2N5109

JAN, JTX, JTXV AVAILABLE
CASE 79-02, STYLE 1
TO-39 (TO-205AD)

HIGH FREQUENCY TRANSISTOR

NPN SILICON

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	20	Vdc
Collector-Base Voltage	V_{CBO}	40	Vdc
Emitter-Base Voltage	V_{EBO}	3.0	Vdc
Base Current	I_B	400	mAdc
Collector Current — Continuous	I_C	400	mAdc
Total Device Dissipation @ T_C = 75°C(1) Derate above 25°C	P_D	2.5 20	Watt mW/°C
Storage Temperature	T_{stg}	−65 to +200	°C

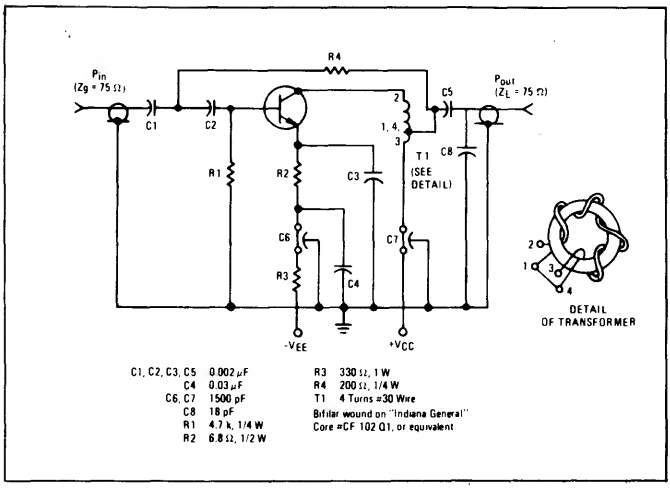
(1) Total Device Dissipation at T_A = 25°C is 1.0 Watt.

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage(2) (I_C = 5.0 mAdc, R_{BE} = 10 Ω)	$V_{(BR)CER}$	40	—	—	Vdc
Collector-Emitter Sustaining Voltage (I_C = 5.0 mAdc, I_B = 0)	$V_{(BR)CEO}$	20	—	—	Vdc
Collector Cutoff Current (V_{CE} = 15 Vdc, I_B = 0)	I_{CEO}	—	—	20	μAdc
Collector Cutoff Current (V_{CE} = 15 Vdc, V_{BE} = −1.5 V, T_C = 150°C) (V_{CE} = 35 Vdc, V_{BE} = −1.5 V)	I_{CEX}	— —	— —	5.0 5.0	mAdc mAdc
Emitter Cutoff Current (V_{BE} = 3.0 Vdc, I_C = 0)	I_{EBO}	—	—	100	μAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 360 mAdc, V_{CE} = 5.0 Vdc) (I_C = 50 mAdc, V_{CE} = 15 Vdc)	h_{FE}	5.0 40	— —	— 120	— —
SMALL SIGNAL CHARACTERISTICS					
Current-Gain — Bandwidth Product (I_C = 50 mAdc, V_{CE} = 15 Vdc, f = 200 MHz)	f_T	1200	—	—	MHz
Collector-Base Capacitance (V_{CB} = 15 Vdc, I_E = 0, f = 1.0 MHz)	C_{cb}	—	1.8	3.5	pF
Noise Figure (I_C = 10 mAdc, V_{CE} = 15 Vdc, f = 200 MHz)	NF	—	3.0	—	dB
FUNCTIONAL TEST					
Common-Emitter Amplifier Voltage Gain (Figure 1) (I_C = 50 mAdc, V_{CC} = 15 Vdc, f = 50 to 216 MHz)	G_{ve}	11	—	—	dB
Power Input (Figure 2) (I_C = 50 mAdc, V_{CC} = 15 Vdc, R_S = 50 ohms, P_{out} = 1.26 mW, f = 200 MHz)	P_{in}	—	—	0.1	mW

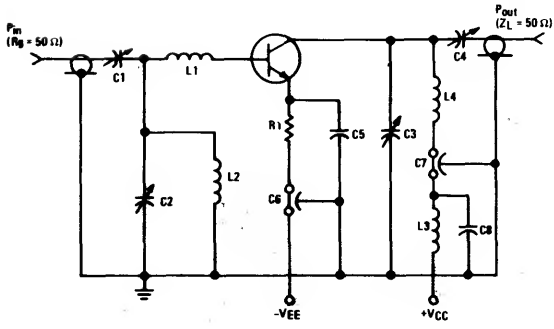
(2) Pulsed thru a 25 mH Inductor; 50% Duty Cycle.

