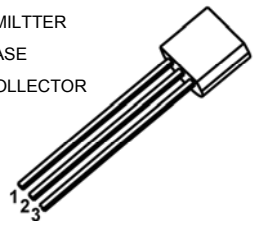
GOOD-ARK
SEMICONDUCTOR

2N3904
NPN Transistor

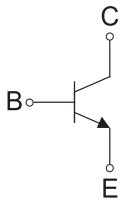
Features

- NPN silicon epitaxial planar transistor for switching and Amplifier applications

1. EMILTTER
2. BASE
3. COLLECTOR



TO-92



Schematic Diagram

Absolute Maximum Ratings (T_A=25°C unless otherwise noted)

Parameter	Symbol	Value	Unit
Collector-Base Voltage	V_{CBO}	60	V
Collector-Emitter Voltage	V_{CEO}	40	V
Emitter-Base Voltage	V_{EBO}	6	V
Collector Current-Continuous	I_C	0.2	A
Collector Power Dissipation	P_C	0.625	W
Operation Junction and Storage Temperature Range	T_J, T_{stg}	-65 to +150	°C

Electrical Characteristics (T_A=25°C unless otherwise noted)

Parameter	Symbol	Test Conditions	Min	Max	Unit
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	I_C=10mA, I_E=0	60	-	V
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	I_C=1mA, I_B=0	40	-	V
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	I_E=10mA, I_C=0	6	-	V
Collector Cut-Off Current	I_{CBO}	V_{CB}=60V, I_E=0	-	0.1	μA
Collector Cut-Off Current	I_{CEX}	V_{CE}=30V, $V_{EB(off)}$=3V	-	0.05	μA
Emitter Cut-Off Current	I_{EBO}	V_{EB}=5V, I_C=0	-	0.1	μA
DC Current Gain	h_{FE1}	V_{CE}=1V, I_C=10mA	100	400	-
	h_{FE2}	V_{CE}=1V, I_C=50mA	60	-	
	h_{FE3}	V_{CE}=1V, I_C=100mA	30	-	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C=50mA, I_B=5mA	-	0.3	V
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	I_C=50mA, I_B=5mA	-	0.95	V
Transition Frequency	f_T	V_{CE}=20V, I_C=10mA, F=100MHz	300	-	MHz
Delay Time	t_d	V_{CC}=3V, V_{BE}=0.5V, I_C=10mA, I_{B1}=1mA	-	35	ns
Rise Time	t_r		-	35	ns
Storage Time	t_s	V_{CC}=3V, I_C=10mA I_{B1}=I_{B2}=1mA	-	200	ns
Fall Time	t_f		-	50	ns

