

MRF511

CASE 244A-01, STYLE 1
TO-117

HIGH FREQUENCY TRANSISTOR

NPN SILICON



MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CE}	20	Vdc
Collector-Base Voltage	V_{CB}	35	Vdc
Emitter-Base Voltage	V_{EB}	3.5	Vdc
Collector Current — Continuous	I_C	250	mA
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	5.0 28.6	Watts mW/°C
Storage Temperature	T_{stg}	-65 to +200	°C
Stud Torque(1)	—	6.5	In. Lb.

(1) For Repeated Assembly use 5 In. Lb.

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage ($I_C = 5.0$ mA, $I_B = 0$)	$V_{(BR)CEO}$	20	—	—	Vdc
Collector-Base Breakdown Voltage ($I_C = 100$ μ A, $I_E = 0$)	$V_{(BR)CBO}$	35	—	—	Vdc
Emitter-Base Breakdown Voltage ($I_E = 100$ μ A, $I_C = 0$)	$V_{(BR)EBO}$	3.5	—	—	Vdc
Collector Cutoff Current ($V_{CE} = 15$ Vdc, $I_B = 0$)	I_{CEO}	—	—	100	μ A

ON CHARACTERISTICS

DC Current Gain ($I_C = 80$ mA, $V_{CE} = 10$ Vdc)	h_{FE}	25	50	200	—
Collector-Emitter Saturation Voltage ($I_C = 100$ mA, $I_B = 10$ mA)	$V_{CE(sat)}$	—	0.2	0.5	Vdc

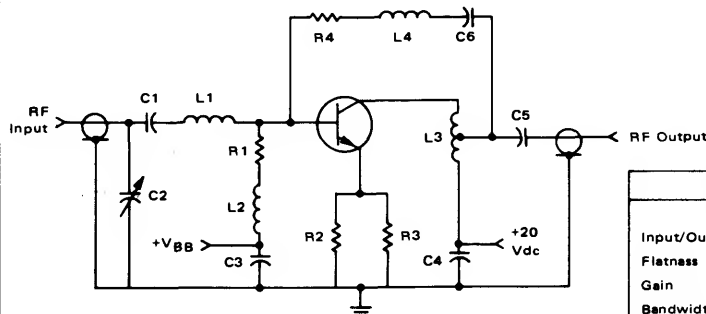
SMALL SIGNAL CHARACTERISTICS

Current-Gain — Bandwidth Product ($I_C = 80$ mA, $V_{CE} = 20$ Vdc, $f = 200$ MHz)	f_T	1.5	2.1	—	GHz
Output Capacitance ($V_{CB} = 20$ Vdc, $I_E = 0$, $f = 1.0$ MHz)	C_{obo}	—	3.2	4.5	pF
Noise Figure ($I_C = 50$ mA, $V_{CE} = 20$ Vdc, $f = 200$ MHz)	NF	—	7.3	10	dB

FUNCTIONAL TEST (FIGURE 1)

Common-Emitter Amplifier Power Gain ($V_{CE} = 20$ Vdc, $I_C = 80$ mA, $f = 250$ MHz)	G_{pe}	10	11	—	dB	
2nd Order Intermodulation Distortion ($V_{CE} = 20$ Vdc, $I_C = 80$ mA, $V_{out} = +50$ dBmV, Chn 2 + Chn 13 = 266.5 MHz)	IMD	—	−55	−50	dB	
Cross-Modulation Distortion ($V_{CE} = 20$ Vdc, $V_{out} = +50$ dBmV, $I_C = 80$ mA)	Chn 13 Chn R	12 Chn XMD 30 Chn XMD	— —	−59 −46	−57 —	dB
Triple Beat ($V_{CE} = 20$ Vdc, $I_C = 80$ mA, $V_{out} = +50$ dBmV, Chn 2 + Chn 3 + Chn E = 261.75 MHz)	TB	—	−68	−65	dB	

FIGURE 1 - 40 to 330 MHz BROADBAND TEST CIRCUIT SCHEMATIC



CIRCUIT PERFORMANCE		
	Min	Typ
Input/Output Return Loss	-	18 dB
Flatness	-	+0.3 dB
Gain	10 dB	
Bandwidth	-	40-300 MHz

