2N5943

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}	30	Vdc
Collector-Base Voltage	V_{CBO}	40	Vdc
Emitter-Base Voltage	V_{EBO}	3.5	Vdc
Collector Current — Continuous	I_C	400	mAdc
Total Device Dissipation @ T_A = 25°C Derate above 25°C	P_D	1.0 5.7	Watt mW/°C
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	3.5 0.02	Watts mW/°C
Operating and Storage Junction Temperature Range	T_J, 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)	$V_{(BR)CEO}$	30	—	—	Vdc
Collector-Base Breakdown Voltage (I_C = 100 μAdc, I_E = 0)	$V_{(BR)CBO}$	40	—	—	Vdc
Emitter-Base Breakdown Voltage (I_E = 100 μAdc, I_C = 0)	$V_{(BR)EBO}$	3.5	—	—	Vdc
Collector Cutoff Current (V_{CE} = 20 Vdc, I_B = 0)	I_{CEO}	—	—	50	μAdc
Collector Cutoff Current (V_{CB} = 15 Vdc, I_E = 0)	I_{CBO}	—	—	10	μAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 50 mAdc, V_{CE} = 15 Vdc)	h_{FE}	25	—	300	—
Collector-Emitter Saturation Voltage (I_C = 100 mAdc, I_B = 10 mAdc)	$V_{CE(sat)}$	—	0.15	0.2	Vdc
Base-Emitter Saturation Voltage (I_C = 100 mAdc, I_B = 10 mAdc)	$V_{BE(sat)}$	—	0.88	1.0	Vdc
SMALL SIGNAL CHARACTERISTICS					
Current-Gain — Bandwidth Product (I_C = 25 mAdc, V_{CE} = 15 Vdc, f = 200 MHz) (I_C = 50 mAdc, V_{CE} = 15 Vdc, f = 200 MHz) (I_C = 100 mAdc, V_{CE} = 15 Vdc, f = 200 MHz)	f_T	 1000 1200 1000	 1350 1550 1425	 — 2400 —	MHz
Collector-Base Capacitance (V_{CB} = 30 Vdc, I_E = 0, f = 100 kHz)	C_{cb}	1.0	1.6	2.5	pF
Emitter-Base Capacitance (V_{EB} = 0.5 Vdc, I_C = 0, f = 100 kHz)	C_{eb}	—	8.4	15	pF
Small Signal Current Gain (I_C = 50 mAdc, V_{CE} = 15 Vdc, f = 1.0 kHz)	h_{fe}	25	—	350	—
Collector Base Time Constant (I_E = 50 mAdc, V_{CB} = 15 Vdc, f = 31.8 MHz)	$rb'C_c$	2.0	5.5	20	ps
Noise Figure (I_C = 30 mAdc, V_{CE} = 15 Vdc, f = 200 MHz) (Figure 1) (I_C = 35 mAdc, V_{CE} = 15 Vdc, f = 200 MHz) (Figure 6)	NF	 — —	 3.4 6.8	 — 8.0	dB
FUNCTIONAL TEST					
Common-Emitter Amplifier Power Gain (I_C = 10 mAdc, V_{CE} = 15 Vdc, f = 200 MHz) (Figure 1) (I_C = 50 mAdc, V_{CE} = 15 Vdc, f = 250 MHz) (Figure 6)	G_{pe}	 — 7.0	 11.4 7.6	 — —	dB
Intermodulation Distortion (I_C = 50 mAdc, V_{CE} = 15 Vdc, V_{out} = +50 dBmV)	IM	—	—	−50	dB
Cross Modulation Distortion (I_C = 50 mAdc, V_{CE} = 15 Vdc, V_{out} = +40 dBmV) (I_C = 50 mAdc, V_{CE} = 15 Vdc, V_{out} = +50 dBmV)	XM	 — —	 −67 −45	 — −42	dB

