

MAXIMUM RATINGS

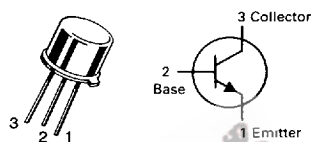
Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	150	Vdc
Collector-Base Voltage	V_{CB0}	150	Vdc
Emitter-Base Voltage	V_{EBO}	6.0	Vdc
Collector Current — Continuous	I_C	300	mAdc
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	1.0 5.71	Watt mW/ $^\circ\text{C}$
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	5.0 28.6	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	$R_{\theta JA}$	175	$^\circ\text{C/W}$
Thermal Resistance, Junction to Case	$R_{\theta JC}$	35	$^\circ\text{C/W}$

2N3500 2N3501★

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



GENERAL PURPOSE TRANSISTORS

NPN SILICON

★2N3501 is a Motorola
designated preferred device.

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage (1) ($I_C = 10$ mAdc, $I_B = 0$)	2N3500, 2N3501	$V_{(BR)CEO}$	150	—	Vdc
Collector-Base Breakdown Voltage ($I_C = 10$ μ Adc, $I_E = 0$)	2N3500, 2N3501	$V_{(BR)CBO}$	150	—	Vdc
Emitter-Base Breakdown Voltage ($I_E = 10$ μ Adc, $I_C = 0$)		$V_{(BR)EBO}$	6.0	—	Vdc
Collector Cutoff Current ($V_{CB} = 75$ Vdc, $I_E = 0$) ($V_{CB} = 75$ Vdc, $I_E = 0$, $T_A = 150^\circ\text{C}$)	2N3500, 2N3501	I_{CBO}	—	0.05 50	μ Adc
Emitter Cutoff Current ($V_{EB(off)} = 4.0$ Vdc, $I_C = 0$)		I_{EBO}	—	25	nAdc

ON CHARACTERISTICS

DC Current Gain ($I_C = 0.1$ mAdc, $V_{CE} = 10$ Vdc)	Symbol	Min	Typ	Max	Unit
2N3500	h_{FE}	20	—	—	—
2N3501		35	—	—	
($I_C = 1.0$ mAdc, $V_{CE} = 10$ Vdc)	2N3500	25	—	—	—
2N3501		50	—	—	
($I_C = 10$ mAdc, $V_{CE} = 10$ Vdc) (1)	2N3500	35	—	—	—
2N3501		75	—	—	
($I_C = 150$ mAdc, $V_{CE} = 10$ Vdc) (1)	2N3500	40	—	120	—
2N3501		100	—	300	
($I_C = 300$ mAdc, $V_{CE} = 10$ Vdc) (1)	2N3500	15	—	—	—
2N3501		20	—	—	
Collector-Emitter Saturation Voltage (1) ($I_C = 10$ mAdc, $I_B = 1.0$ mAdc) ($I_C = 50$ mAdc, $I_B = 5.0$ mAdc) ($I_C = 150$ mAdc, $I_B = 15$ mAdc)	All Types All Types 2N3500, 2N3501	$V_{CE(sat)}$	—	0.2 0.25 0.4	Vdc

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2N3500 2N3501

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

Characteristic	Symbol	Min	Typ	Max	Unit
Base-Emitter Saturation Voltage (1) ($I_C = 10\text{ mAdc}$, $I_B = 1.0\text{ mAdc}$) ($I_C = 50\text{ mAdc}$, $I_B = 5.0\text{ mAdc}$) ($I_C = 150\text{ mAdc}$, $I_B = 15\text{ mAdc}$)	$V_{BE(sat)}$	— — —	— — —	0.8 0.9 1.2	Vdc

SMALL-SIGNAL CHARACTERISTICS

Current-Gain — Bandwidth Product (2) ($V_{CE} = 20\text{ Vdc}$, $I_C = 20\text{ mAdc}$, $f = 100\text{ MHz}$)	f_T	150	—	—	MHz
Output Capacitance ($V_{CB} = 10\text{ Vdc}$, $I_E = 0$, $f = 1.0\text{ MHz}$)	C_{obo}	—	—	8.0	pF
Input Capacitance ($V_{EB} = 0.5\text{ Vdc}$, $I_C = 0$, $f = 1.0\text{ MHz}$)	C_{ibo}	—	—	80	pF
Input Impedance ($I_C = 10\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$, $f = 1.0\text{ kHz}$)	h_{ie}	0.2 0.25	— —	1.0 1.25	k ohms
Voltage Feedback Ratio ($I_C = 10\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$, $f = 1.0\text{ kHz}$)	h_{re}	— —	— —	2.5 4.0	$\times 10^{-4}$
Small-Signal Current Gain ($I_C = 10\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$, $f = 1.0\text{ kHz}$)	h_{fe}	50 75	— —	300 375	—
Output Admittance ($I_C = 10\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$, $f = 1.0\text{ kHz}$)	h_{oe}	— —	— —	100 200	μmhos

