



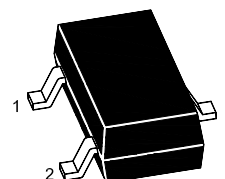
# MMBT9013

## NPN Transistor

### Features

- For Switching and Amplifier Applications.
- As Complementary Type of the PNP Transistor MMBT9012 is Recommended.

SOT-23  
(TO-236)



1.Base 2.Emitter 3.Collector

### Absolute Maximum Ratings

Ratings at 25°C ambient temperature unless otherwise specified.

Parameter	Symbol	Value	Unit
Collector Base Voltage	$V_{CB0}$	40	V
Collector Emitter Voltage	$V_{CE0}$	30	V
Emitter Base Voltage	$V_{EB0}$	5	V
Collector Current	$I_C$	500	mA
Power Dissipation	$P_D$	200	mW
Junction Temperature	$T_J$	150	°C
Storage Temperature Range	$T_{STG}$	-55 to 150	°C

### Electrical Characteristics

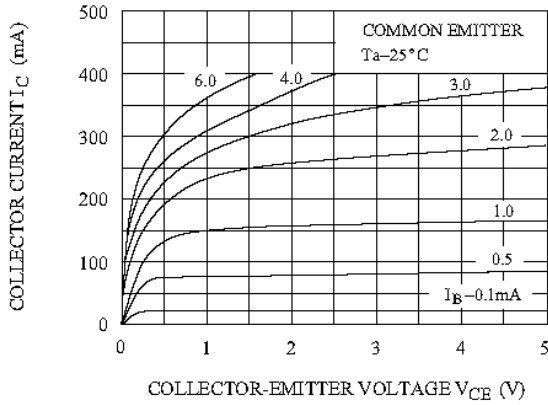
Ratings at 25°C ambient temperature unless otherwise specified.

Parameter	Symbol	Min.	Typ.	Max.	Unit
DC Current Gain at $V_{CE} = 1\text{ V}$ , $I_C = 50\text{ mA}$ Current Gain Group    G H	$H_{FE}$	100 160 40	- - -	250 400 -	
Collector Base Cutoff Current at $V_{CB} = 35\text{ V}$	$I_{CB0}$	-	-	100	nA
Collector Base Cutoff Current at $V_{CB} = 5\text{ V}$	$I_{EB0}$	-	-	100	nA
Emitter Base Breakdown Voltage at $I_C = 100\ \mu\text{A}$	$V_{(BR)CBO}$	40	-	-	V
Collector Emitter Breakdown Voltage at $I_C = 1\text{ mA}$	$V_{(BR)CEO}$	30	-	-	V
Emitter Base Breakdown Voltage at $I_E = 100\ \mu\text{A}$	$V_{(BR)EBO}$	5	-	-	V
Collector Emitter Saturation Voltage at $I_C = 500\text{ mA}$ , $I_B = 50\text{ mA}$	$V_{CE(sat)}$	-	-	0.6	V
Base Emitter Saturation Voltage at $I_C = 500\text{ mA}$ , $I_B = 50\text{ mA}$	$V_{BE(sat)}$	-	-	1	V
Base Emitter Voltage at $V_{CE} = 1\text{ V}$ , $I_C = 100\text{ mA}$	$V_{BE}$	-	-	1	V
Transition Frequency at $V_{CE} = 6\text{ V}$ , $I_C = 20\text{ mA}$	$F_T$	-	100	-	MHz