FIGURE 1 – NARROW-BAND TEST CIRCUIT

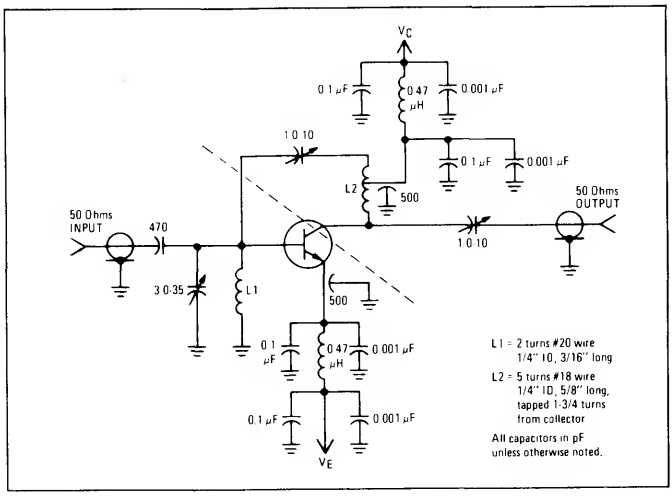


FIGURE 2 – CURRENT-GAIN – BANDWIDTH PRODUCT

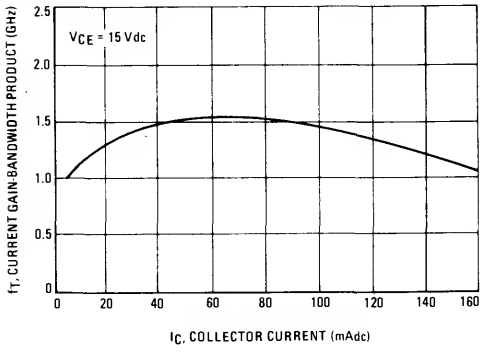


FIGURE 3 – COLLECTOR-BASE TIME CONSTANT

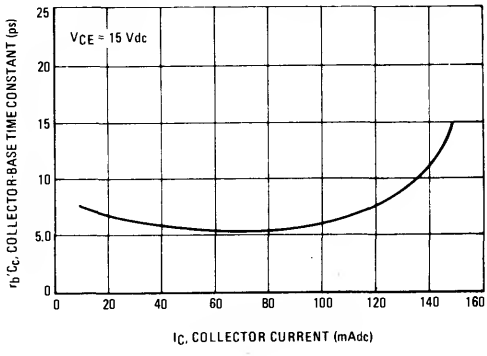


FIGURE 4 – SATURATION VOLTAGES

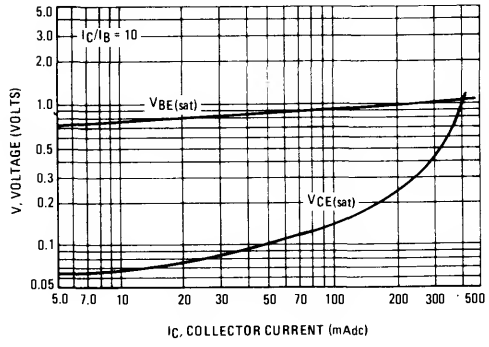


FIGURE 5 – CAPACITANCES versus REVERSE VOLTAGE

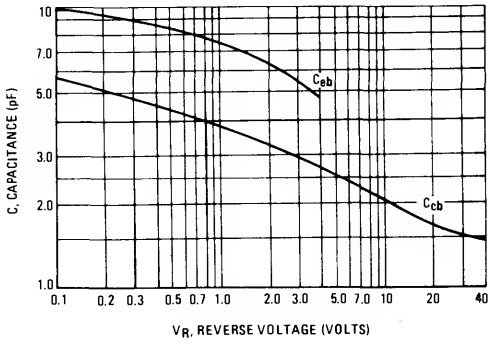
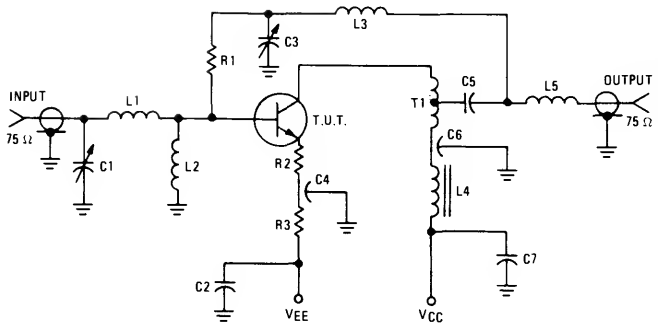


FIGURE 6 – BROADBAND TEST CIRCUIT



C1	1.0-10 pF	JOHANSON 2951 OR EQUIVALENT
C2, C7	0.01 μF	
C3	0.5-6.0 pF	JOHANSON 4642 OR EQUIVALENT
C4, C6	1500 pF	
C5	470 pF	
L1	2 TURNS AWG #26, 5/32" I.D.	
L2	1 μH MOLOED CHOKE	
L3	5 TURNS AWG #26, 3/32" I.D.	
L4	FERRITE CHOKE, 3 TURNS #30 ON STACKPOLE 57-0156 BEAD	
L5	2 TURNS AWG #26, 3/32" I.D.	
T1	AWG #30 TRIFILAR WOUND 1-9-9 ON STACKPOLE 57-0985, #11 TOROID	
R1	270 OHMS	
R2	18 OHMS	
R3	150 OHMS	

GARLOCK TEFLON SOCKET

FIGURE 7 – CROSS-MODULATION DISTORTION versus COLLECTOR CURRENT

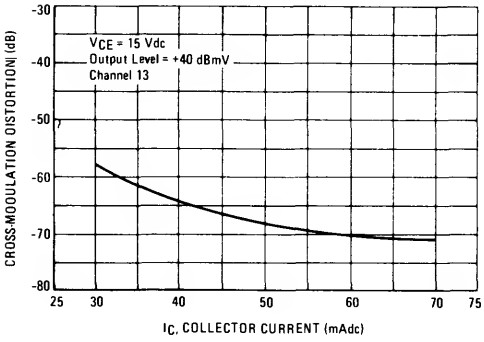


FIGURE 8 – CROSS-MODULATION DISTORTION versus OUTPUT LEVEL

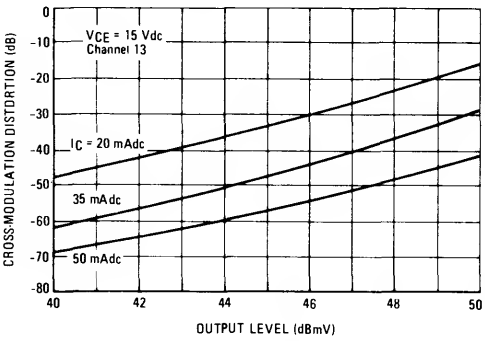


FIGURE 9 – NARROWBAND NOISE FIGURE versus COLLECTOR CURRENT

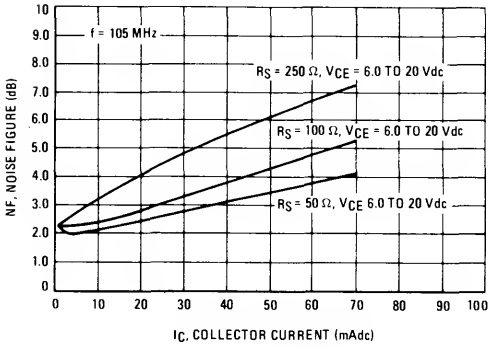


FIGURE 10 – NARROWBAND NOISE FIGURE versus COLLECTOR CURRENT

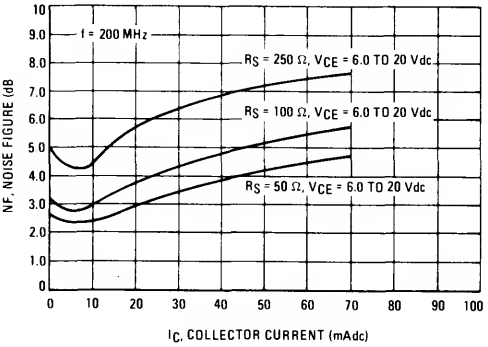


FIGURE 11 – BROADBAND NOISE FIGURE versus COLLECTOR CURRENT

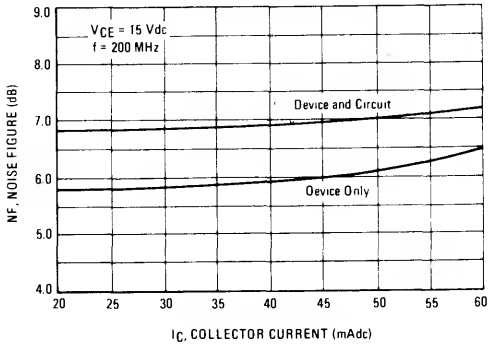


FIGURE 12 – NARROWBAND NOISE FIGURE versus FREQUENCY

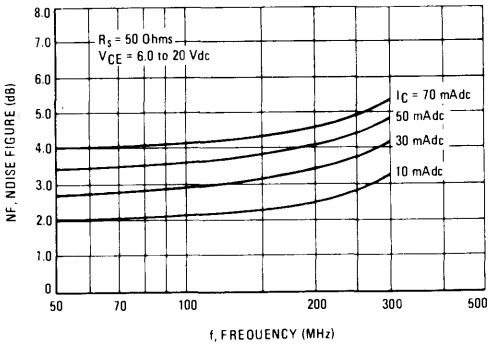


FIGURE 13 – INPUT ADMITTANCE versus FREQUENCY

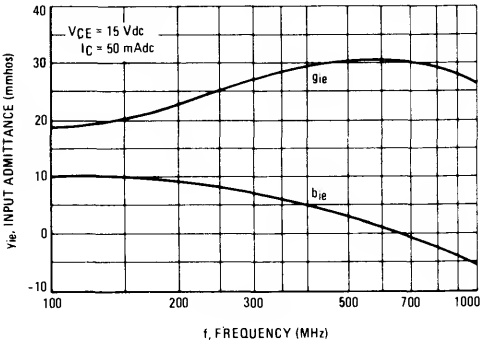