FIGURE 1 – RF AMPLIFIER FOR VOLTAGE GAIN TEST CIRCUIT



C1, C2, C3, C5 0.002 μF
C4 0.03 μF
C6, C7 1500 pF
C8 18 pF
R1 4.7 k, 1/4 W
R2 6.8 Ω, 1/2 W
R3 330 Ω, 1 W
R4 200 Ω, 1/4 W
T1 4 Turns #30 Wire
Bifilar wound on "Indiana General" Core #CF 102 Q1, or equivalent

FIGURE 2 – 200 MHz TEST CIRCUIT



C1, C2, C3 1.0 – 30 pF
C4 1.0 – 20 pF
C5 10,000 pF
C6, C7 1,000 pF
C8 0.01 μF
L1 4-1/2 turns, No. 22 wire, 3/16" I.D.
L4 3-1/2 turns, No. 22 wire, 3/16" I.D.
L2, L3 0.82 μH RFC
R1 240 OHMS, 2 WATTS

FIGURE 3 – CURRENT-GAIN – BANDWIDTH PRODUCT

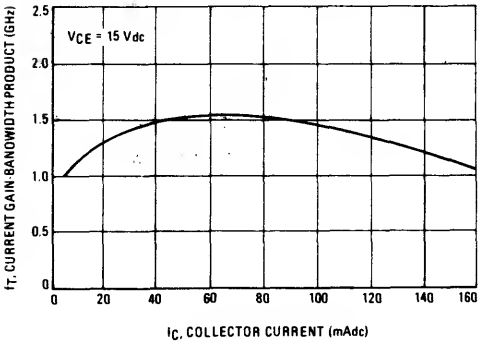


FIGURE 4 – COLLECTOR-BASE TIME CONSTANT

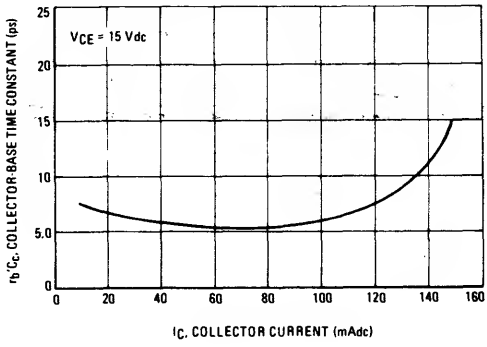


FIGURE 5 – SATURATION VOLTAGES

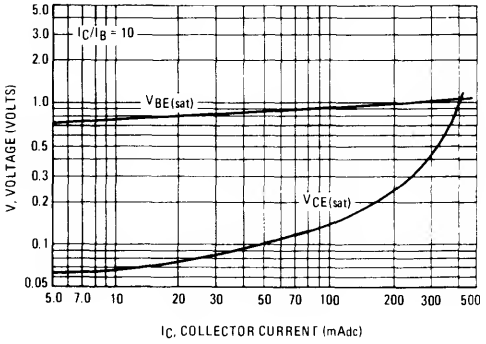


