2N6304
2N6305

CASE 20-03, STYLE 10
TO-72 (TO-206AF)

HIGH FREQUENCY TRANSISTOR

NPN SILICON

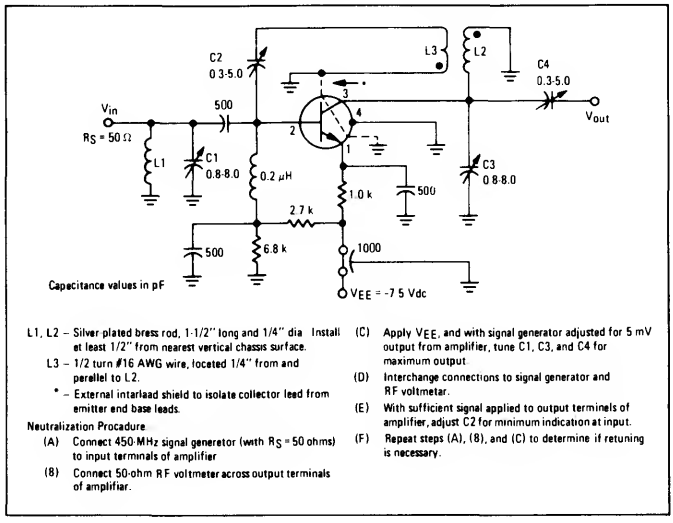
MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	15	Vdc
Collector-Base Voltage	V_{CBO}	30	Vdc
Emitter-Base Voltage	V_{EBO}	3.0	Vdc
Collector Current — Continuous	I_C	50	mAdc
Total Device Dissipation @ T_A = 25°C Derate above 25°C	P_D	200 1.14	mW mW/°C
Storage Temperature	T_{stg}	−65 to +200	°C

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted.)

Characteristic		Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Collector-Emitter Breakdown Voltage (I_C = 5.0 mAdc, I_B = 0)		$V_{(BR)CEO}$	15	—	—	Vdc
Collector-Base Breakdown Voltage (I_C = 0.1 mAdc, I_E = 0)		$V_{(BR)CBO}$	30	—	—	Vdc
Emitter-Base Breakdown Voltage (I_E = 0.1 mAdc, I_C = 0)		$V_{(BR)EBO}$	3.5	—	—	Vdc
Collector Cutoff Current (V_{CB} = 5.0 Vdc, I_E = 0)		I_{CBO}	—	—	10	nAdc
ON CHARACTERISTICS						
DC Current Gain (I_C = 2.0 mAdc, V_{CE} = 5.0 Vdc)		h_{FE}	25	—	250	—
SMALL SIGNAL CHARACTERISTICS						
Current-Gain — Bandwidth Product (I_C = 10 mAdc, V_{CE} = 5.0 Vdc, f = 100 MHz)	2N6304 2N6305	f_T	 1400 1200	 — —	 — —	MHz
Collector-Base Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 1.0 MHz)		C_{cb}	—	0.8	1.0	pF
Small Signal Current Gain (I_C = 2.0 mAdc, V_{CE} = 5.0 Vdc, f = 1.0 kHz)		h_{fe}	25	—	250	—
Collector Base Time Constant (I_E = 2.0 mAdc, V_{CB} = 5.0 Vdc, f = 31.8 MHz)	2N6304 2N6305	$rb'C_c$	 2.0 2.0	 — —	 12 15	ps
Noise Figure (I_C = 2.0 mAdc, V_{CE} = 5.0 Vdc, R_S = 50 ohms, f = 450 MHz) (Figure 1)	2N6304 2N6305	NF	 — —	 — —	 4.5 5.5	dB
FUNCTIONAL TEST						
Common-Emitter Amplifier Power Gain (I_C = 2.0 mAdc, V_{CE} = 5.0 Vdc, f = 450 MHz) (Figure 1)	2N6304 2N6305	G_{pe}	 15 12	 — —	 — —	dB

FIGURE 1 – TEST CIRCUIT FOR NOISE FIGURE AND POWER GAIN



L1, L2 – Silver-plated brass rod, 1-1/2" long and 1/4" dia. Install at least 1/2" from nearest vertical chassis surface.

L3 – 1/2 turn #16 AWG wire, located 1/4" from and parallel to L2.

* – External interlead shield to isolate collector lead from emitter and base leads.

Neutralization Procedure

(A) Connect 450-MHz signal generator (with R_S = 50 ohms) to input terminals of amplifier.

(B) Connect 50-ohm RF voltmeter across output terminals of amplifier.

(C) Apply V_{EE}, and with signal generator adjusted for 5 mV output from amplifier, tune C1, C3, and C4 for maximum output.

(D) Interchange connections to signal generator and RF voltmeter.

(E) With sufficient signal applied to output terminals of amplifier, adjust C2 for minimum indication at input.