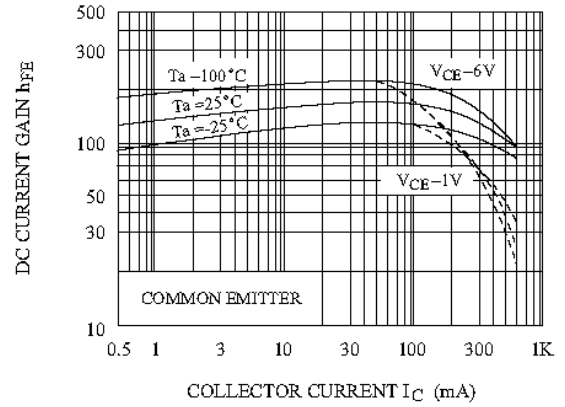


### Electrical Characteristics Curves

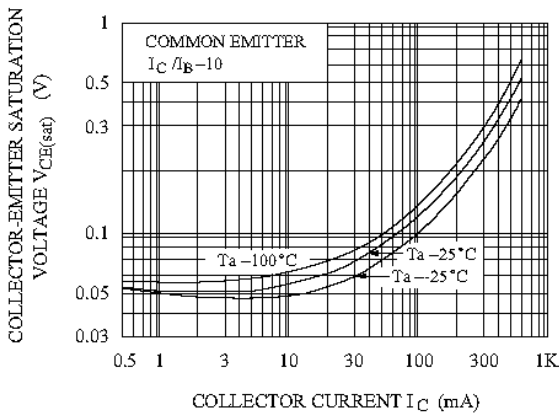
$I_C - V_{CE}$   
(LOW VOLTAGE REGION)



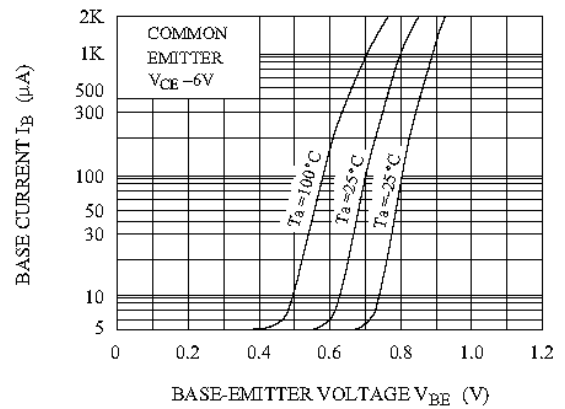
$h_{FE} - I_C$



$V_{CE(sat)} - I_C$

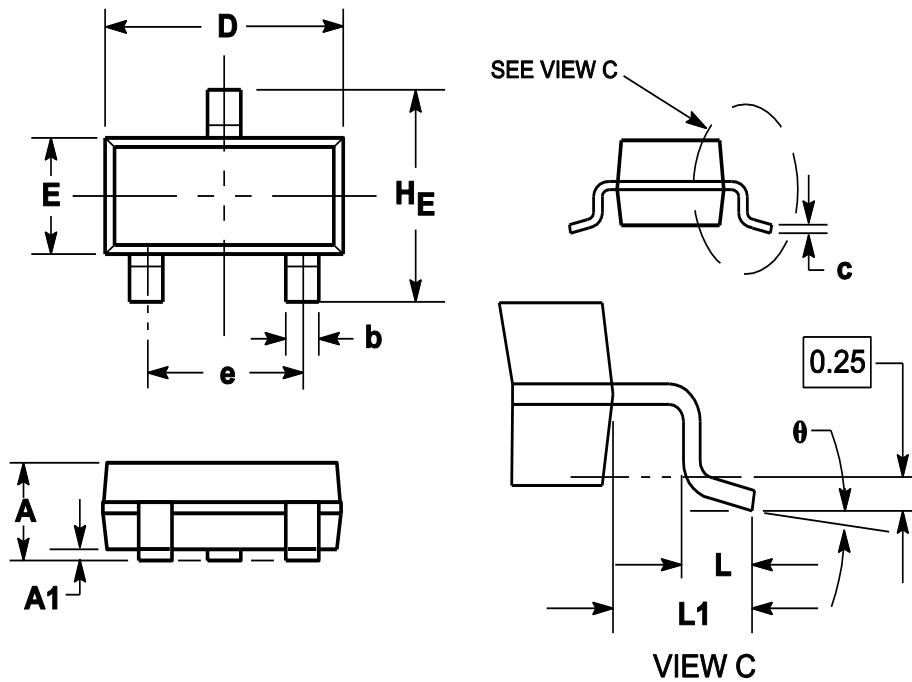


$I_B - V_{BE}$





### Package Outline(SOT-23)



Symbol	Dimensions in millimeter		
	Min.	Typ.	Max.
A	0.900	1.025	1.150
A1	0.000	0.050	0.100
b	0.300	0.400	0.500
c	0.080	0.115	0.150
D	2.800	2.900	3.000
E	1.200	1.300	1.400
HE	2.250	2.400	2.550
e	1.800	1.900	2.000
L1	0.550REF		
L	0.300		0.500
θ	0°		8°

Device	Package	Reel Dimension (inch)	Shipping
MMBT9013	SOT-23	7	3,000