C1,C3,C4,C5,C6 0.002 μ F Ceramic Disc
C2 0.35-3.5 pF JOHANSON 4702
L1 2 Turns, #20 AWG, 1/8" I.D., 0.2" Long
L2 5 μ H, Ferrite Choke, MILLER
L3 18 Turns, #24 AWG Enamelled, on Ferrite Torroid Core FERROXCUBE 1041TO60-4C7
L4 5 Turns, #20 AWG, 3/16" I.D., 0.35" Long

R1 4.7 k Ω , 1/4W, 10%
R2 27 Ω , 1W, 10%
R3 27 Ω , 1W, 10%
R4 300 Ω , 1/4W, 10%
 Input/Output Connectors - Type F
 Z_0 - 75 Ohms

FIGURE 2 - CURRENT-GAIN-BANDWIDTH PRODUCT

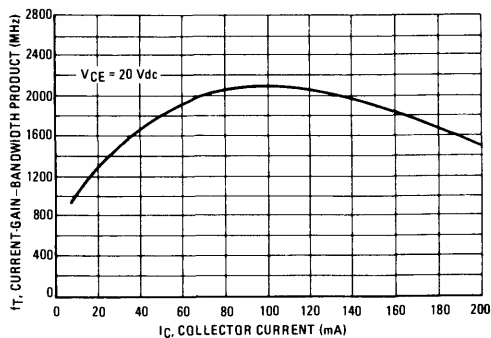


FIGURE 3 - OUTPUT CAPACITANCE

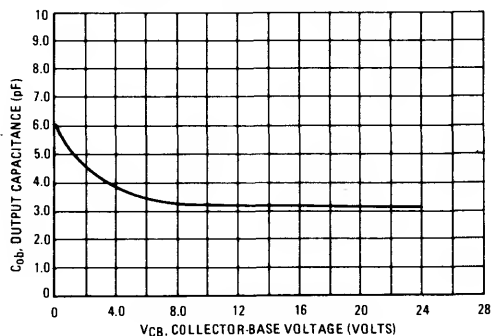


FIGURE 4 - INPUT CAPACITANCE

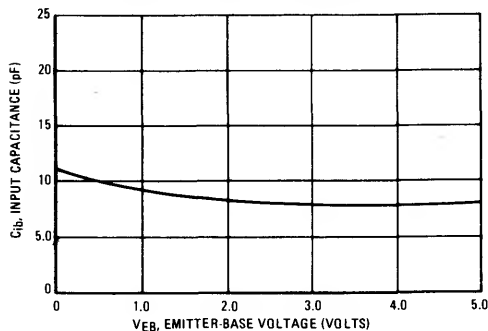


FIGURE 5 - BROADBAND NOISE FIGURE

