

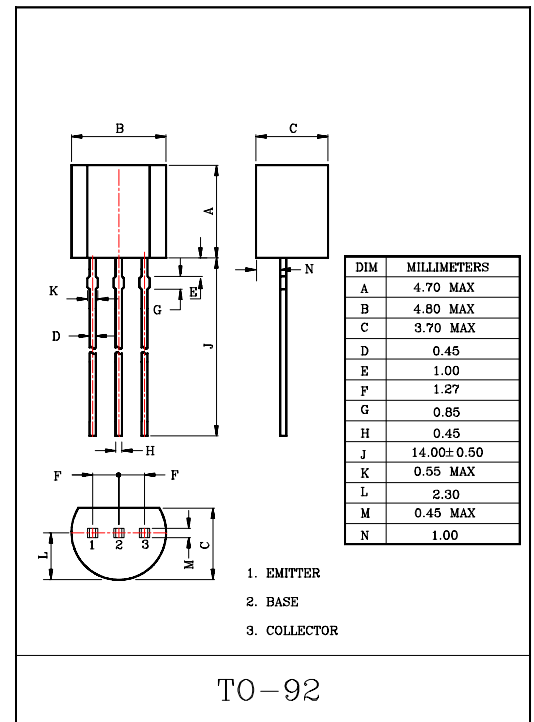
GENERAL PURPOSE APPLICATION.  
SWITCHING APPLICATION.

#### FEATURES

- Low Leakage Current  
:  $I_{CEX}=50\text{nA}(\text{Max.})$ ,  $I_{BL}=50\text{nA}(\text{Max.})$   
@  $V_{CE}=30\text{V}$ ,  $V_{EB}=3\text{V}$ .
- Excellent DC Current Gain Linearity.
- Low Saturation Voltage  
:  $V_{CE(\text{sat})}=0.3\text{V}(\text{Max.})$  @  $I_C=50\text{mA}$ ,  $I_B=5\text{mA}$ .
- Low Collector Output Capacitance  
:  $C_{ob}=4\text{pF}(\text{Max.})$  @  $V_{CB}=5\text{V}$ .
- Complementary to 2N3906.

#### MAXIMUM RATINGS ( $T_a=25^\circ\text{C}$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Collector-Base Voltage	$V_{CBO}$	60	V
Collector-Emitter Voltage	$V_{CEO}$	40	V
Emitter-Base Voltage	$V_{EBO}$	6	V
Collector Current	$I_C$	200	mA
Base Current	$I_B$	50	mA
Collector Power Dissipation	$T_a=25^\circ\text{C}$	625	mW
	$T_c=25^\circ\text{C}$	1.5	W
Junction Temperature	$T_j$	150	$^\circ\text{C}$
Storage Temperature Range	$T_{stg}$	-55~150	$^\circ\text{C}$



# 2N3904

## ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Collector Cut-off Current		$I_{CEX}$	$V_{CE}=30V, V_{EB}=3V$	-	-	50	nA	
Base Cut-off Current		$I_{BL}$	$V_{CE}=30V, V_{EB}=3V$	-	-	50	nA	
Collector-Base Breakdown Voltage		$V_{(BR)CBO}$	$I_C=10\mu A, I_E=0$	60	-	-	V	
Collector-Emitter Breakdown Voltage *		$V_{(BR)CEO}$	$I_C=1mA, I_B=0$	40	-	-	V	
Emitter-Base Breakdown Voltage		$V_{(BR)EBO}$	$I_E=10\mu A, I_C=0$	6.0	-	-	V	
DC Current Gain	*	$h_{FE}(1)$	$V_{CE}=1V, I_C=0.1mA$	40	-	-		
		$h_{FE}(2)$	$V_{CE}=1V, I_C=1mA$	70	-	-		
		$h_{FE}(3)$	$V_{CE}=1V, I_C=10mA$	100	-	300		
		$h_{FE}(4)$	$V_{CE}=1V, I_C=50mA$	60	-	-		
		$h_{FE}(5)$	$V_{CE}=1V, I_C=100mA$	30	-	-		
Collector-Emitter Saturation Voltage *	*	$V_{CE(sat)1}$	$I_C=10mA, I_B=1mA$	-	-	0.2	V	
		$V_{CE(sat)2}$	$I_C=50mA, I_B=5mA$	-	-	0.3		
Base-Emitter Saturation Voltage *	*	$V_{BE(sat)1}$	$I_C=10mA, I_B=1mA$	0.65	-	0.85	V	
		$V_{BE(sat)2}$	$I_C=50mA, I_B=5mA$	-	-	0.95		
Transition Frequency		$f_T$	$V_{CE}=20V, I_C=10mA, f=100MHz$	300	-	-	MHz	
Collector Output Capacitance		$C_{ob}$	$V_{CB}=5V, I_E=0, f=1MHz$	-	-	4.0	pF	
Input Capacitance		$C_{ib}$	$V_{BE}=0.5V, I_C=0, f=1MHz$	-	-	8.0	pF	
Input Impedance		$h_{ie}$	$V_{CE}=10V, I_C=1mA, f=1kHz$	1.0	-	10	k $\Omega$	
Voltage Feedback Ratio		$h_{re}$		0.5	-	8.0	$\times 10^{-4}$	
Small-Signal Current Gain		$h_{fe}$		100	-	400		
Collector Output Admittance		$h_{oe}$		1.0	-	40	$\mu S$	
Noise Figure		NF		$V_{CE}=5V, I_C=0.1mA$ $R_g=1k\Omega, f=10Hz \sim 15.7kHz$	-	-	5.0	dB
Switching Time	Delay Time	$t_d$		-	-	35	nS	
	Rise Time	$t_r$		-	-	35		
	Storage Time	$t_{stg}$			-	-		200
	Fall Time	$t_f$			-	-		50

\*Pulse Test : Pulse Width  $\leq 300\mu S$ , Duty Cycle  $\leq 2\%$