SWITCHING CHARACTERISTICS

Delay Time ($I_C = 150\text{ mAdc}$, $I_{B1} = 15\text{ mAdc}$, $V_{CC} = 100\text{ Vdc}$, $V_{BE(off)} = -2.0\text{ Vdc}$)	t_d	—	20	—	ns
Rise Time ($I_C = 150\text{ mAdc}$, $I_{B1} = 15\text{ mAdc}$, $V_{CC} = 100\text{ Vdc}$, $V_{BE(off)} = -2.0\text{ Vdc}$)	t_r	—	35	—	ns
Storage Time ($I_C = 150\text{ mAdc}$, $I_{B1} = I_{B2} = 15\text{ mAdc}$, $V_{CC} = 100\text{ Vdc}$)	t_s	—	800	—	ns
Fall Time ($I_C = 150\text{ mAdc}$, $I_{B1} = I_{B2} = 15\text{ mAdc}$, $V_{CC} = 100\text{ Vdc}$)	t_f	—	80	—	ns

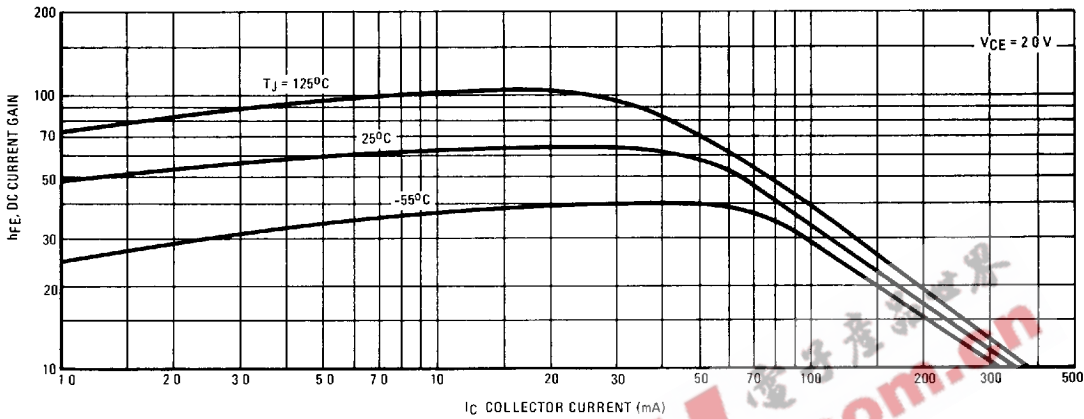
(1) Pulse Test: Pulse Width $\leq 300\ \mu\text{s}$, Duty Cycle $\leq 2.0\%$

(2) $f_T = |h_{fe}| \cdot f_{test}$

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2N3500 2N3501

**FIGURE 1 — CURRENT GAIN CHARACTERISTICS versus JUNCTION TEMPERATURE
2N3500**



2N3501

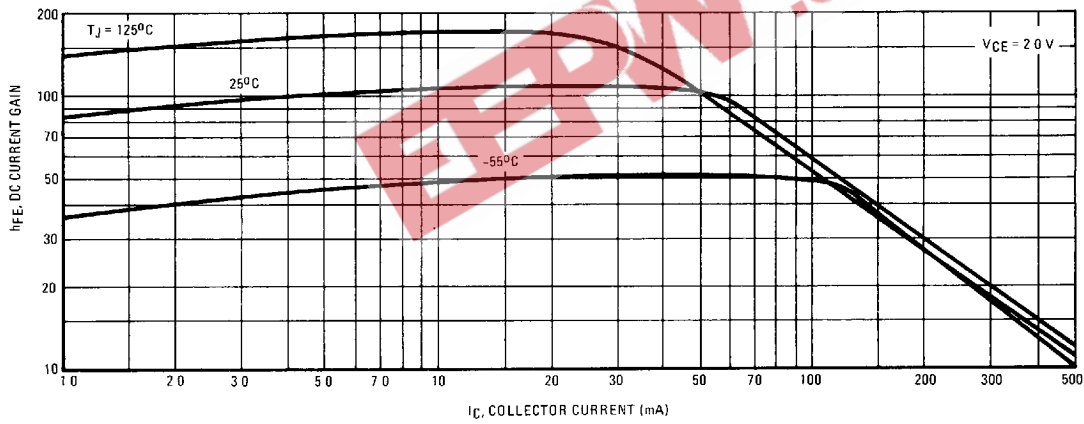
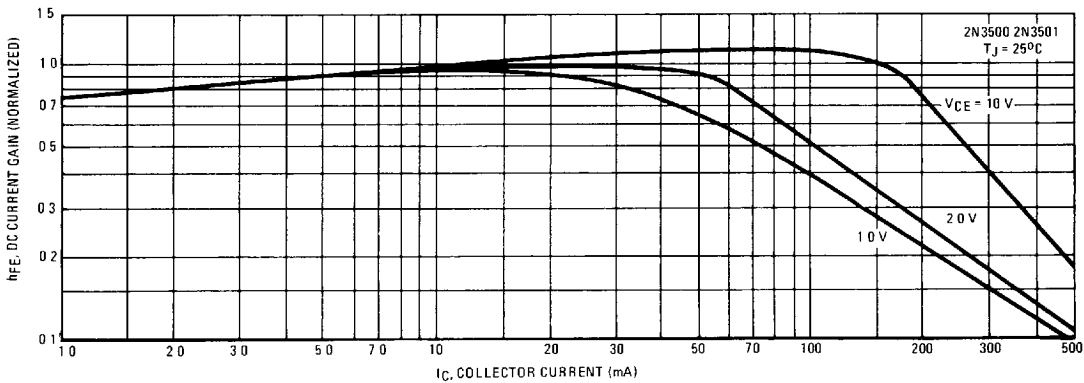