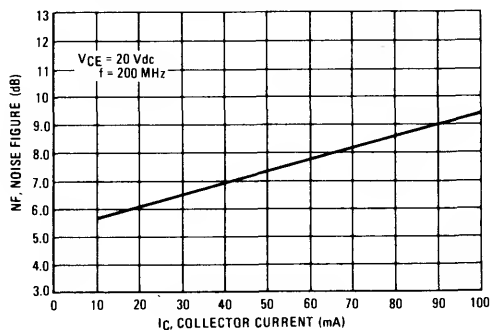


FIGURE 6 – 12 CHANNEL CROSS-MODULATION
versus COLLECTOR-EMITTER VOLTAGE

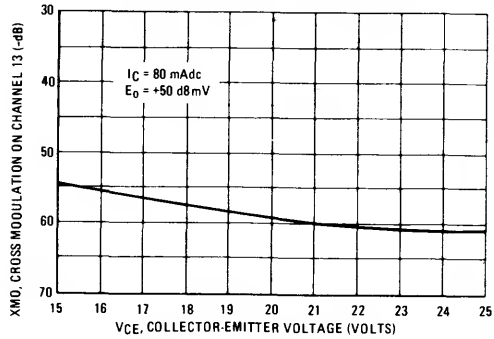


FIGURE 7 – 12 CHANNEL CROSS-MODULATION
versus COLLECTOR CURRENT

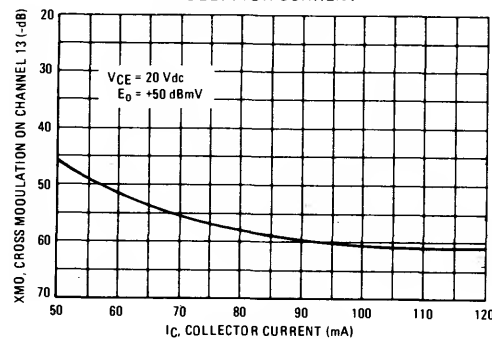


FIGURE 8 – 30 CHANNEL CROSS-MODULATION
ON CHANNEL R

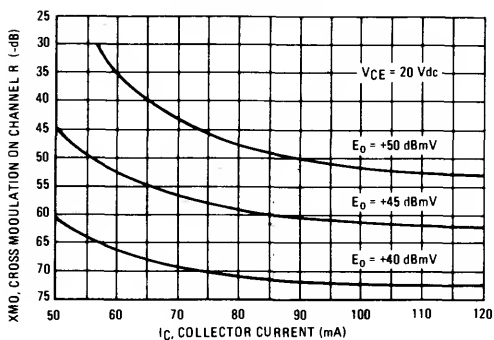


FIGURE 9 – 30 CHANNEL CROSS-MODULATION
ON CHANNEL 2,13,R

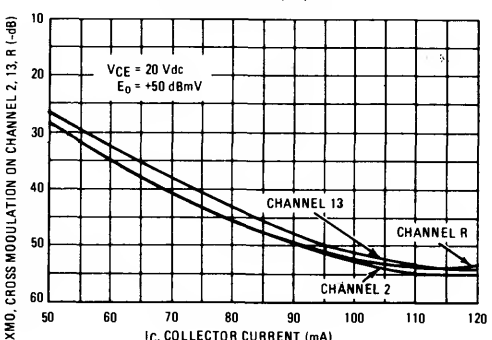


FIGURE 10 – 30-CHANNEL CROSS-MODULATION versus
COLLECTOR-EMITTER VOLTAGE

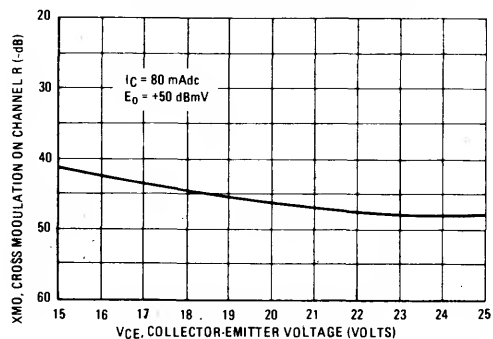


FIGURE 11 – TRIPLE BEAT versus COLLECTOR CURRENT