FIGURE 6 – CAPACITANCES versus REVERSE VOLTAGE

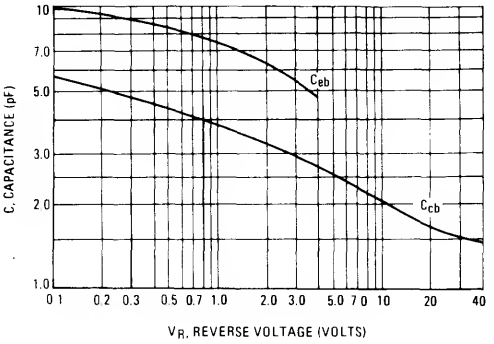


FIGURE 7 – INPUT ADMITTANCE versus FREQUENCY

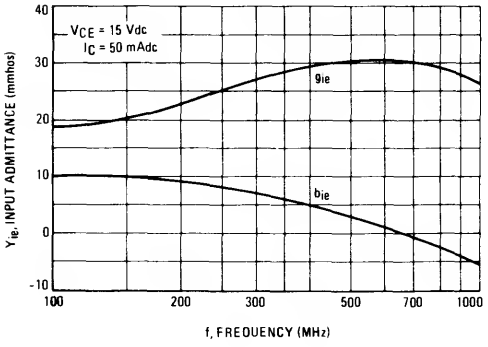


FIGURE 8 – INPUT ADMITTANCE versus COLLECTOR CURRENT

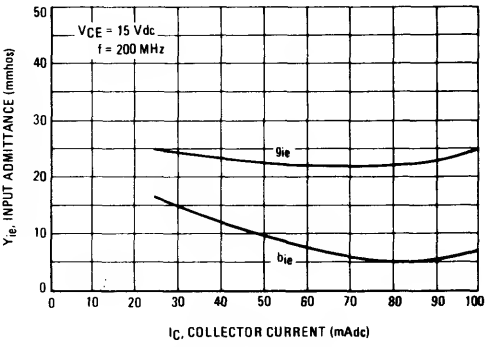


FIGURE 9 – REVERSE TRANSFER ADMITTANCE versus FREQUENCY

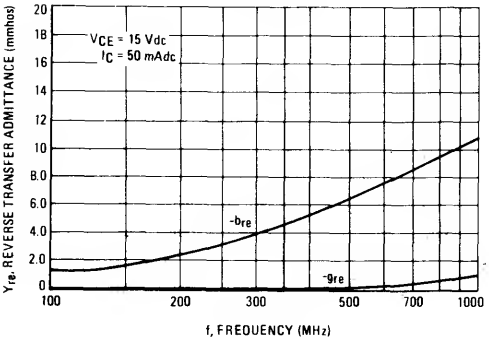


FIGURE 10 – REVERSE TRANSFER ADMITTANCE versus COLLECTOR CURRENT

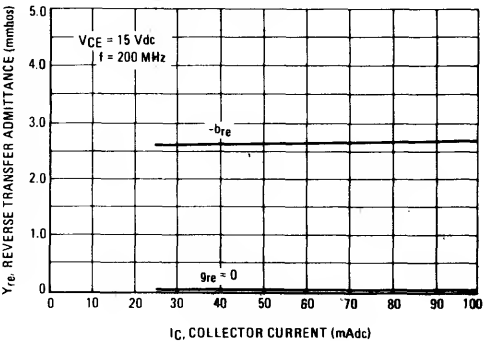


FIGURE 11 – FORWARD TRANSFER ADMITTANCE versus FREQUENCY

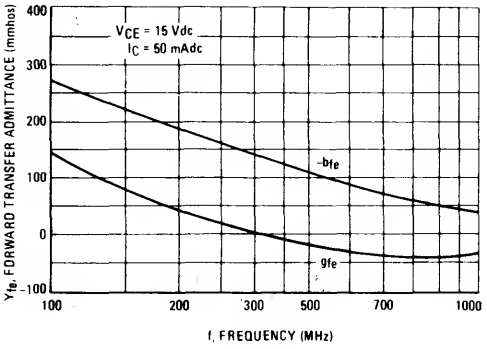


FIGURE 12 – FORWARD TRANSFER ADMITTANCE versus COLLECTOR CURRENT

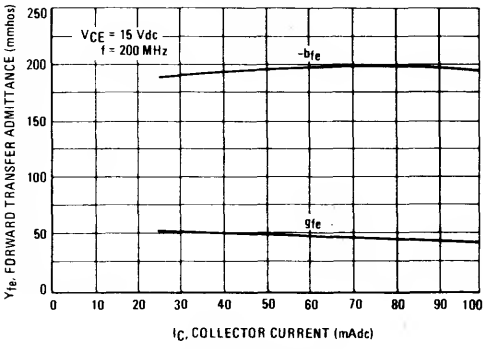


FIGURE 13 – OUTPUT ADMITTANCE versus FREQUENCY

