

### MAXIMUM RATINGS

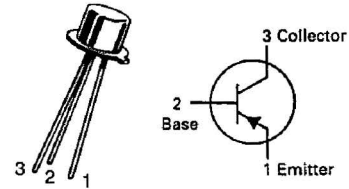
Rating	Symbol	2N3964	2N3963	Unit
Collector-Emitter Voltage	$V_{CE0}$	-45	-80	V
Collector-Base Voltage	$V_{CBO}$	-45	-80	V
Emitter-Base Voltage	$V_{EBO}$	-6.0		V
Collector Current — Continuous	$I_C$	-200		mA
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	0.36	2.06	Watt mW/ $^\circ\text{C}$
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	1.2	6.85	Watts mW/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	-65 to +200		$^\circ\text{C}$

### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	486	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction to Case	$R_{\theta JC}$	146	$^\circ\text{C}/\text{W}$

## 2N3963, 2N3964★

CASE 22-03, STYLE 1  
TO-18 (TO-206AA)



### AMPLIFIER TRANSISTORS

PNP SILICON

★This is a Motorola  
designated preferred device.

Refer to 2N3799 for graphs.

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

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector-Emitter Breakdown Voltage ( $I_C = -5.0 \text{ mA}$ )	$V_{(BR)CEO}$	-80 -45	—	Vdc
Collector-Emitter Breakdown Voltage ( $I_C = -10 \mu\text{A}$ )	$V_{(BR)CES}$	-80 -45	—	Vdc
Collector-Base Breakdown Voltage ( $I_C = -10 \mu\text{A}$ )	$V_{(BR)CBO}$	-80 -45	—	Vdc
Emitter-Base Breakdown Voltage ( $I_E = -10 \mu\text{A}$ )	$V_{(BR)EBO}$	-6.0	—	Vdc
Collector Cutoff Current ( $V_{CE} = -40 \text{ V}$ ) ( $V_{CE} = -70 \text{ V}$ )	$I_{CBO}$	—	-10 -10	nAdc
Collector Cutoff Current ( $V_{CE} = -70 \text{ V}$ ) ( $V_{CE} = -40 \text{ V}$ )	$I_{CES}$	—	-10 -10	nAdc
Emitter Cutoff Current ( $V_{EB} = -4.0 \text{ V}$ )	$I_{EBO}$	—	-10	nAdc
<b>ON CHARACTERISTICS</b>				
DC Current Gain ( $I_C = -10 \mu\text{A}, V_{CE} = -5.0 \text{ V}$ )	$h_{FE}$	100 250	300 500	—
( $I_C = -100 \mu\text{A}, V_{CE} = -5.0 \text{ V}$ )		100 250	— —	
( $I_C = -1.0 \text{ mA}, V_{CE} = -5.0$ )		100 250	450 600	
( $I_C = -10 \mu\text{A}, V_{CE} = -5.0, T_A = -55^\circ\text{C}$ )		40 100	— —	

(continued)

**2N3963, 2N3964**

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

Characteristic	Symbol	Min	Max	Unit
DC Current Gain continued ( $I_C = -1.0\text{ mA}, V_{CE} = -5.0\text{ V}, T_A = 100^\circ\text{C}$ )	2N3963 2N3964	— —	600 800	
( $I_C = -1.0\ \mu\text{A}, V_{CE} = -5.0\text{ V}$ )	2N3963 2N3964	60 180	— —	
( $I_C = -10\ \mu\text{A}, V_{CE} = -5.0\text{ V}$ )	2N3963 2N3964	100 200	— —	
( $I_C = -50\text{ mA}, V_{CE} = -5.0$ )(1)	2N3963 2N3964	90 180	— —	
( $I_C = -50\text{ mA}, V_{CE} = -5.0, T_A = -55^\circ\text{C}$ )(1)	2N3963 2N3964	45 90	— —	
Collector-Emitter Saturation Voltage ( $I_C = -10\text{ mA}, I_B = -0.5\text{ mA}$ )(1) ( $I_C = -50\text{ mA}, I_B = -5.0\text{ mA}$ )(1)	$V_{CE(sat)}$	— —	-0.25 -0.4	V V
Base-Emitter Saturation Voltage ( $I_C = -10\text{ mA}, I_B = -0.5\text{ mA}$ )(1) ( $I_C = -50\text{ mA}, I_B = -5.0\text{ mA}$ )(1)	$V_{BE(sat)}$	— —	0.9 0.95	V V
<b>SMALL-SIGNAL CHARACTERISTICS</b>				
Output Capacitance ( $V_{CB} = -5.0\text{ V}, f = 1.0\text{ MHz}$ )	$C_{obo}$	—	6.0	pF
Input Capacitance ( $V_{EB} = -0.5\text{ V}, f = 1.0\text{ MHz}$ )	$C_{ibo}$	—	15	pF
Input Impedance ( $I_C = -1.0\text{ mA}, V_{CE} = -5.0\text{ V}, f = 1.0\text{ kHz}$ )	$h_{ie}$	2.5 6.0	17 20	k $\Omega$
Voltage Feedback Ratio ( $I_C = -1.0\text{ mA}, V_{CE} = -5.0, f = 1.0\text{ kHz}$ )	$h_{re}$	—	10	$10^{-4}$
Small Signal Current Gain ( $I_C = -1.0\text{ mA}, V_{CE} = -5.0\text{ V}, f = 1.0\text{ kHz}$ )	$h_{fe}$	100 250	550 700	— —
Magnitude of Forward Current Transfer Ratio, Common-Emitter ( $I_C = -0.5\text{ mA}, V_{CE} = -5.0\text{ V}, f = 20\text{ MHz}$ )	$ h_{fe} $	2.0 2.5	8.0 8.0	— —
Output Admittance ( $I_C = -1.0\text{ mA}, V_{CE} = -5.0, f = 1.0\text{ kHz}$ )	$h_{oe}$	5.0 5.0	40 50	$\mu\text{mhos}$
Noise Figure ( $I_C = -20\text{ mA}, V_{CE} = -5.0\text{ V}, \text{BW} = 15.7\text{ kHz}$ )	NF	— —	3 2	dB
( $I_C = -20\ \mu\text{A}, V_{CE} = -5.0\text{ V}, \text{BW} = 1.5\text{ kHz}, f = 10\text{ kHz}, R_S = 10\text{ k}\Omega$ )	2N3963 2N3964	— —	3 2	
( $I_C = -20\ \mu\text{A}, V_{CE} = -5.0\text{ V}, \text{BW} = 150\text{ Hz}, f = 1.0\text{ kHz}, R_S = 10\text{ k}\Omega$ )	2N3963 2N3964	— —	3 2	
( $I_C = -20\ \mu\text{A}, V_{CE} = -5.0\text{ V}, \text{BW} = 15\text{ Hz}, f = 100\text{ Hz}, R_S = 10\text{ h}\Omega$ )	2N3963 2N3964	— —	10 4	
( $I_C = -20\ \mu\text{A}, V_{CE} = -5.0\text{ V}, \text{BW} = 2.0\text{ Hz}, f = 10\text{ Hz}, R_S = 10\text{ k}\Omega$ )	2N3964	—	8	

(1) Pulse Test: Pulse Width  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .