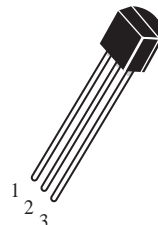


**NPN General Purpose Transistors**

**(Pb)** Lead(Pb)-Free

**TO-92**


1. EMITTER  
2. BASE  
3. COLLECTOR

**ABSOLUTE MAXIMUM RATINGS (Ta=25°C)**

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V <sub>CEO</sub>	40	Vdc
Collector-Base Voltage	V <sub>CBO</sub>	60	Vdc
Emitter-Base Voltage	V <sub>EBO</sub>	6.0	Vdc
Collector Current	I <sub>C</sub>	200	mAdc
Total Device Dissipation T <sub>A</sub> =25°C	P <sub>D</sub>	0.625	W
Junction Temperature	T <sub>j</sub>	150	°C
Storage, Temperature	T <sub>stg</sub>	-55 to +150	°C

**ELECTRICAL CHARACTERISTICS**

Characteristics	Symbol	Min	Max	Unit
Collector-Emitter Breakdown Voltage (I <sub>C</sub> = 1.0 mAdc, I <sub>B</sub> =0)	V <sub>(BR)CEO</sub>	40	-	Vdc
Collector-Base Breakdown Voltage (I <sub>C</sub> = 100 μAdc, I <sub>E</sub> =0)	V <sub>(BR)CBO</sub>	60	-	Vdc
Emitter-Base Breakdown Voltage (I <sub>E</sub> = 100 μAdc, I <sub>C</sub> =0)	V <sub>(BR)EBO</sub>	6.0	-	Vdc
Collector Cutoff Current (V <sub>CE</sub> = 40 Vdc, I <sub>B</sub> =0)	I <sub>CEO</sub>	-	0.1	uAdc
Collector Cutoff Current (V <sub>CB</sub> = 60 Vdc, I <sub>E</sub> =0)	I <sub>CBO</sub>	-	0.1	uAdc
Emitter Cutoff Current (V <sub>EB</sub> = 5.0Vdc, I <sub>C</sub> =0)	I <sub>EBO</sub>	-	0.1	uAdc

# 2N3904



## ELECTRICAL CHARACTERISTICS ( $T_A=25^\circ\text{C}$ unless otherwise noted) (Continued)

Characteristics	Symbol	Min	TYP	Max	Unit
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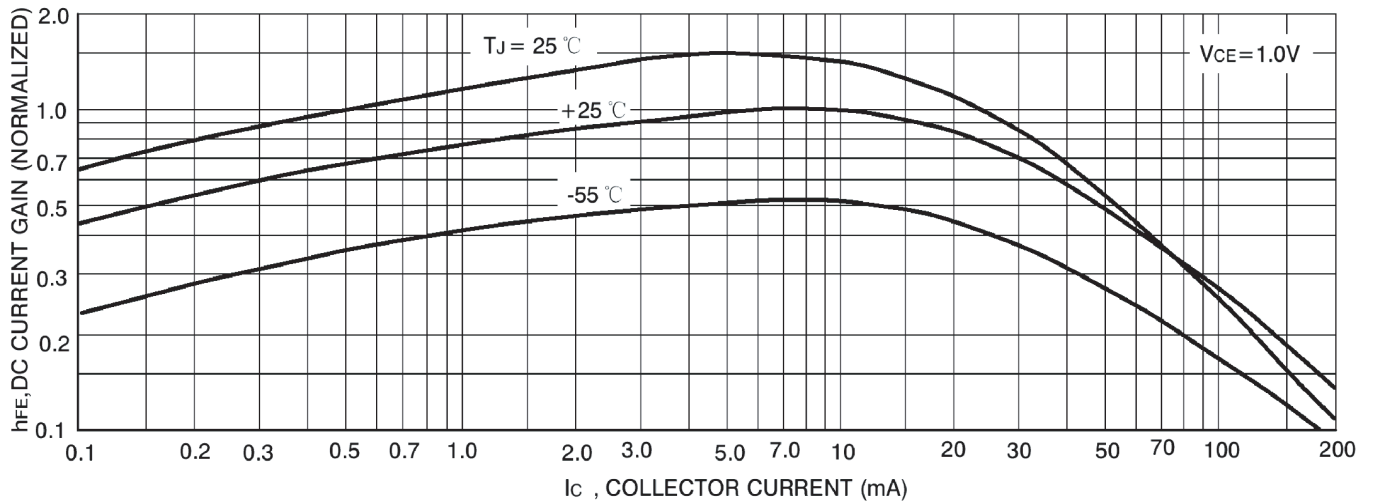
### ON CHARACTERISTICS