FIGURE 2 — CURRENT GAIN CHARACTERISTICS versus COLLECTOR-EMITTER VOLTAGE



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FIGURE 3 — "ON" VOLTAGES

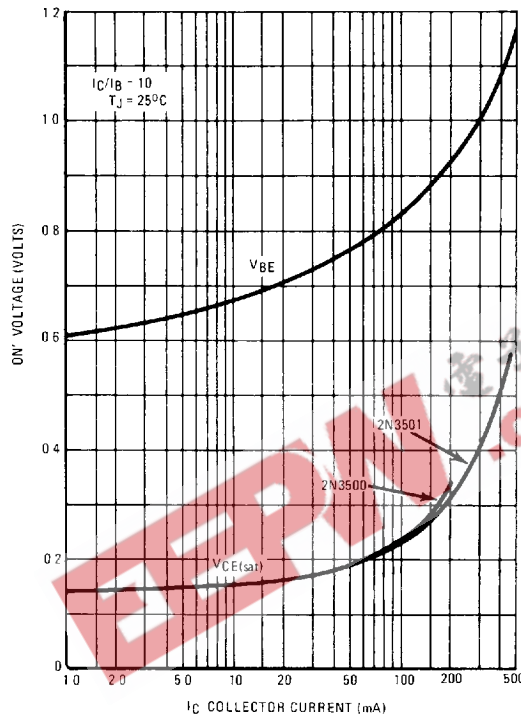


FIGURE 4 — TEMPERATURE COEFFICIENTS

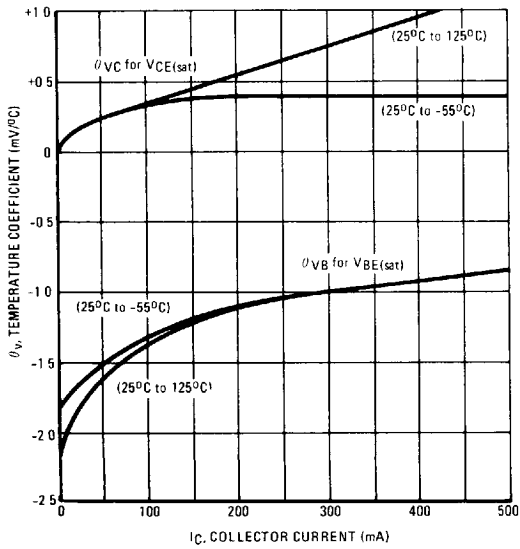
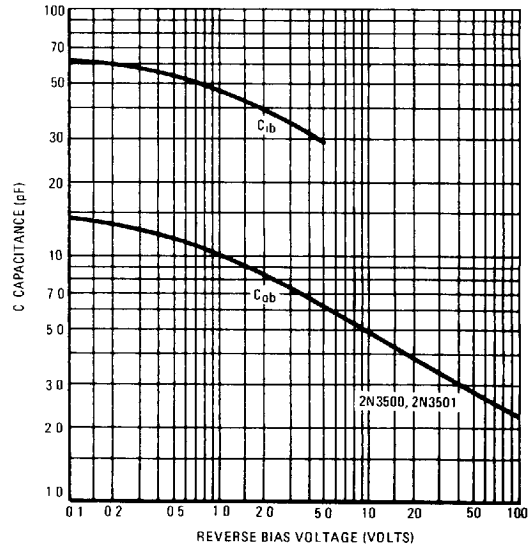


