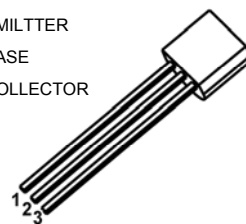


2N3904 NPN Transistor

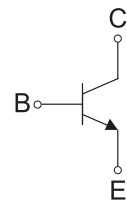
Features

- NPN silicon epitaxial planar transistor for switching and Amplifier applications

1. EMITTER
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	-	200	ns
Fall Time	t _f	I _{B1} =I _{B2} =1mA	-	50	ns

Classification of h_{FE1}

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

Typical Characteristic Curves

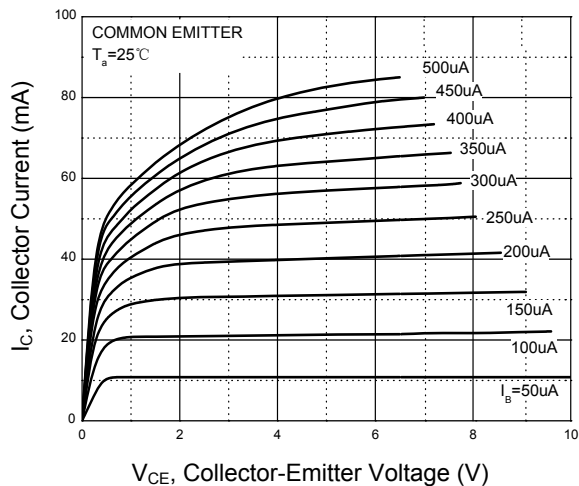


Figure 1. Static Characteristic

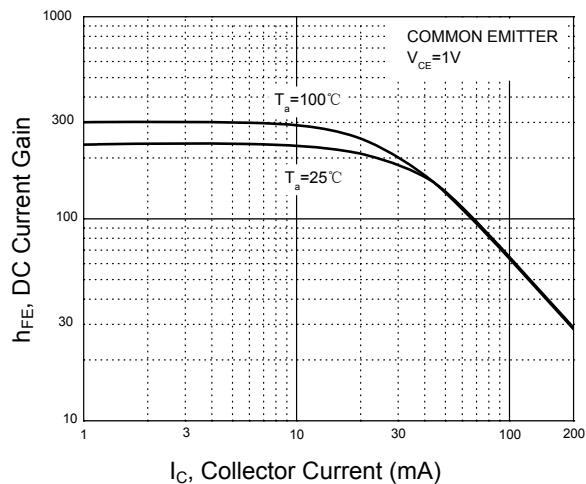


Figure 2. $h_{FE} - I_C$

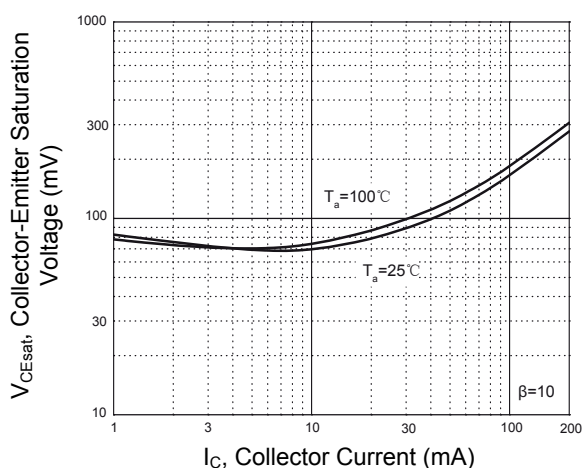


