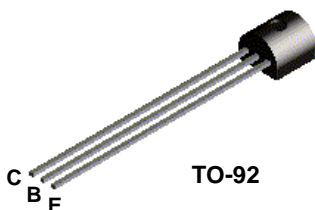


## 2N3903



### NPN General Purpose Amplifier

This device is designed for use as general purpose amplifiers and switches requiring collector currents to 100 mA. Sourced from Process 23. See 2N3904 for characteristics.

#### Absolute Maximum Ratings\*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V <sub>CEO</sub>	Collector-Emitter Voltage	40	V
V <sub>CB0</sub>	Collector-Base Voltage	60	V
V <sub>EBO</sub>	Emitter-Base Voltage	6.0	V
I <sub>C</sub>	Collector Current - Continuous	200	mA
T <sub>J</sub> , T <sub>stg</sub>	Operating and Storage Junction Temperature Range	-55 to +150	°C

\*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

#### NOTES:

- 1) These ratings are based on a maximum junction temperature of 150 degrees C.
- 2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

#### Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		2N3903	
P <sub>D</sub>	Total Device Dissipation Derate above 25°C	625	mW
		5.0	mW/°C
R <sub>θJC</sub>	Thermal Resistance, Junction to Case	83.3	°C/W
R <sub>θJA</sub>	Thermal Resistance, Junction to Ambient	200	°C/W

# NPN General Purpose Amplifier

(continued)

2N3903

## Electrical Characteristics

TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
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### OFF CHARACTERISTICS

$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	$I_C = 1.0 \text{ mA}, I_B = 0$	40		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	$I_C = 10 \text{ } \mu\text{A}, I_E = 0$	60		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	$I_E = 10 \text{ } \mu\text{A}, I_C = 0$	6.0		V
$I_{CEX}$	Collector Cutoff Current	$V_{CE} = 30 \text{ V}, V_{OB} = 3.0 \text{ V}$		50	nA
$I_{BL}$	Base Cutoff Current	$V_{CE} = 30 \text{ V}, V_{OB} = 3.0 \text{ V}$		50	nA

### ON CHARACTERISTICS\*

$h_{FE}$	DC Current Gain	$V_{CE} = 1.0 \text{ V}, I_C = 0.1 \text{ mA}$ $V_{CE} = 1.0 \text{ V}, I_C = 1.0 \text{ mA}$ $V_{CE} = 1.0 \text{ V}, I_C = 10 \text{ mA}$ $V_{CE} = 1.0 \text{ V}, I_C = 50 \text{ mA}$ $V_{CE} = 1.0 \text{ V}, I_C = 100 \text{ mA}$	20 35 50 30 15	150	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 10 \text{ mA}, I_B = 1.0 \text{ mA}$ $I_C = 50 \text{ mA}, I_B = 5.0 \text{ mA}$		0.2 0.3	V V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	$I_C = 10 \text{ mA}, I_B = 1.0 \text{ mA}$ $I_C = 50 \text{ mA}, I_B = 5.0 \text{ mA}$	0.65	0.85 0.95	V V

### SMALL SIGNAL CHARACTERISTICS

$C_{ob}$	Output Capacitance	$V_{CB} = 5.0 \text{ V}, f = 100 \text{ kHz}$		4.0	pF
$C_{ib}$	Input Capacitance	$V_{EB} = 0.5 \text{ V}, f = 100 \text{ kHz}$		8.0	pF
$h_{re}$	Small-Signal Current Gain	$I_C = 10 \text{ mA}, V_{CE} = 20 \text{ V},$ $f = 100 \text{ MHz}$	2.5		
$h_{fe}$	Small-Signal Current Gain	$V_{CE} = 10 \text{ V}, I_C = 1.0 \text{ mA}$	50	200	
$h_{ie}$	Input Impedance	$f = 1.0 \text{ kHz}$	1.0	8.0	k $\Omega$
$h_{re}$	Voltage Feedback Ratio		0.1	5.0	$\times 10^{-4}$
$h_{oe}$	Output Admittance		1.0	40	$\mu\text{mhos}$
NF	Noise Figure	$V_{CE} = 5.0 \text{ V}, I_C = 100 \text{ } \mu\text{A},$ $R_S = 1.0 \text{ k}\Omega,$ $B_W = 10 \text{ Hz to } 15.7 \text{ kHz}$		6.0	dB

### SWITCHING CHARACTERISTICS

$t_d$	Delay Time	$V_{CC} = 3.0 \text{ V}, I_C = 10 \text{ mA},$		35	ns
$t_r$	Rise Time	$I_{B1} = 1.0 \text{ mA}, V_{ob(off)} = 0.5 \text{ V}$		35	ns
$t_s$	Storage Time	$V_{CC} = 3.0 \text{ V}, I_C = 10 \text{ mA}$		175	ns
$t_f$	Fall Time	$I_{B1} = I_{B2} = 1.0 \text{ mA}$		50	ns

\* Pulse Test: Pulse Width  $\leq 300 \text{ } \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$