Classification of h_{FE1}

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

Typical Characteristic Curves

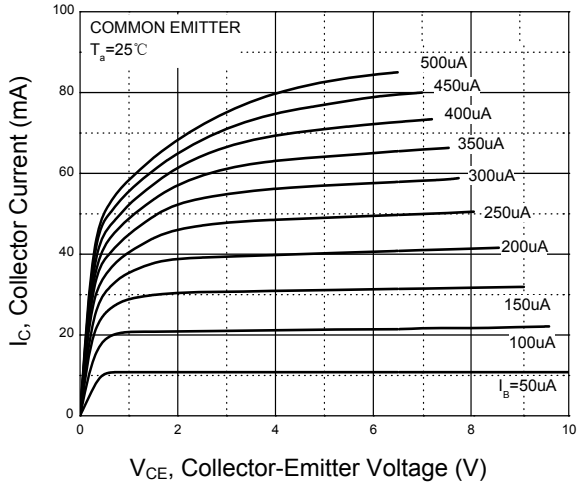


Figure 1. Static Characteristic

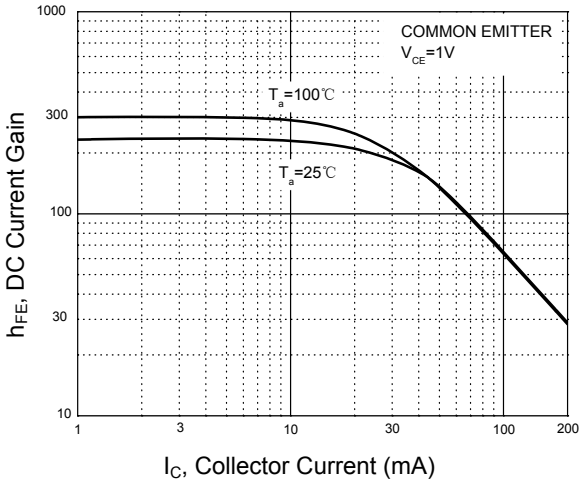


Figure 2. h_{FE} — I_C

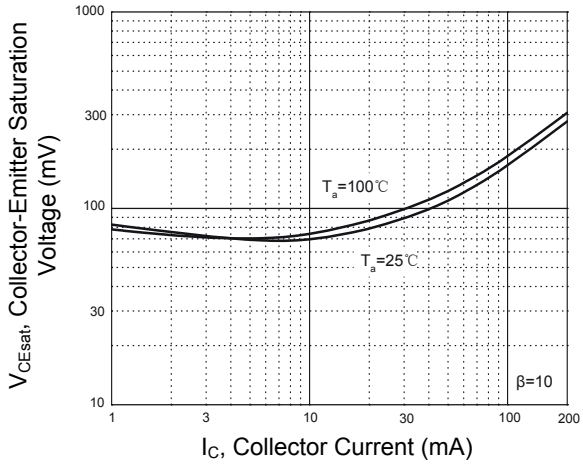


Figure 3. V_{CEsat} — I_C

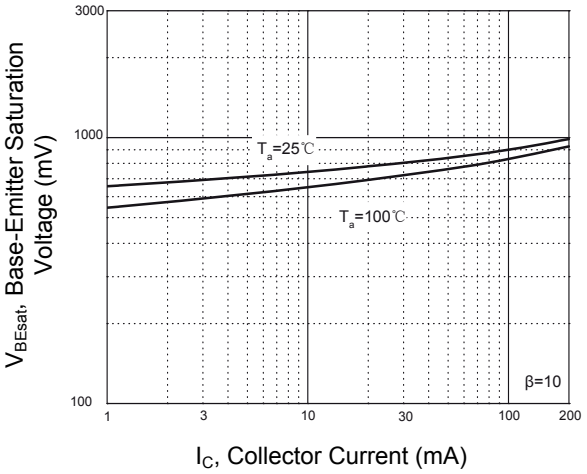


Figure 4. V_{BEsat} — I_C

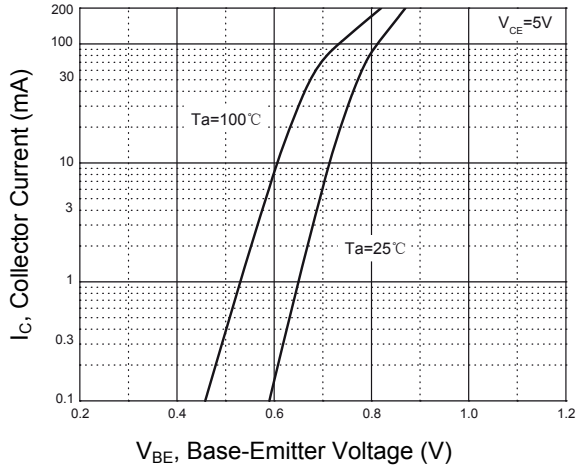


Figure 5. I_C — V_{BE}

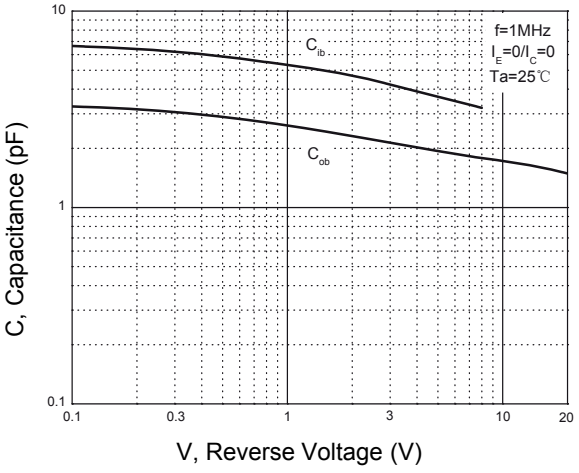


Figure 6. C_{ob}/C_{ib} — V_{CB}/V_{EB}

Typical Characteristic Curves

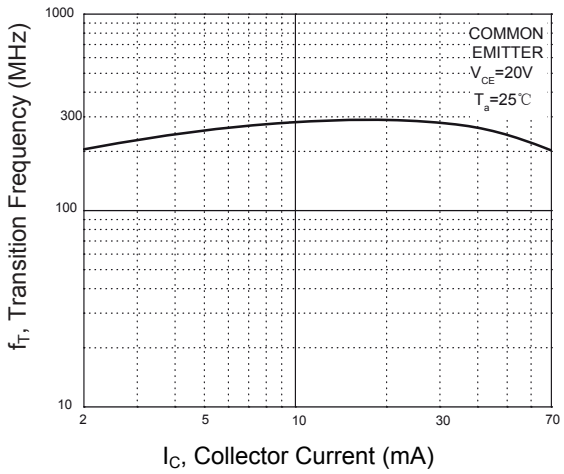


Figure 7. f_T — I_C

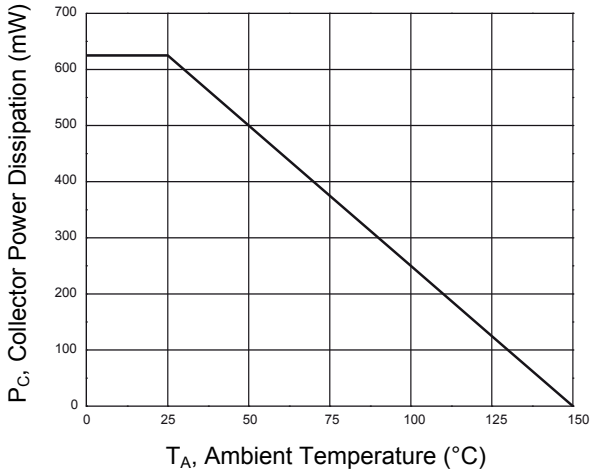
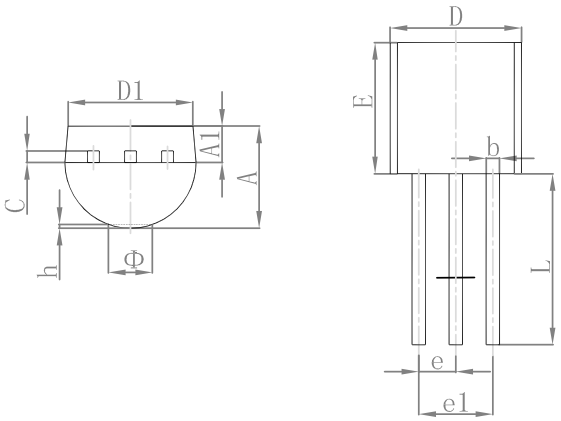


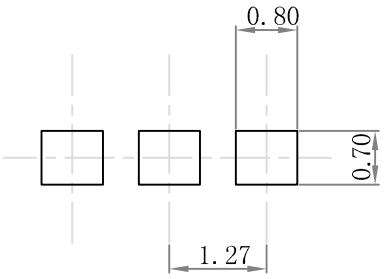
Figure 8. P_C — T_a

Package Outline Dimensions (TO-92)



Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	3.300	3.700	0.130	0.146
A1	1.100	1.400	0.043	0.055
b	0.380	0.550	0.015	0.022
c	0.360	0.510	0.014	0.020
D	4.300	4.700	0.169	0.185
D1	3.430	-	0.135	-
E	4.300	4.700	0.169	0.185
e	1.270 TYP		0.050 TYP	
e1	2.440	2.640	0.096	0.104
L	14.100	14.500	0.555	0.571
Φ	-	1.600	-	0.063
h	0.000	0.380	0.000	0.015

Recommended Pad Layout



Note:
1. Controlling dimension: in millimeters
2. General tolerance: ±0.05mm
3. The pad layout is for reference purposes only

Order Information

Device	Package	Marking	Quantity	HSF Status
2N3904	TO-92	2N3904	2,000pcs / Box	RoHS Compliant