



DONGGUAN NANJING ELECTRONICS LTD.,

TO-92 Plastic-Encapsulate Transistors

2N3904 TRANSISTOR (NPN)

FEATURE

- 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)

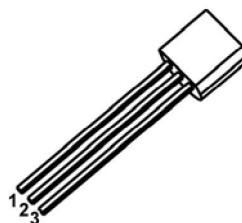
Symbol	Parameter	Value	Unit
V_{CBO}	Collector-Base Voltage	60	V
V_{CEO}	Collector-Emitter Voltage	40	V
V_{EBO}	Emitter-Base Voltage	6	V
I_{C}	Collector Current -Continuous	0.2	A
P_{C}	Collector Power Dissipation	0.625	W
T_{J}	Junction Temperature	150	$^{\circ}\text{C}$
T_{stg}	Storage Temperature	-55-150	$^{\circ}\text{C}$

TO-92

1. EMITTER

2. BASE

3. COLLECTOR



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

Parameter	Symbol	Test conditions	Min	Typ	Max	Unit
Collector-base breakdown voltage	$V_{(\text{BR})\text{CBO}}$	$I_{\text{C}}=10\mu\text{A}$, $I_{\text{E}}=0$	60			V
Collector-emitter breakdown voltage	$V_{(\text{BR})\text{CEO}}$	$I_{\text{C}}=1\text{mA}$, $I_{\text{B}}=0$	40			V
Emitter-base breakdown voltage	$V_{(\text{BR})\text{EBO}}$	$I_{\text{E}}=10\mu\text{A}$, $I_{\text{C}}=0$	6			V
Collector cut-off current	I_{CBO}	$V_{\text{CB}}=60\text{V}$, $I_{\text{E}}=0$			0.1	μA
Collector cut-off current	I_{CEO}	$V_{\text{CE}}=40\text{V}$, $I_{\text{B}}=0$			0.1	μA
Emitter cut-off current	I_{EBO}	$V_{\text{EB}}=5\text{V}$, $I_{\text{C}}=0$			0.1	μA
DC current gain	h_{FE1}	$V_{\text{CE}}=1\text{V}$, $I_{\text{C}}=10\text{mA}$	100		400	
	h_{FE2}	$V_{\text{CE}}=1\text{V}$, $I_{\text{C}}=50\text{mA}$	60			
	h_{FE3}	$V_{\text{CE}}=1\text{V}$, $I_{\text{C}}=100\text{mA}$	30			
Collector-emitter saturation voltage	$V_{\text{CE(sat)}}$	$I_{\text{C}}=50\text{mA}$, $I_{\text{B}}=5\text{mA}$			0.3	V
Base-emitter saturation voltage	$V_{\text{BE(sat)}}$	$I_{\text{C}}=50\text{mA}$, $I_{\text{B}}=5\text{mA}$			0.95	V
Transition frequency	f_{T}	$V_{\text{CE}}=20\text{V}$, $I_{\text{C}}=10\text{mA}$, $f=100\text{MHz}$	300			MHz
Delay Time	t_{d}	$V_{\text{CC}}=3\text{V}$, $V_{\text{BE}}=0.5\text{V}$, $I_{\text{C}}=10\text{mA}$, $I_{\text{B1}}=1\text{mA}$			35	ns
Rise Time	t_{r}				35	ns
Storage Time	t_{s}	$V_{\text{CC}}=3\text{V}$, $I_{\text{C}}=10\text{mA}$			200	ns
Fall Time	t_{f}	$I_{\text{B1}}=I_{\text{B2}}=1\text{mA}$			50	ns

CLASSIFICATION OF h_{FE1}

Rank	O	Y	G
Range	100-200	200-300	300-400

Typical Characteristics

2N3904

