

### MAXIMUM RATINGS

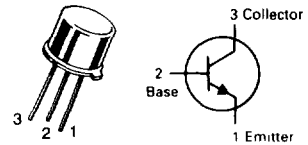
Rating	Symbol	Value	Unit
Collector-Emitter Voltage	$V_{CE0}$	65	Vdc
Collector-Emitter Voltage, $R_{BE} \leq 10 \text{ Ohms}$	$V_{CER}$	80	Vdc
Collector-Base Voltage	$V_{CBO}$	120	Vdc
Emitter-Base Voltage	$V_{EBO}$	7.0	Vdc
Collector Current — Continuous	$I_C$	1.0	Adc
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	1.0 5.71	Watt mW/°C
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	5.0 28.6	Watts mW/°C
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	-65 to +200	°C

### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Ambient	$R_{\theta JA}(1)$	175	°C/W
Thermal Resistance, Junction to Case	$R_{\theta JC}$	35	°C/W

# 2N2102

CASE 79-04, STYLE 1  
TO-39 (TO-205AD)



## AMPLIFIER TRANSISTOR

NPN SILICON

Refer to 2N3019 for graphs.

### ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Collector-Emitter Breakdown Voltage ( $I_C = 100 \text{ mA dc}, R_{BE} \leq 10 \text{ ohms}(2)$ )	$V_{CER(sus)}$	80	—	—	Vdc
Collector-Emitter Sustaining Voltage(2) ( $I_C = 100 \text{ mA dc}, I_B = 0(2)$ )	$V_{CE0(sus)}$	65	—	—	Vdc
Collector-Emitter Breakdown Voltage ( $I_C = 100 \text{ } \mu\text{A dc}, V_{EB} = 1.5 \text{ Vdc}$ )	$V_{(BR)CEX}$	120	—	—	Vdc
Collector-Base Breakdown Voltage ( $I_C = 100 \text{ } \mu\text{A dc}, I_E = 0$ )	$V_{(BR)CBO}$	120	—	—	Vdc
Emitter-Base Breakdown Voltage ( $I_E = 100 \text{ } \mu\text{A dc}, I_C = 0$ )	$V_{(BR)EBO}$	7.0	—	—	Vdc
Collector Cutoff Current ( $V_{CB} = 60 \text{ Vdc}, I_E = 0$ ) ( $V_{CB} = 60 \text{ Vdc}, I_E = 0, T_A = 150^\circ\text{C}$ )	$I_{CBO}$	—	—	2.0 2.0	nAdc $\mu\text{A dc}$
Emitter Cutoff Current ( $V_{EB} = 5.0 \text{ Vdc}, I_C = 0$ )	$I_{EBO}$	—	—	2.0	nAdc
<b>ON CHARACTERISTICS</b>					
DC Current Gain ( $I_C = 0.1 \text{ mA dc}, V_{CE} = 10 \text{ Vdc}$ ) ( $I_C = 10 \text{ mA dc}, V_{CE} = 10 \text{ Vdc}(2)$ ) ( $I_C = 10 \text{ mA dc}, V_{CE} = 10 \text{ Vdc}, T_A = -55^\circ\text{C}(2)$ ) ( $I_C = 150 \text{ mA dc}, V_{CE} = 10 \text{ Vdc}(2)$ ) ( $I_C = 500 \text{ mA dc}, V_{CE} = 10 \text{ Vdc}(2)$ ) ( $I_C = 1.0 \text{ A dc}, V_{CE} = 10 \text{ Vdc}(2)$ )	$h_{FE}$	20 35 20 40 25 10	— — — — — —	— — — 120 — —	—
Collector-Emitter Saturation Voltage ( $I_C = 150 \text{ mA dc}, I_B = 15 \text{ mA dc}(2)$ )	$V_{CE(sat)}$	—	0.15	0.5	Vdc
Base-Emitter Saturation Voltage ( $I_C = 150 \text{ mA dc}, I_B = 15 \text{ mA dc}(2)$ )	$V_{BE(sat)}$	—	0.88	1.1	Vdc
<b>SMALL-SIGNAL CHARACTERISTICS</b>					
Current-Gain — Bandwidth Product ( $I_C = 50 \text{ mA dc}, V_{CE} = 10 \text{ Vdc}$ , $f = 20 \text{ MHz}$ )	$f_T$	60	—	—	MHz
Output Capacitance ( $V_{CB} = 10 \text{ Vdc}, I_E = 0, f = 1.0 \text{ MHz}$ )	$C_{obo}$	—	6.0	15	pF
Input Capacitance ( $V_{EB} = 0.5 \text{ Vdc}, I_C = 0, f = 1.0 \text{ MHz}$ )	$C_{ibo}$	—	50	80	pF
Input Impedance ( $I_C = 1.0 \text{ mA dc}, V_{CE} = 5.0 \text{ Vdc}, f = 1.0 \text{ kHz}$ ) ( $I_C = 5.0 \text{ mA dc}, V_{CE} = 10 \text{ Vdc}, f = 1.0 \text{ kHz}$ )	$h_{ib}$	24 4.0	— —	34 8.0	Ohms
Voltage Feedback Ratio ( $I_C = 1.0 \text{ mA dc}, V_{CE} = 5.0 \text{ Vdc}, f = 1.0 \text{ kHz}$ ) ( $I_C = 5.0 \text{ mA dc}, V_{CE} = 10 \text{ Vdc}, f = 1.0 \text{ kHz}$ )	$h_{rb}$	— —	— —	3.0 3.0	$\times 10^{-4}$
Small-Signal Current Gain ( $I_C = 1.0 \text{ mA dc}, V_{CE} = 5.0 \text{ Vdc}, f = 1.0 \text{ kHz}$ ) ( $I_C = 5.0 \text{ mA dc}, V_{CE} = 10 \text{ Vdc}, f = 1.0 \text{ kHz}$ )	$h_{fe}$	30 35	— —	100 150	—
Output Admittance ( $I_C = 1.0 \text{ mA dc}, V_{CE} = 5.0 \text{ Vdc}, f = 1.0 \text{ kHz}$ ) ( $I_C = 5.0 \text{ mA dc}, V_{CE} = 10 \text{ Vdc}, f = 1.0 \text{ kHz}$ )	$h_{ob}$	0.01 0.01	— —	0.5 1.0	$\mu\text{mho}$
Noise Figure ( $I_C = 300 \text{ } \mu\text{A dc}, V_{CE} = 10 \text{ Vdc}, R_S = 1.0 \text{ k Ohm}$ , $f = 1.0 \text{ kHz}$ , Bandwidth = 1.0 Hz)	NF	—	4.0	6.0	dB
<b>SWITCHING CHARACTERISTICS</b>					
Switching Time	$t_d + t_r + t_f$	—	—	30	ns

(1)  $R_{\theta JA}$  is measured with the device soldered into a typical printed circuit board. (2) Pulse Test: Pulse Width  $\leq 300 \text{ } \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$