(F) Repeat steps (A), (B), and (C) to determine if retuning is necessary.

FIGURE 2 – COLLECTOR-BASE CAPACITANCE versus COLLECTOR BASE VOLTAGE

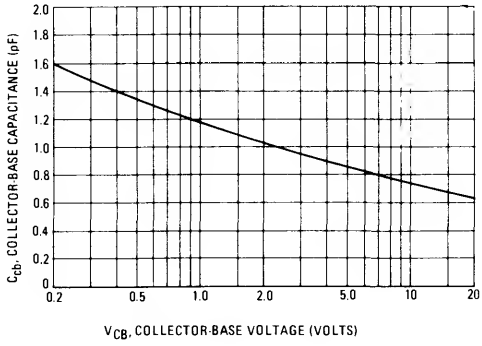


FIGURE 3 – CURRENT-GAIN-BANDWIDTH PRODUCT versus COLLECTOR CURRENT

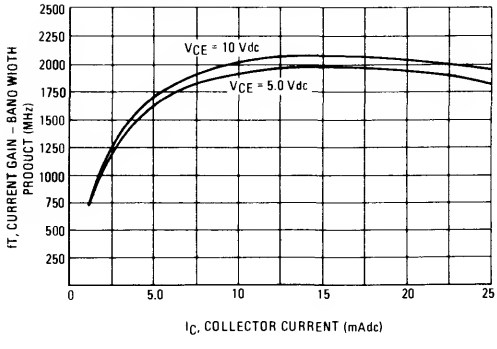


FIGURE 4 – COLLECTOR-BASE TIME CONSTANT versus EMITTER CURRENT

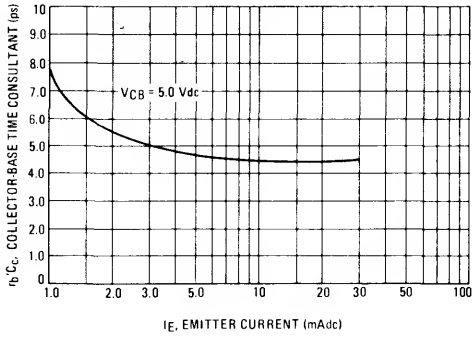


FIGURE 5 – REVERSE TRANSFER ADMITTANCE versus FREQUENCY

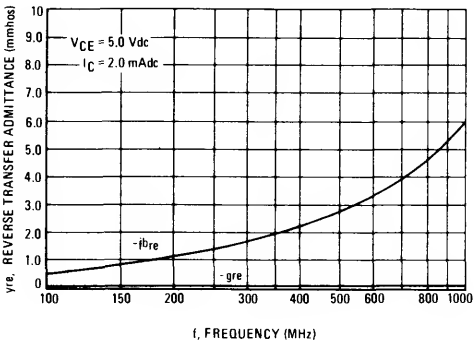


FIGURE 6 – INPUT ADMITTANCE versus FREQUENCY

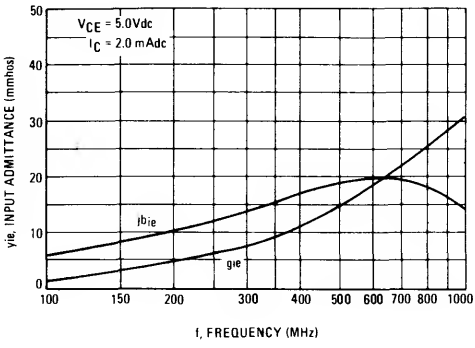


FIGURE 7 – OUTPUT ADMITTANCE versus FREQUENCY

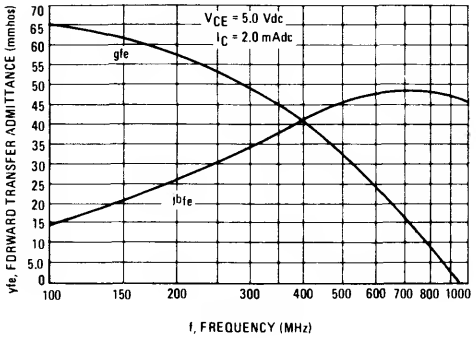
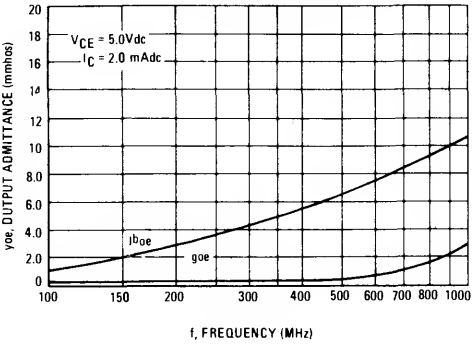