FIGURE 14 – INPUT ADMITTANCE versus COLLECTOR CURRENT

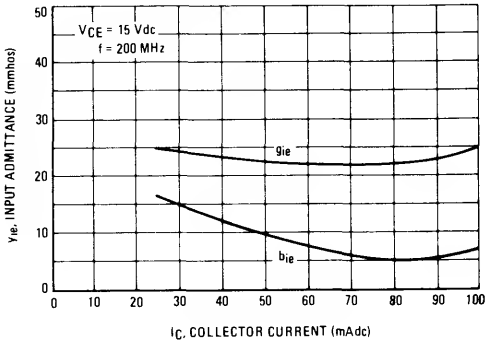


FIGURE 15 – REVERSE TRANSFER ADMITTANCE versus FREQUENCY

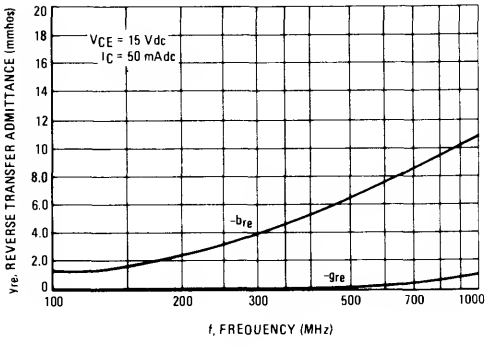


FIGURE 16 – REVERSE TRANSFER ADMITTANCE versus COLLECTOR CURRENT

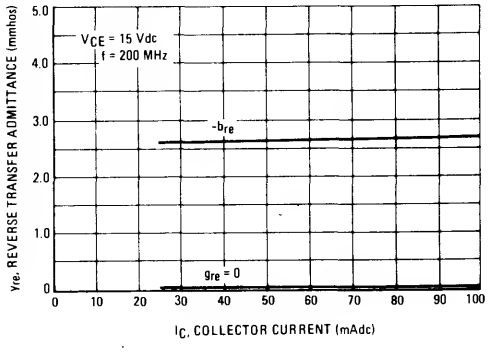


FIGURE 17 – FORWARD TRANSFER ADMITTANCE versus FREQUENCY

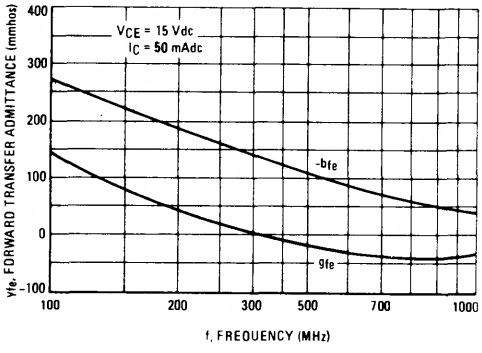


FIGURE 18 – FORWARD TRANSFER ADMITTANCE versus COLLECTOR CURRENT

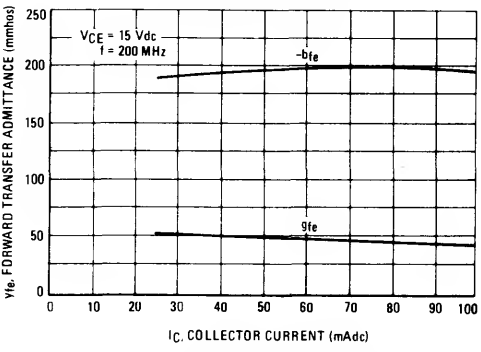


FIGURE 19 – OUTPUT ADMITTANCE versus FREQUENCY

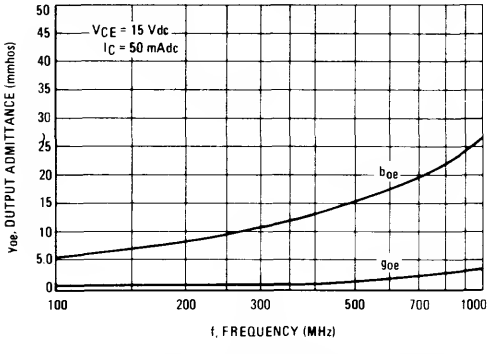