DC Current Gain ( $I_C=10\text{ mA dc}, V_{CE}=1.0\text{ V dc}$ )	$h_{FE(1)}$	100	-	400	-
DC Current Gain ( $I_C=50\text{ mA dc}, V_{CE}=1.0\text{ V dc}$ )	$h_{FE(2)}$	60	-	-	-
Collector-Emitter Saturation Voltage ( $I_C=50\text{ mA dc}, I_B=5\text{ mA dc}$ )	$V_{CE(sat)}$	-	-	0.3	Vdc
Base-Emitter Saturation Voltage ( $I_C=50\text{ mA dc}, I_B=5\text{ mA dc}$ )	$V_{BE(sat)}$	-	-	0.95	Vdc
Current-Gain-Bandwidth Product ( $I_C=10\text{ mA dc}, V_{CE}=20\text{ V dc}, f=100\text{ MHz}$ )	$f_T$	300	-	-	MHz

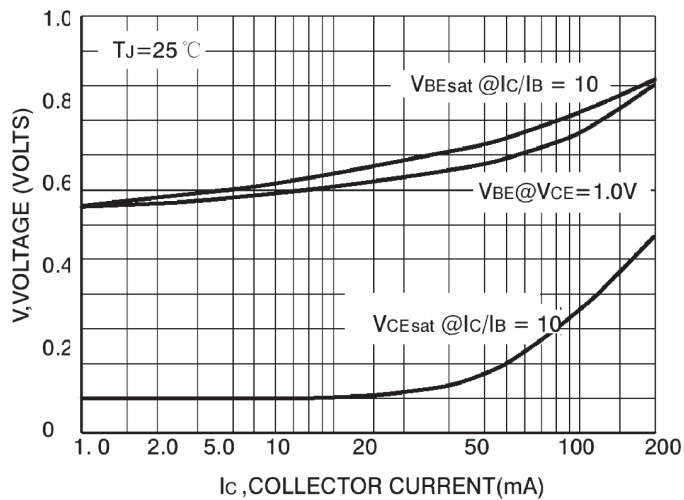
### Classification of $h_{FE(1)}$

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

## Typical Characteristics



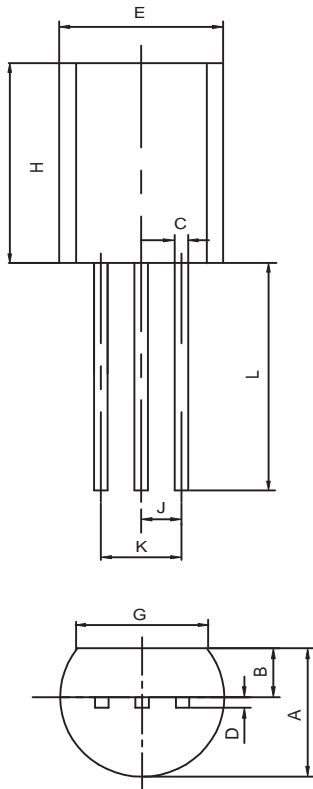
**FIG1 DC CURRENT GAIN**



**FIG2 "ON" VOLTAGES**

## TO-92 Outline Dimensions

unit:mm



TO-92		
Dim	Min	Max
A	3.30	3.70
B	1.10	1.40
C	0.38	0.55
D	0.36	0.51
E	4.40	4.70
G	3.43	-
H	4.30	4.70
J	1.270TYP	
K	2.44	2.64
L	14.10	14.50