

TOSHIBA Transistor Silicon PNP Epitaxial Type (PCT process)

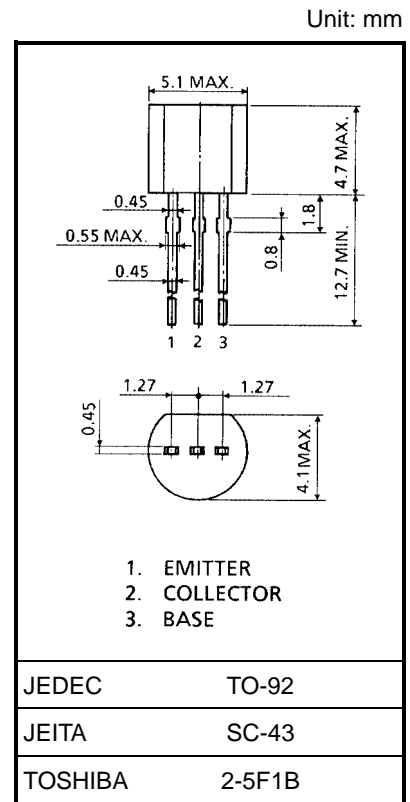
# 2SA970

## Low Noise Audio Amplifier Applications

- Low noise:  $NF = 3\text{dB (typ.)}$   $R_G = 100\ \Omega$ ,  $V_{CE} = -6\ \text{V}$ ,  $I_C = -100\ \mu\text{A}$ ,  $f = 1\ \text{kHz}$   
 :  $NF = 0.5\text{dB (typ.)}$   $R_G = 1\ \text{k}\Omega$ ,  $V_{CE} = -6\ \text{V}$ ,  $I_C = -100\ \mu\text{A}$ ,  $f = 1\ \text{kHz}$
- High DC current gain:  $h_{FE} = 200\sim 700$
- High breakdown voltage:  $V_{CEO} = -120\ \text{V}$
- Low pulse noise. Low  $1/f$  noise

## Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

Characteristics	Symbol	Rating	Unit
Collector-base voltage	$V_{CBO}$	-120	V
Collector-emitter voltage	$V_{CEO}$	-120	V
Emitter-base voltage	$V_{EBO}$	-5	V
Collector current	$I_C$	-100	mA
Base current	$I_B$	-20	mA
Collector power dissipation	$P_C$	300	mW
Junction temperature	$T_j$	125	$^\circ\text{C}$
Storage temperature range	$T_{stg}$	-55~125	$^\circ\text{C}$



## Electrical Characteristics ( $T_a = 25^\circ\text{C}$ )

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	$I_{CBO}$	$V_{CB} = -120\ \text{V}$ , $I_E = 0$	—	—	-0.1	$\mu\text{A}$
Emitter cut-off current	$I_{EBO}$	$V_{EB} = -5\ \text{V}$ , $I_C = 0$	—	—	-0.1	$\mu\text{A}$
Collector-emitter breakdown voltage	$V_{(BR)CEO}$	$I_C = -1\ \text{mA}$ , $I_B = 0$	-120	—	—	V
DC current gain	$h_{FE}$ (Note)	$V_{CE} = -6\ \text{V}$ , $I_C = -2\ \text{mA}$	200	—	700	
Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_C = -10\ \text{mA}$ , $I_B = -1\ \text{mA}$	—	—	-0.3	V
Base-emitter voltage	$V_{BE}$	$V_{CE} = -6\ \text{V}$ , $I_C = -2\ \text{mA}$	—	0.65	—	V
Transition frequency	$f_T$	$V_{CE} = -6\ \text{V}$ , $I_C = -1\ \text{mA}$	—	100	—	MHz
Collector output capacitance	$C_{ob}$	$V_{CB} = -10\ \text{V}$ , $I_E = 0$ , $f = 1\ \text{MHz}$	—	4.0	—	pF
Noise figure	NF	$V_{CE} = -6\ \text{V}$ , $I_C = -0.1\ \text{mA}$ , $f = 10\ \text{Hz}$ , $R_G = 10\ \text{k}\Omega$	—	—	6	dB
		$V_{CE} = -6\ \text{V}$ , $I_C = -0.1\ \text{mA}$ , $f = 1\ \text{kHz}$ , $R_G = 10\ \text{k}\Omega$	—	—	2	
		$V_{CE} = -6\ \text{V}$ , $I_C = -0.1\ \text{mA}$ , $f = 1\ \text{kHz}$ , $R_G = 100\ \Omega$	—	3	—	

Note:  $h_{FE}$  classification GR: 200~400, BL: 350~700

