2N3904

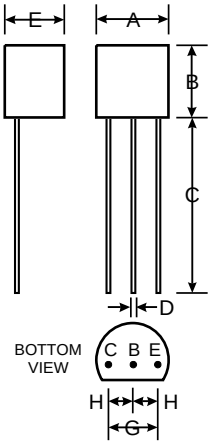
NPN SMALL SIGNAL TRANSISTOR

Features

- Epitaxial Planar Die Construction
- Available in both Through-Hole and Surface Mount Packages
- Ideal for Switching and Amplifier Applications
- Complementary PNP Type Available (2N3906)

Mechanical Data

- Case: TO-92, Plastic
- Leads: Solderable per MIL-STD-202, Method 208
- Terminal Connections: See Diagram
- Marking: Type Number
- Weight: 0.18 grams (approx.)



TO-92		
Dim	**Min**	**Max**
A	4.32	4.83
B	4.32	4.78
C	12.50	15.62
D	0.36	0.56
E	3.15	3.94
G	2.29	2.79
H	1.14	1.40
All Dimensions in mm		

Maximum Ratings @ T_A = 25 C unless otherwise specified

Characteristic		Symbol	2N3904	Unit
Collector-Base Voltage		V_{CBO}	60	V
Collector-Emitter Voltage		V_{CEO}	40	V
Emitter-Base Voltage		V_{EBO}	5.0	V
Collector Current - Continuous		I_C	100	mA
Collector Current - Peak		I_{CM}	200	mA
Power Dissipation	(Note 1)	P_d	500	mW
Thermal Resistance, Junction to Ambient	(Note 1)	R_{JA}	250	K/W
Operating and Storage Temperature Range		T_j, T_{STG}	-55 to +150	C

Notes: 1. Leads maintained at a distance of 2.0mm from body at specified ambient temperature.
2. Pulse test: Pulse width 300 s, duty cycle 2%.

Electrical Characteristics @ T_A = 25 C unless otherwise specified

Characteristic	Symbol	Min	Max	Unit	Test Condition
DC Current Gain	h_{FE}	50 70 100 60 30	300		$-V_{CE}$ = 1.0V,- I_C = 0.1mA $-V_{CE}$ = 1.0V,- I_C = 1.0mA $-V_{CE}$ = 1.0V,- I_C = 10mA $-V_{CE}$ = 1.0V,- I_C = 50mA $-V_{CE}$ = 1.0V,- I_C = 100mA
Collector Saturation Voltage	$V_{CE(SAT)}$		0.25 0.40	V	(Note 2) $-I_C$ = 10mA,- I_B = 1.0mA $-I_C$ = 50mA,- I_B = 5.0mA
Base Saturation Voltage	$V_{BE(SAT)}$		0.85 0.95	V	(Note 2) $-I_C$ = 10mA, $-I_B$ = 1.0mA $-I_C$ = 50mA, $-I_B$ = 5.0mA
Collector Cutoff Current	I_{CEX}		50	nA	$-V_{EB}$ = 3.0V, $-V_{CE}$ = 30V
Emitter Cutoff Current	I_{BL}		50	nA	$-V_{EB}$ = 3.0V, $-V_{CE}$ = 30V
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	60	—	V	$-I_C$ = 10µA, $-I_B$ = 0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	40	—	V	$-I_C$ = 1.0mA,- I_E = 0 (Note 2)
Emitter-base Breakdown voltage	$V_{(BR)EBO}$	5.0	—	V	$-I_E$ = 10µA,- I_C = 0
Gain Bandwidth Product	f_T	250	—	MHz	V_{CE} = 20V, $-I_C$ = 10mA, -f = 100MHz
Collector-Base Capacitance	C_{CBO}		4.5	pF	$-V_{CB}$ = 5.0V, $-I_E$ = 0, f = 100kHz
Emitter-Base Capacitance	C_{EBO}		10	pF	$-V_{EB}$ = 0.5V, $-I_C$ = 0, f = 100kHz
Noise Figure			5.0	dB	$-V_{CE}$ = 5.0V, $-I_C$ = 100 A, R_G = 1.0k , -f = 10 to 15000Hz
Delay Time	t_d		35	ns	$-I_{B1}$ = 1.0mA, $-I_C$ = 10mA, V_{CC} = 3.0V, $V_{BE(off)}$ = 0.5V
Rise Time	t_r		35	ns	$-I_{B1}$ = 1.0mA,- I_C = 10mA, $-V_{CC}$ = 3.0V, $-V_{BE(off)}$ = 0.5V
Storage Time	t_s		225	ns	$-I_{B1}$ =- I_{B2} = 1.0mA, $-I_C$ = 10mA, $-V_{CC}$ = 3.0V
Fall Time	t_f		75	ns	$-I_{B1}$ =- I_{B2} = 1.0mA, $-I_C$ = 10mA, $-V_{CC}$ = 3.0V

Notes: 1. Leads maintained at a distance of 2.0mm from body at specified ambient temperature.
2. Pulse test: Pulse width 300 s, duty cycle 2%.