Figure 3. $V_{CEsat} - I_C$

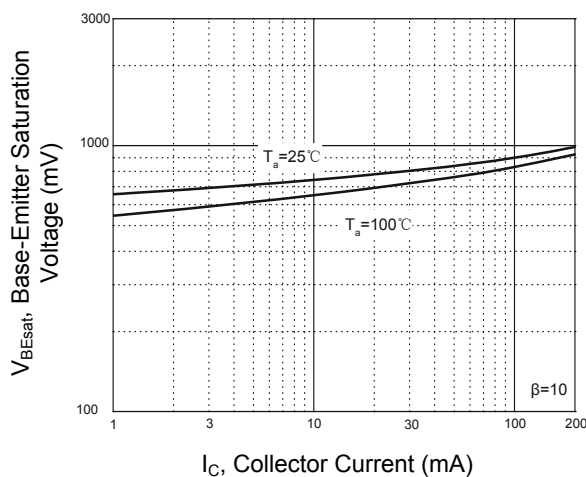


Figure 4. $V_{BEsat} - I_C$

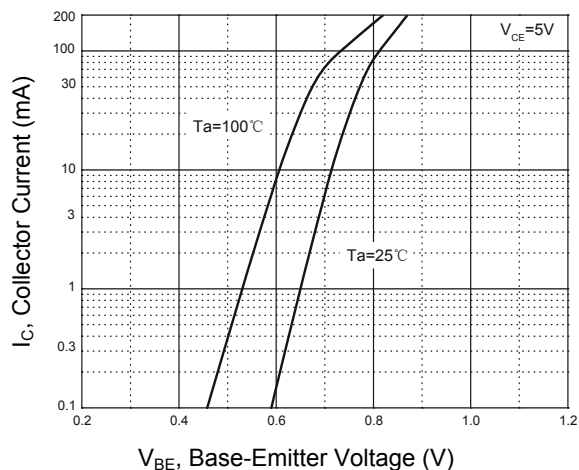


Figure 5. $I_C - V_{BE}$

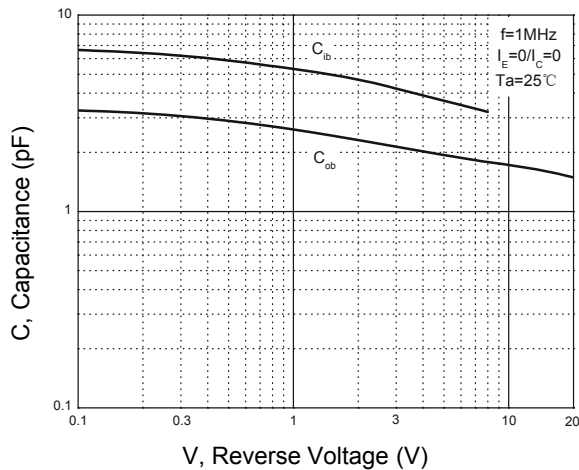


Figure 6. $C_{ob}/C_{ib} - V_{CB}/V_{EB}$

Typical Characteristic Curves

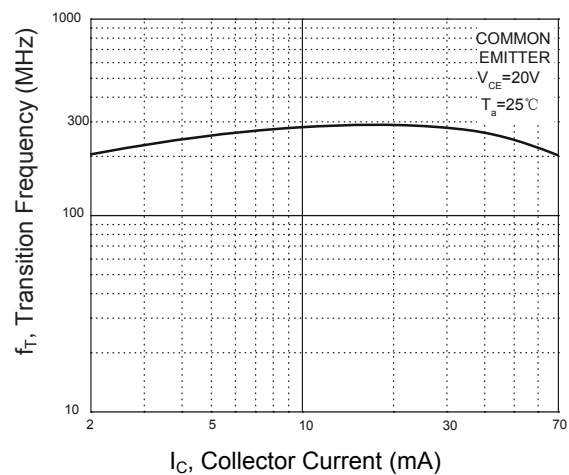


Figure 7. $f_T - I_C$

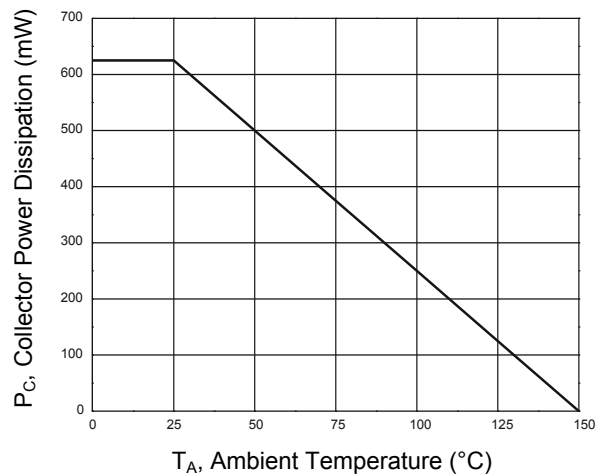
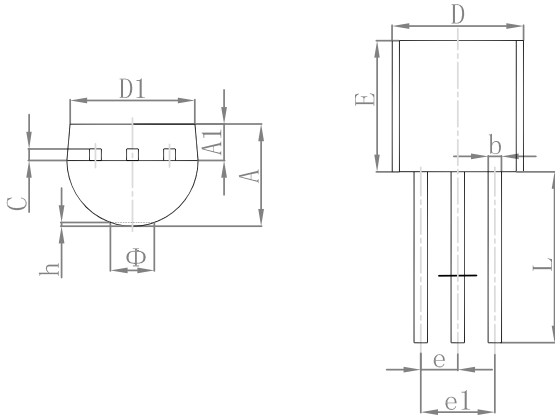


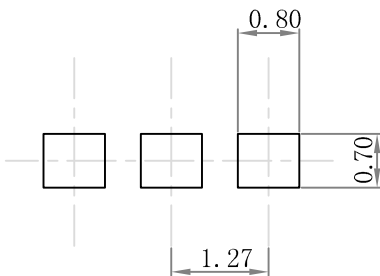
Figure 8. $P_C - T_a$

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: $\pm 0.05\text{mm}$
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