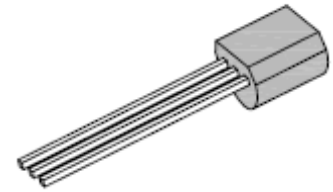


Small Signal General Purpose Transistors (NPN)

Features

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



TO-92



Mechanical Data

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

Maximum Ratings *(T_{Ambient}=25°C 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_{θJA}	Thermal Resistance Junction to Ambient Air	200		° C/W
R_{θJC}	Thermal Resistance Junction to Case	83.3		° C/W
T_J , T_{STG}	Operation and Storage Junction Temperature Range	-55 to +150		° C

Small Signal General Purpose Transistors (NPN)

2N3903/2N3904

Electrical Characteristics ($T_{Ambient}=25^{\circ}C$ 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, R _s =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	
t_f	Fall Time	-	50	-	50	nS	V _{CC} =3V, I _C =10mA I _{B1} =I _{B2} =1mA

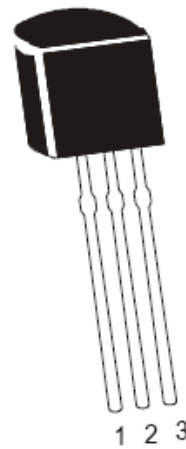
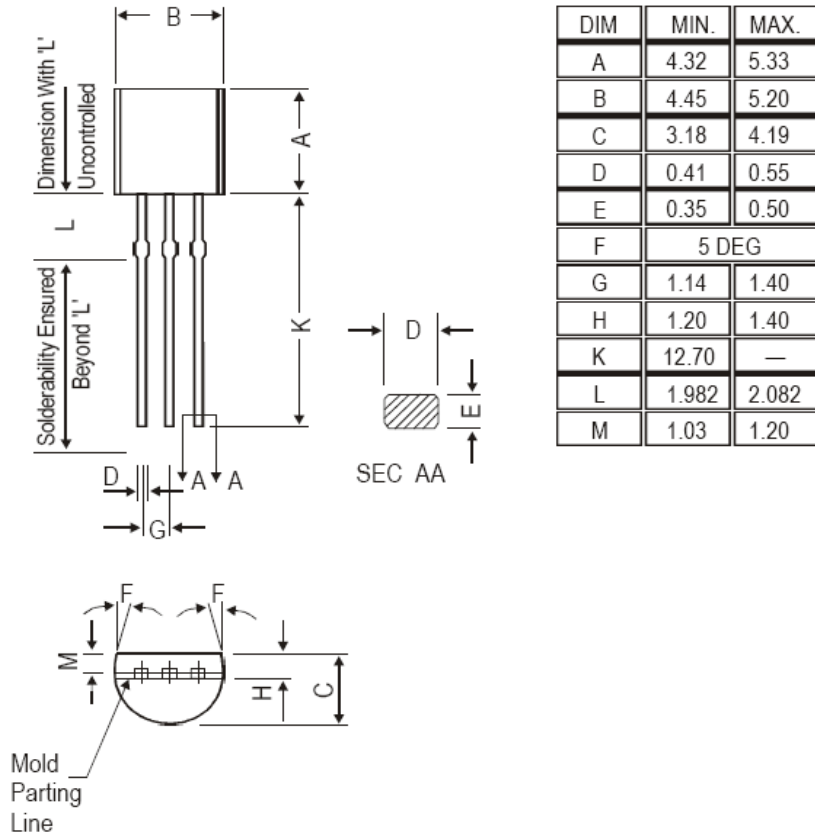
Small Signal General Purpose Transistors (NPN)

2N3903/2N3904

*Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2\%$

Dimensions in mm

TO-92



PIN CONFIGURATION

1. EMITTER
2. BASE
3. COLLECTOR

Small Signal General Purpose Transistors (NPN)

2N3903/2N3904

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