

TO-92 Plastic-Encapsulate Transistors

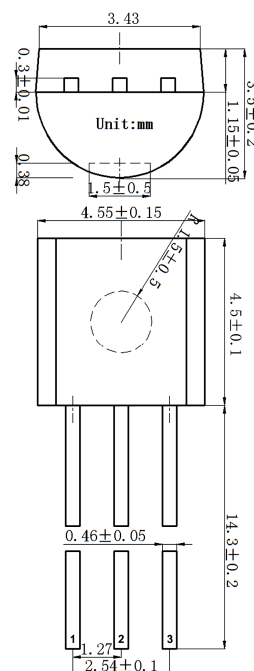
NPN Transistors

Features

- NPN silicon epitaxial planar transistor for switching and Amplifier applications.
- As complementary type, the PNP transistor 2N3906 is Recommended.
- This transistor is also available in the SOT-23 case with the type designation MMBT3904.

Maximum Ratings ($T_a=25^{\circ}\text{C}$ unless otherwise noted)

Symbol	Parameter	Value	Unit
V_{CB0}	Collector Base Voltage	60	V
V_{CE0}	Collector Emitter Voltage	40	V
V_{EB0}	Emitter Base Voltage	6	V
I_C	Collector Current	100	mA
P_C	Collector Power Dissipation	450	mW
T_j	Junction Temperature	150	$^{\circ}\text{C}$
T_{stg}	Storage Temperature	-55 ~ +150	$^{\circ}\text{C}$



1. Emitter
2. Base
3. Collector

Electrical Characteristics ($T_a=25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
$V_{(BR)CBO}$	Collector-base breakdown voltage	$I_C = 10\mu\text{A}$, $I_E = 0$	60			V
$V_{(BR)CEO}$	Collector-emitter breakdown voltage	$I_C = 1\text{mA}$, $I_B = 0$	40			V
$V_{(BR)EBO}$	Emitter-base breakdown voltage	$I_E = 10\mu\text{A}$, $I_C = 0$	6			V
I_{CBO}	Collector cut-off current	$V_{CB} = 60\text{V}$, $I_E = 0$			100	nA
I_{CEO}	Collector cut-off current	$V_{CE} = 40\text{V}$, $I_B = 0$			100	nA
I_{EBO}	Emitter cut-off current	$V_{EB} = 5\text{V}$, $I_C = 0$			100	nA
$h_{FE(1)}$	DC current gain	$V_{CE} = 5\text{V}$, $I_C = 1\text{mA}$	100		400	
$h_{FE(2)}$		$V_{CE} = 1\text{V}$, $I_C = 10\text{mA}$	100			
$h_{FE(3)}$		$V_{CE} = 1\text{V}$, $I_C = 50\text{mA}$	60			
$h_{FE(4)}$		$V_{CE} = 1\text{V}$, $I_C = 100\text{mA}$	30			
$V_{CE(sat)}$	Collector-emitter saturation voltage	$I_C = 50\text{mA}$, $I_B = 5\text{mA}$			0.3	V
$V_{BE(sat)}$	Base-emitter saturation voltage	$I_C = 50\text{mA}$, $I_B = 5\text{mA}$			0.95	V
f_T	Transition frequency	$V_{CE}=20\text{V}$, $I_C=10\text{mA}$, $f=100\text{MHz}$	300			MHz
t_d	Delay time	$V_{CC} = 3\text{V}$, $V_{BE} = 0.5\text{V}$, $I_C = 10\text{mA}$, $I_{B1} = 1\text{mA}$			35	ns
t_r	Rise time				35	ns
t_s	Storage time	$V_{CC} = 3\text{V}$, $I_C = 10\text{mA}$ $I_{B1} = I_{B2} = 1\text{mA}$			200	ns
t_f	Fall time				50	ns



Typical Characteristics

