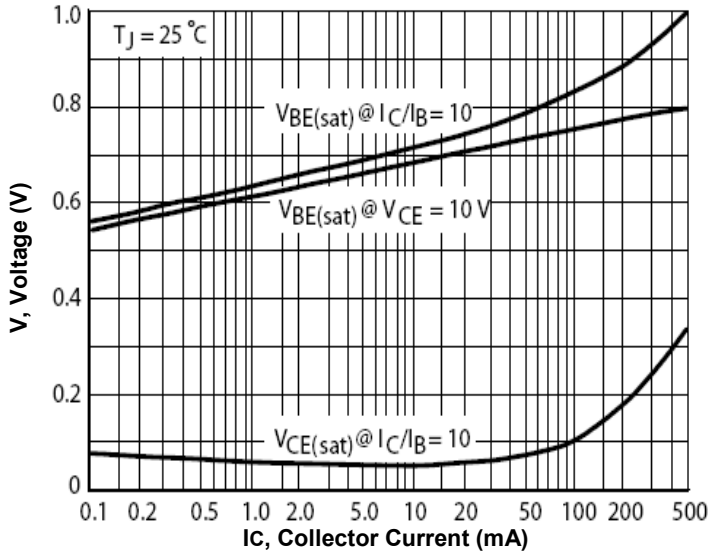
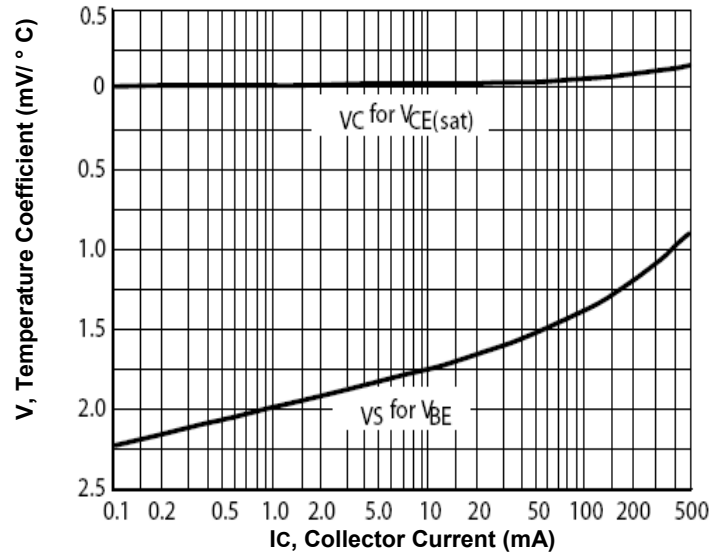
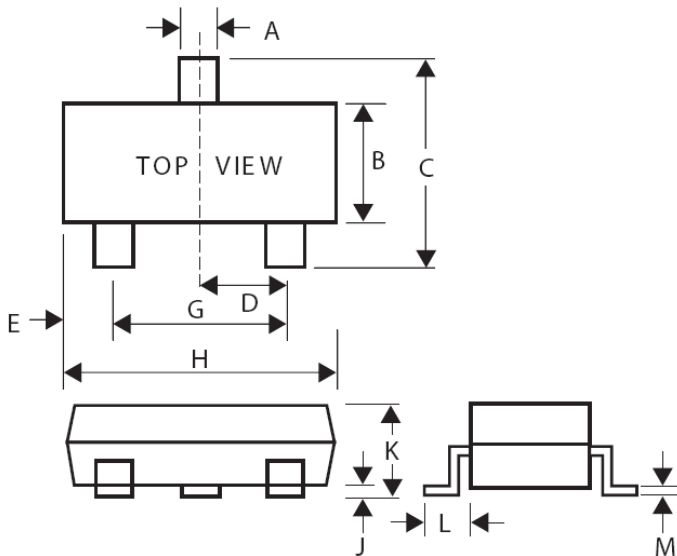


Fig.15- Temperature Coefficient



### Dimensions in mm

### SOT-23



Dim	Min	Max
A	0.35	0.51
B	1.19	1.80
C	2.10	3.00
D	0.85	1.05
E	0.46	1.00
G	1.70	2.10
H	2.70	3.10
J	0.01	0.13
K	0.89	1.60
L	0.30	0.61
M	0.076	0.25



# SMD General Purpose Transistor (PNP)

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**MMBT4403**

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