FIGURE 5 — CAPACITANCE



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AUDIO SMALL-SIGNAL h PARAMETER CHARACTERISTICS
 ($V_{CE} = 10 \text{ Vdc}$, $T_A = 25^\circ\text{C}$, $f = 1.0 \text{ kHz}$)

FIGURE 6 — CURRENT GAIN

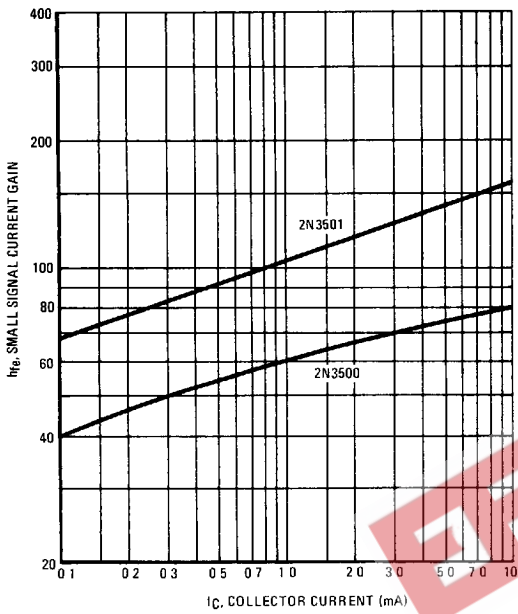


FIGURE 7 — OUTPUT IMPEDANCE

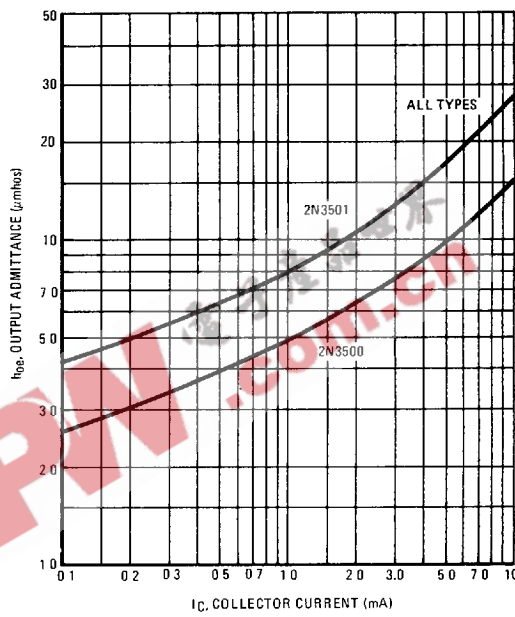


FIGURE 8 — INPUT IMPEDANCE

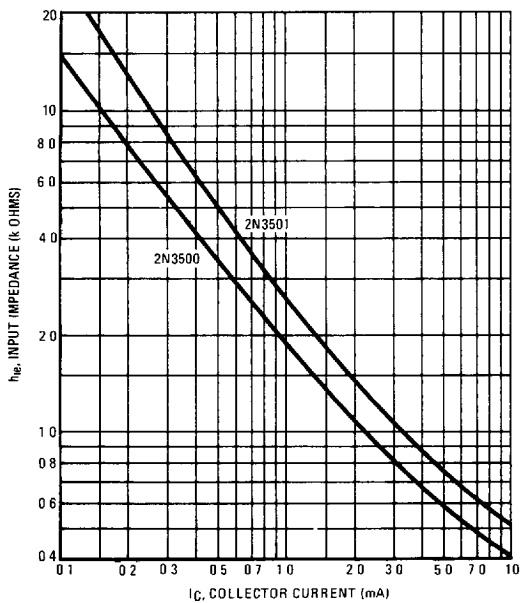
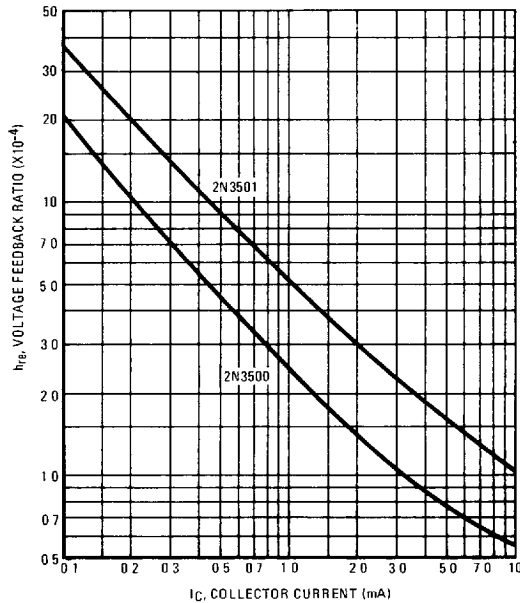


FIGURE 9 — VOLTAGE FEEDBACK RATIO



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