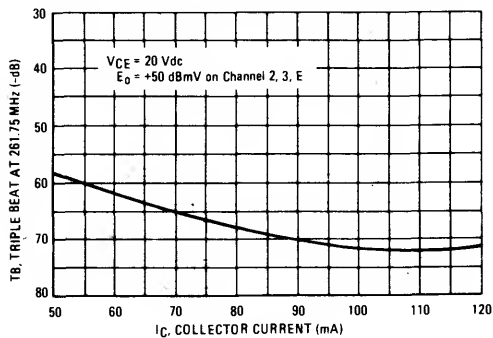


FIGURE 12 – TRIPLE BEAT versus COLLECTOR-EMITTER VOLTAGE

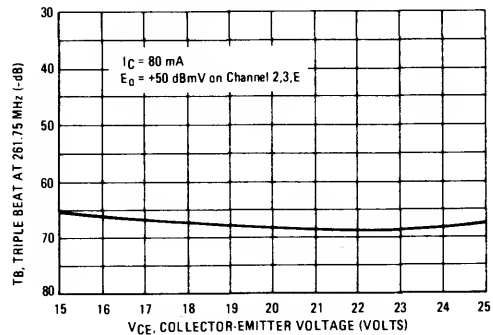


FIGURE 13 – SECOND ORDER IMD versus COLLECTOR CURRENT

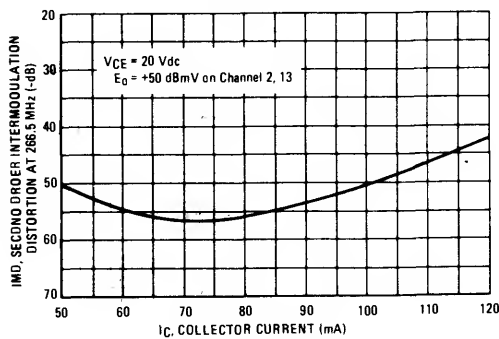


FIGURE 14 – SECOND ORDER IMD versus COLLECTOR-EMITTER VOLTAGE

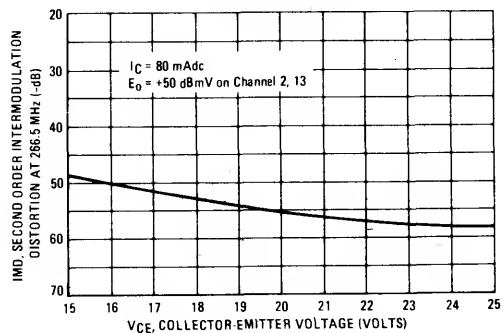


FIGURE 15 – INPUT REFLECTION COEFFICIENT (S11) AND OUTPUT REFLECTION COEFFICIENT (S22) versus FREQUENCY

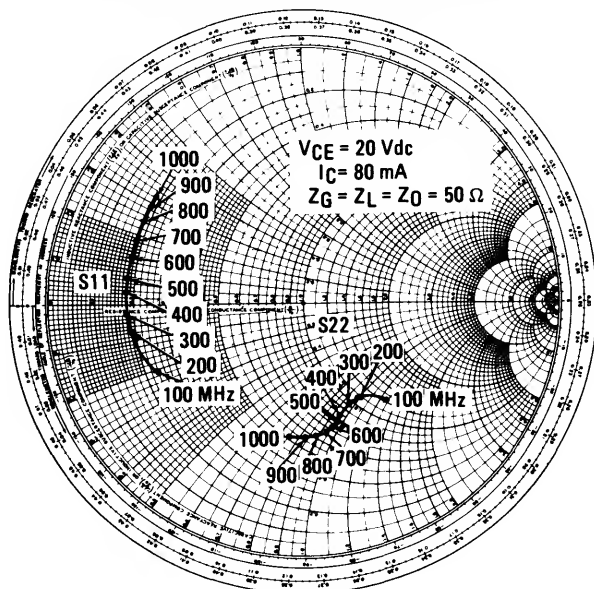


FIGURE 16 – FORWARD TRANSMISSION COEFFICIENT (S21) versus FREQUENCY

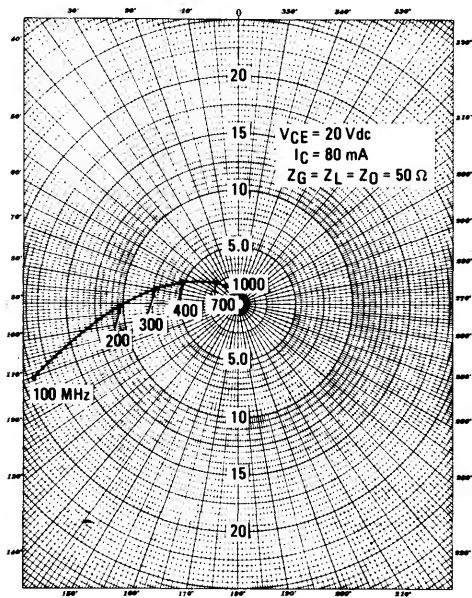


FIGURE 17 – REVERSE TRANSMISSION COEFFICIENT (S12) versus FREQUENCY

