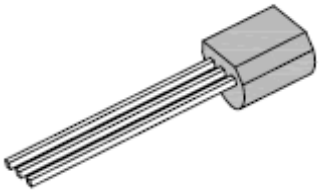
Small Signal General Purpose Transistors (NPN)

Features

- NPN Silicon Epitaxial Transistor for Switching and Amplifier Applications
- RoHS Compliance



TO-92

RoHS Compliant

Mechanical Data

Case:	TO-92, Plastic Package
Terminals:	Solderable per MIL-STD-202G, Method 208
Weight:	0.18 gram

Maximum Ratings *(T Ambient=25ºC unless noted otherwise)*

Symbol	Description	2N3903	2N3904	Unit
V_{CEO}	Collector-Emitter Voltage	40		V
V_{CBO}	Collector-Base Voltage	60		V
V_{EBO}	Emitter-Base Voltage	6.0		V
I_C	Collector Current Continuous	200		mA
P_D	Power Dissipation at T_A=25°C	625		mW
	Derate above 25°C	5.0		mW/° C
P_D	Power Dissipation at T_C=25°C	1.5		W
	Derate above 25°C	12		mW/° C
$R_{\theta JA}$	Thermal Resistance Junction to Ambient Air	200		° C/W
$R_{\theta JC}$	Thermal Resistance Junction to Case	83.3		° C/W
T_J ,T_{STG}	Operation and Storage Junction Temperature Range	-55 to +150		° C

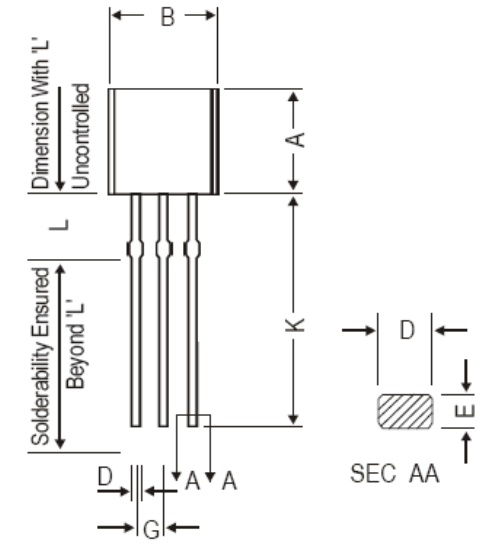
Electrical Characteristics *(T Ambient=25ºC unless noted otherwise)*

Symbol	Description	2N3903		2N3904		Unit	Conditions
		Min.	Max.	Min.	Max.		
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	60	-	60	-	V	I_C=10μA, I_E=0
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage	40	-	40	-	V	I_C=1mA, I_B=0
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	6.0	-	6.0	-	V	I_E=10μA, I_C=0
$V_{CE(sat)}$*	Collector Emitter Saturation Voltage	-	0.2	-	0.2	V	I_C=10mA, I_B=1mA
		-	0.3	-	0.3		I_C=50mA, I_B=5mA
$V_{BE(sat)}$*	Base Emitter Saturation Voltage	0.65	0.85	0.65	0.85	V	I_C=10mA, I_B=1mA
		-	0.95	-	0.95		I_C=50mA, I_B=5mA
I_{CEX}	Collector Cut–Off Current	-	50	-	50	nA	V_{EB}=3V, V_{CE}=30V
I_{BL}	Base Cut–Off Current	-	50	-	50	nA	V_{EB}=3V, V_{CE}=30V
h_{FE}*	D.C. Current Gain	20	-	40	-		V_{CE}=1V, I_C=0.1mA
		35	-	70	-		V_{CE}=1V, I_C=1mA
		50	150	100	300		V_{CE}=1V, I_C=10mA
		30	-	60	-		V_{CE}=1V, I_C=50mA
		15	-	30	-		V_{CE}=1V, I_C=100mA
h_{fe}	Small Signal Current Gain	50	200	100	400		V_{CE}=10V, I_C=1mA f=1KHz
h_{ie}	Input Impedance	1.0	8.0	1.0	10	kΩ	V_{CE}=10V, I_C=1mA f=1KHz
h_{re}	Voltage Feedback Ratio	0.1	5.0	0.5	8.0	$x10^{-4}$	V_{CE}=10V, I_C=1mA f=1KHz
h_{oe}	Output Admittance	1.0	40	1.0	40	μS	V_{CE}=10V, I_C=1mA f=1KHz
f_T	Current Gain-Bandwidth Product	250	-	300	-	MHz	V_{CE}=20V, I_C=10mA, f=100MHz
C_{ob}	Output Capacitance	-	4.0	-	4.0	pF	V_{CB}=5V, I_E=0 f=1MHz
C_{ib}	Input Capacitance	-	8.0	-	8.0	pF	V_{EB}=0.5V, I_C=0 f=1MHz
NF	Noise Figure	-	6.0	-	5.0	dB	V_{CE}=5V, I_C=100μA, Rs=1KΩ, f=1KHz
t_d	Delay Time	-	35	-	35	nS	V_{CC}=3V, V_{BE}=0.5V I_C=10mA, I_{B1}=1mA
t_r	Rise Time	-	35	-	35	nS	
t_s	Storage Time	-	175	-	200	nS	V_{CC}=3V, I_C=10mA I_{B1}=I_{B2}=1mA
t_f	Fall Time	-	50	-	50	nS	

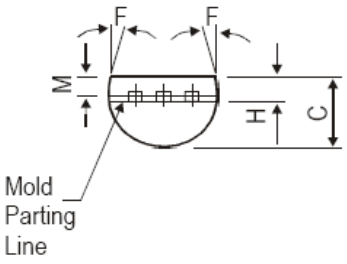
*Pulse Test: Pulse Width≤300μs, Duty Cycle≤2%

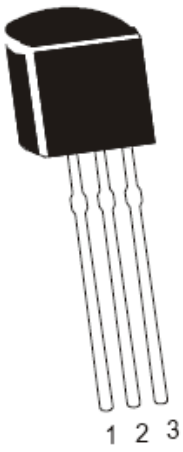
Dimensions in mm

TO-92



DIM	MIN.	MAX.
A	4.32	5.33
B	4.45	5.20
C	3.18	4.19
D	0.41	0.55
E	0.35	0.50
F	5 DEG	
G	1.14	1.40
H	1.20	1.40
K	12.70	—
L	1.982	2.082
M	1.03	1.20





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3. COLLECTOR

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