FIGURE 8 – FORWARD TRANSFER ADMITTANCE versus FREQUENCY



7

FIGURE 9 – S_{11}, INPUT REFLECTION COEFFICIENT

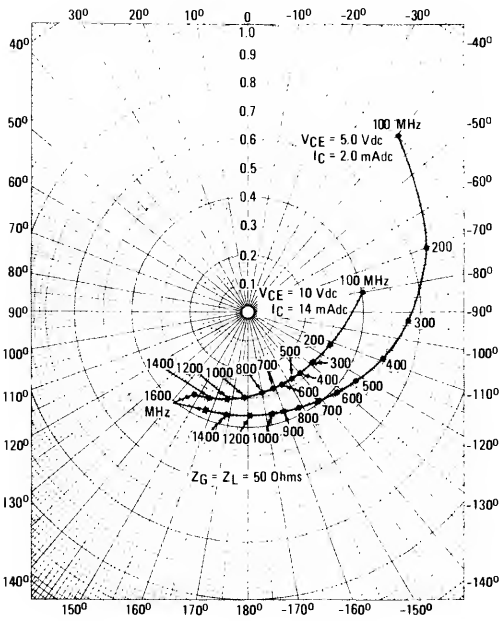


FIGURE 10 – S_{22}, OUTPUT REFLECTION COEFFICIENT

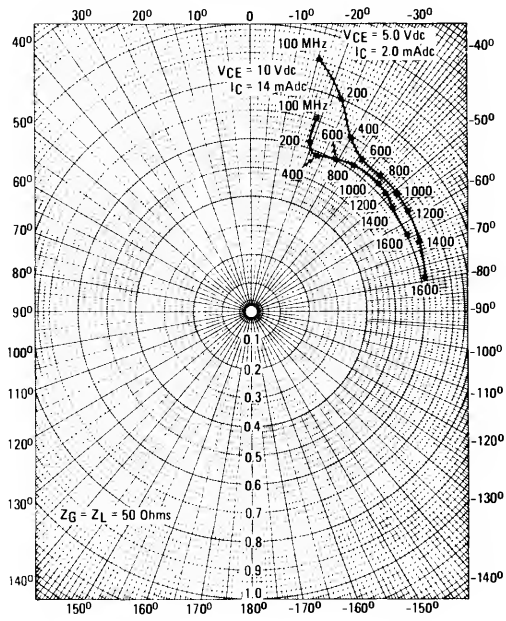


FIGURE 11 – S_{12}, REVERSE TRANSMISSION COEFFICIENT

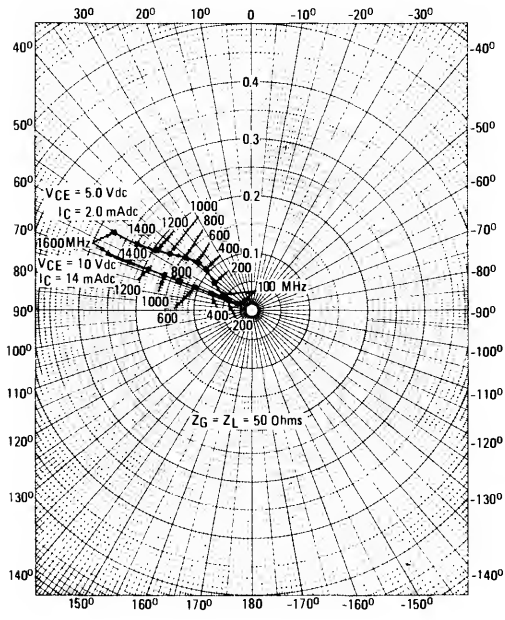


FIGURE 12 – S_{21}, FORWARD TRANSMISSION COEFFICIENT

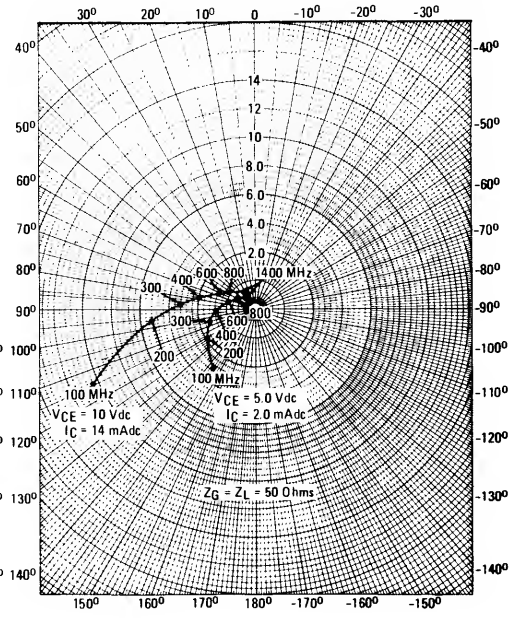


FIGURE 13 – S_{11}, INPUT REFLECTION COEFFICIENT AND S_{22}, OUTPUT REFLECTION COEFFICIENT