TO-92 Plastic-Encapsulate Transistors

2N3904 TRANSISTOR（ NPN ）

TO—92

1.EMITTER

2.BASE

3. COLLECTOR

1 2 3

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 MMBT3904LT1**

MAXIMUM RATINGS* T_A=25℃ 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 Dissipation	0.625	W
T_J, T_{stg}	Junction and Storage Temperature	-55-150	℃

ELECTRICAL CHARACTERISTICS（Tamb=25℃ unless otherwise specified）

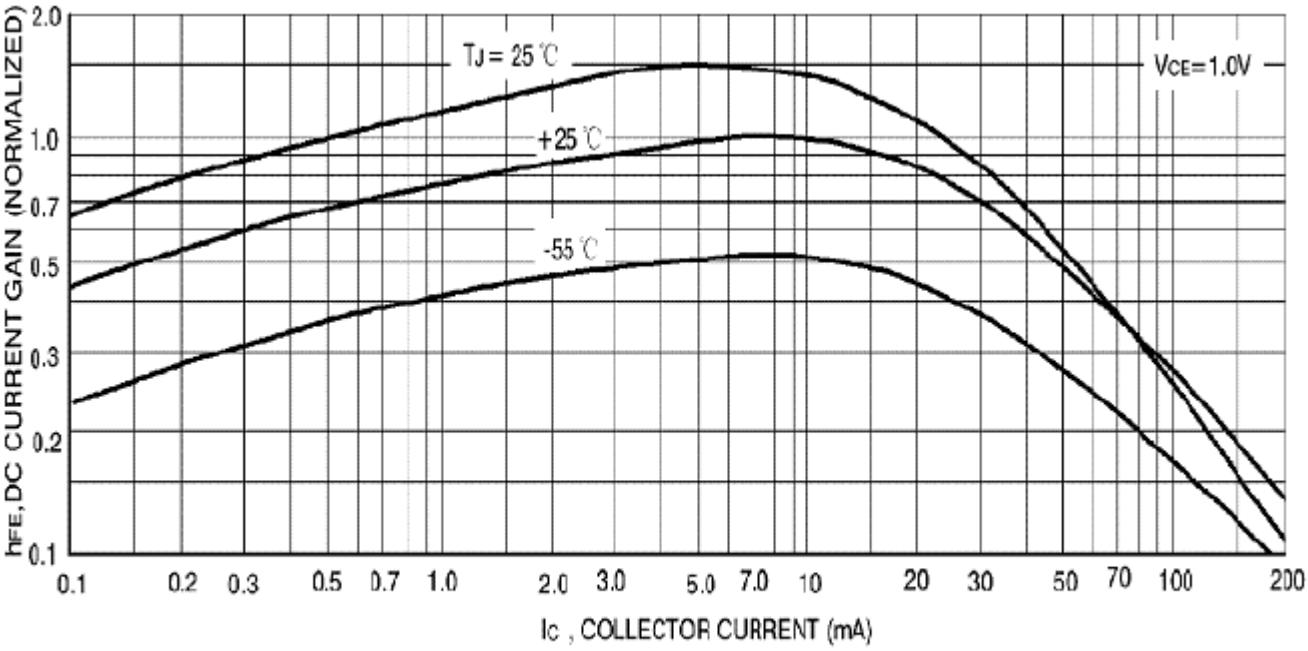
Parameter	Symbol	Test conditions	MIN	TYP	MAX	UNIT
Collector-base breakdown voltage	$V(BR)_{CBO}$	Ic=10μA， I_E=0	60			V
Collector-emitter breakdown voltage	$V(BR)_{CEO}$	I_C= 1 mA， I_B=0	40			V
Emitter-base breakdown voltage	$V(BR)_{EBO}$	I_E= 10μA， I_C=0	6			V
Collector cut-off current	I_{CBO}	V_{CB}=60 V， I_E=0			0.1	μA
Collector cut-off current	I_{CEO}	V_{CE}= 40 V， I_B=0			0.1	μA
Emitter cut-off current	I_{EBO}	V_{EB}= 5 V， I_C=0			0.1	μA
DC current gain	h_{FE}（1）	V_{CE}=1 V, I_C=0.1mA	40			
	h_{FE}（2）	V_{CE}=1 V, I_C=1mA	70			
	h_{FE}（3）	V_{CE}=1 V, I_C=10mA	100		400	
	h_{FE}（4）	V_{CE}=1 V, I_C=50mA	60			
	h_{FE}（5）	V_{CE}=1 V, I_C=100mA	30			
Collector-emitter saturation voltage	$V_{CE(sat)}$	I_C=10 mA, I_B=1 mA			0.2	V
		I_C=50 mA, I_B=5 mA			0.3	V
Base-emitter saturation voltage	$V_{BE(sat)}$	I_C= 10 mA, I_B=1 mA			0.85	V
		I_C=50 mA, I_B= 5 mA	0.65		0.95	V
Output capacitance	Cobo	V_{CB}=5V,I_E=0,f=100KHz			4	pF
Input Capacitance	Cibo	V_{EB}=0.5V,I_E=0,f=100KHz			8	pF
Noise figure	NF	V_{CE}=5V,I_C=100μA, f=1KHz,RS=1KΩ			5	dB
Transition frequency	f_T	V_{CE}= 20 V, I_C= 10mA f = 100MHz	300			MHz

Delay Time	td	Vcc=3V,V_{BE}=0.5V,			35	ns
Rise Time	tr	Ic=10mA,I_{B1}=1mA			35	ns
Storage Time	ts	Vcc=3V, Ic=10mA			200	ns
Fall Time	tf	I_{B1}=I_{B2}=1mA			50	ns

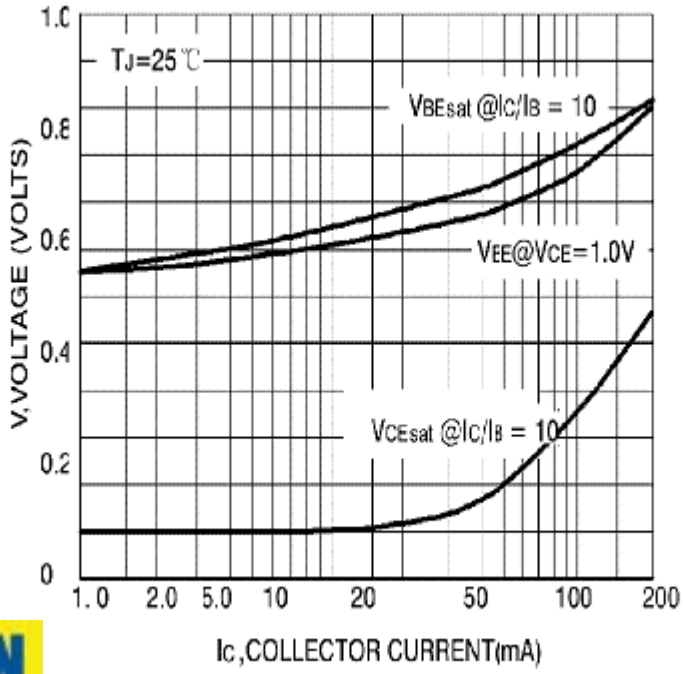
CLASSIFICATION OF $h_{FE(3)}$

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

Typical Characteristics 2N3904



DC CURRENT GAIN



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