FIGURE 20 – OUTPUT ADMITTANCE versus COLLECTOR CURRENT

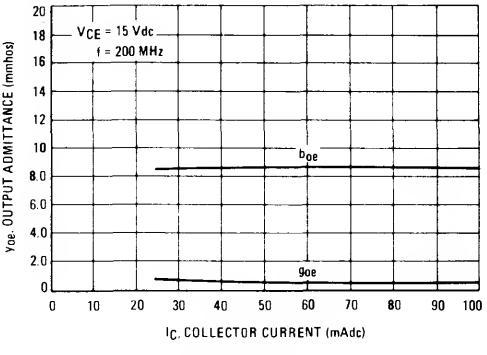


FIGURE 21 – INPUT REFLECTION COEFFICIENT versus FREQUENCY

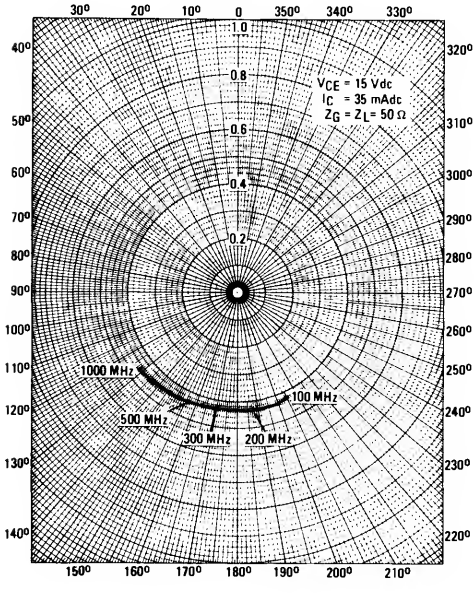
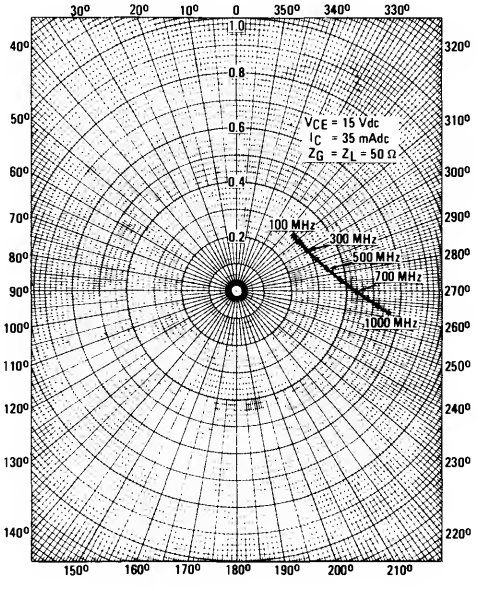


FIGURE 22 – OUTPUT REFLECTION COEFFICIENT versus FREQUENCY



7

FIGURE 23 – REVERSE TRANSMISSION COEFFICIENT versus FREQUENCY

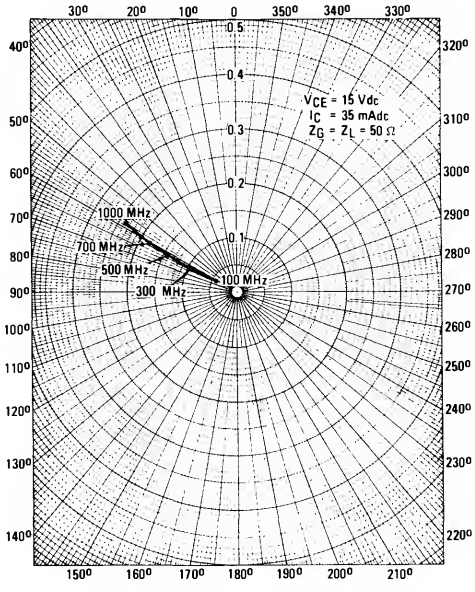
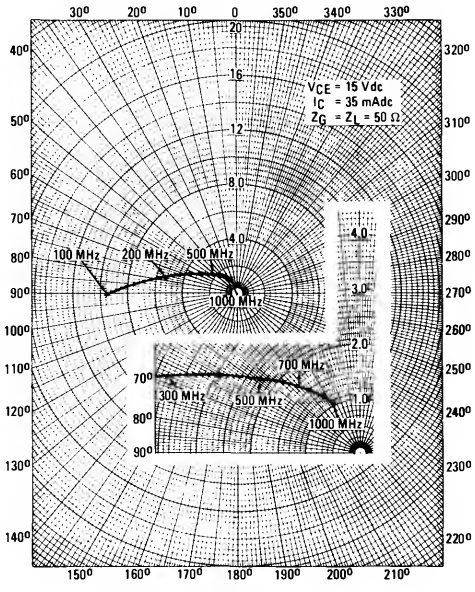


FIGURE 24 – FORWARD TRANSMISSION COEFFICIENT versus FREQUENCY



7

FIGURE 25 – INPUT REFLECTION COEFFICIENT AND OUTPUT REFLECTION COEFFICIENT versus FREQUENCY