

TO-92 Plastic-Encapsulate Transistors

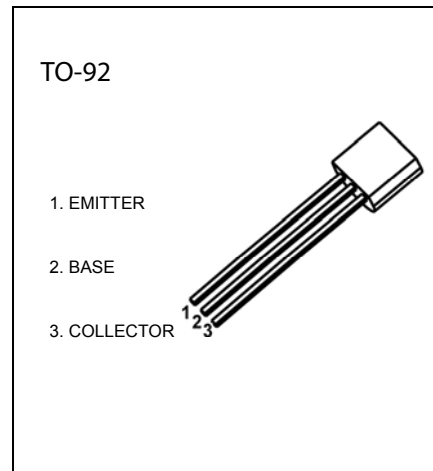
2N3904G TRANSISTOR (NPN)

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	Units
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	$^{\circ}\text{C}$



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

Parameter	Symbol	Test conditions	Min	Typ	Max	Unit
Collector-base breakdown voltage	$V_{(BR)CBO}$	$I_C=10\mu\text{A}, I_E=0$	60			V
Collector-emitter breakdown voltage	$V_{(BR)CEO}$	$I_C=1\text{mA}, I_B=0$	40			V
Emitter-base breakdown voltage	$V_{(BR)EBO}$	$I_E=10\mu\text{A}, I_C=0$	6			V
Collector cut-off current	I_{CBO}	$V_{CB}=60\text{V}, I_E=0$			0.1	μA
Collector cut-off current	I_{CEX}	$V_{CE}=30\text{V}, V_{BE(off)}=3\text{V}$			0.05	μA
Emitter cut-off current	I_{EBO}	$V_{EB}=5\text{V}, I_C=0$			0.1	μA
DC current gain	h_{FE1}	$V_{CE}=1\text{V}, I_C=10\text{mA}$	100		400	
	h_{FE2}	$V_{CE}=1\text{V}, I_C=50\text{mA}$	60			
	h_{FE3}	$V_{CE}=1\text{V}, I_C=100\text{mA}$	30			
Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_C=50\text{mA}, I_B=5\text{mA}$			0.3	V
Base-emitter saturation voltage	$V_{BE(sat)}$	$I_C=50\text{mA}, I_B=5\text{mA}$			0.95	V
Transition frequency	f_T	$V_{CE}=20\text{V}, I_C=10\text{mA}, f=100\text{MHz}$	300			MHz
Delay time	t_d	$V_{CC}=3\text{V}, V_{BE}=0.5\text{V}, I_C=10\text{mA}, I_{B1}=1\text{mA}$			35	ns
Rise time	t_r				35	ns
Storage time	t_s	$V_{CC}=3\text{V}, I_C=10\text{mA}$			200	ns
Fall time	t_f	$I_{B1}=I_{B2}=1\text{mA}$			50	ns

CLASSIFICATION OF h_{FE1}

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