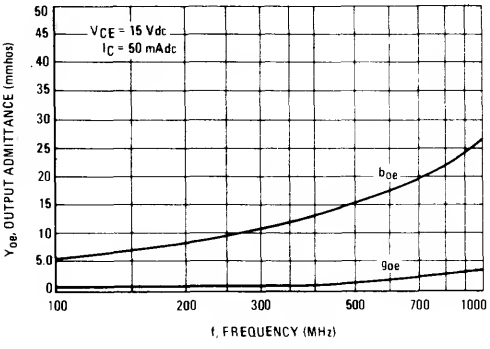


FIGURE 14 – OUTPUT ADMITTANCE versus COLLECTOR CURRENT

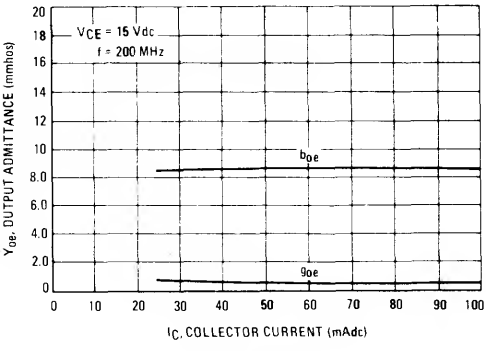


FIGURE 15 – INPUT REFLECTION COEFFICIENT versus FREQUENCY

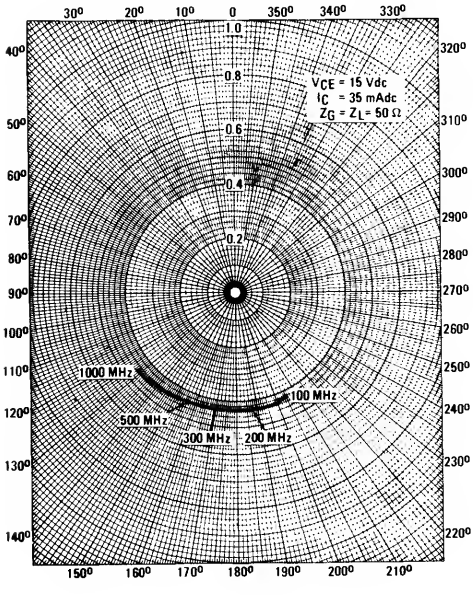


FIGURE 16 – OUTPUT REFLECTION COEFFICIENT versus FREQUENCY

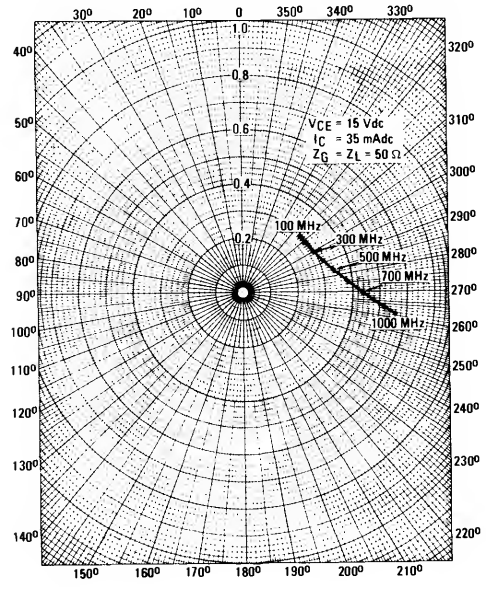


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FIGURE 17 – REVERSE TRANSMISSION COEFFICIENT versus FREQUENCY

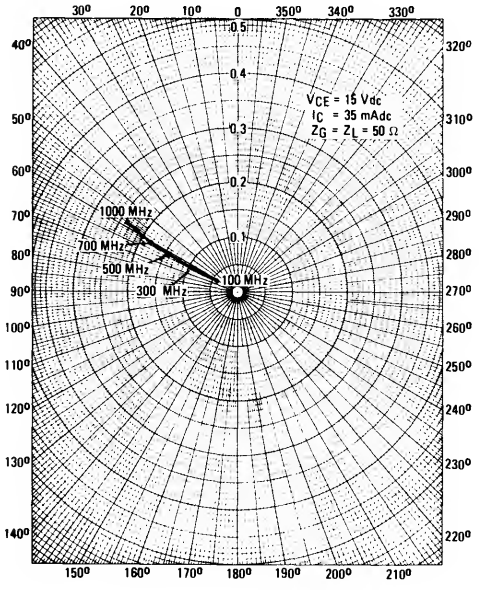

FIGURE 18 – FORWARD TRANSMISSION COEFFICIENT versus FREQUENCY

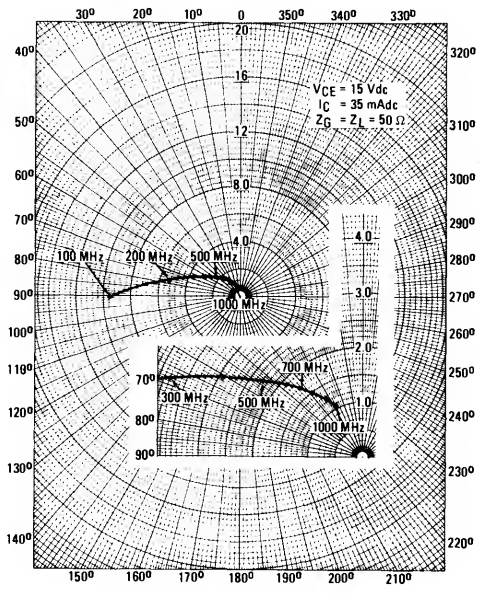

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FIGURE 19 – INPUT REFLECTION COEFFICIENT AND OUTPUT REFLECTION COEFFICIENT versus FREQUENCY