

2N5179

The RF Line

2

NPN SILICON RF HIGH FREQUENCY TRANSISTOR

... designed primarily for use in high-gain, low-noise amplifier, oscillator, and mixer applications. Can also be used in UHF converter applications.

- High Current-Gain – Bandwidth Product –
 $f_T = 1.4 \text{ GHz (Typ) @ } I_C = 10 \text{ mAdc}$
- Low Collector-Base Time Constant –
 $r_b' C_C = 14 \text{ ps (Max) @ } I_E = 2.0 \text{ mAdc}$
- Characterized with Scattering Parameters
- Low Noise Figure –
 $NF = 4.5 \text{ dB (Max) @ } f = 200 \text{ MHz}$

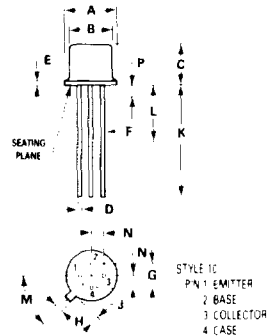
4.5 dB @ 200 MHz
HIGH FREQUENCY
TRANSISTOR
NPN SILICON



***MAXIMUM RATINGS**

Rating	Symbol	Value	Unit
Collector-Emitter Voltage Applicable 1.0 to 20 mAdc	V_{CEO}	12	Vdc
Collector-Base Voltage	V_{CB}	20	Vdc
Emitter-Base Voltage	V_{EB}	2.5	Vdc
Collector Current	I_C	50	mAdc
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	200 1.14	mW mW/ $^\circ\text{C}$
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	300 1.71	mW mW/ $^\circ\text{C}$
Storage Temperature Range	T_{stg}	-65 to +200	$^\circ\text{C}$

* Indicates JEDEC Registered Data.



NOTE: ALL RULES AND NOTES ASSOCIATED WITH TO-72 OUTLINE SHALL APPLY.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	5.31	5.84	0.209	0.230
B	4.52	4.95	0.178	0.195
C	4.32	5.33	0.170	0.210
D	0.41	0.53	0.016	0.021
E	—	0.76	—	0.030
F	0.41	0.48	0.016	0.019
G	—	2.54 BSC	—	0.100 BSC
H	0.91	1.17	0.036	0.046
J	0.71	.72	0.028	0.048
K	12.70	—	0.500	—
L	6.35	—	0.250	—
M	—	45 BSC	—	45 BSC
N	—	1.27 BSC	—	0.050 BSC
P	—	1.27	—	0.050

CASE 20-03
TO-206AF
(TO-72)

2N5179

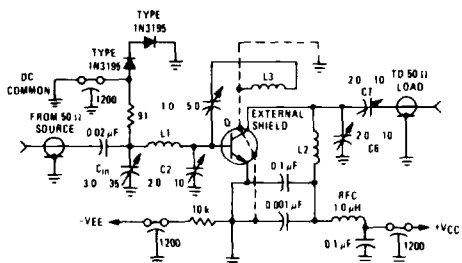
*ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector-Emitter Sustaining Voltage (I _C = 3.0 mA _{dc} , I _B = 0)	V _{CEO(sus)}	12	—	V _{dc}
Collector-Base Breakdown Voltage (I _C = 0.001 mA _{dc} , I _E = 0)	V _{(BR)CBO}	20	—	V _{dc}
Emitter-Base Breakdown Voltage (I _E = 0.01 mA _{dc} , I _C = 0)	V _{(BR)EBO}	2.5	—	V _{dc}
Collector Cutoff Current (V _{CB} = 15 V _{dc} , I _E = 0) (V _{CB} = 15 V _{dc} , I _E = 0, T _A = 150°C)	I _{CBO}	— —	0.02 1.0	μA _{dc}
ON CHARACTERISTICS				
DC Current Gain (I _C = 3.0 mA _{dc} , V _{CE} = 1.0 V _{dc})	h _{FE}	25	250	—
Collector-Emitter Saturation Voltage (I _C = 10 mA _{dc} , I _B = 1.0 mA _{dc})	V _{CE(sat)}	—	0.4	V _{dc}
Base-Emitter Saturation Voltage (I _C = 10 mA _{dc} , I _B = 1.0 mA _{dc})	V _{BE(sat)}	—	1.0	V _{dc}
DYNAMIC CHARACTERISTICS				
Current-Gain – Bandwidth Product ① (I _C = 5.0 mA _{dc} , V _{CE} = 6.0 V _{dc} , f = 100 MHz)	f _T	900	2000	MHz
Collector-Base Capacitance (V _{CB} = 10 V _{dc} , I _E = 0, f = 0.1 to 1.0 MHz)	C _{cb}	—	1.0	pF
Small-Signal Current Gain (I _C = 2.0 mA _{dc} , V _{CE} = 6.0 V _{dc} , f = 1.0 kHz)	h _{fe}	25	300	—
Collector-Base Time Constant (I _E = 2.0 mA _{dc} , V _{CB} = 6.0 V _{dc} , f = 31.9 MHz)	τ _b C _c	3.0	14	ps
Noise Figure (See Figure 1) (I _C = 1.5 mA _{dc} , V _{CE} = 6.0 V _{dc} , R _S = 50 ohms, f = 200 MHz)	NF	—	4.5	dB
FUNCTIONAL TEST				
Common-Emitter Amplifier Power Gain (See Figure 1) (V _{CE} = 6.0 V _{dc} , I _C = 5.0 mA _{dc} , f = 200 MHz)	G _{pe}	15	—	dB
Power Output (See Figure 2) (V _{CB} = 10 V _{dc} , I _E = 12 mA _{dc} , f ≥ 500 MHz)	P _{out}	20	—	mW

*Indicates JEDEC Registered Values.

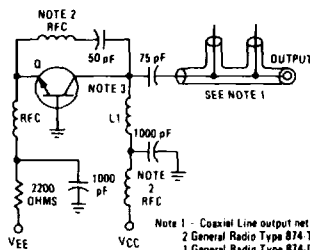
① f_T is defined as the frequency at which |h_{fe}| extrapolates to unity.

FIGURE 1 - 200 MHz AMPLIFIER POWER GAIN AND NOISE FIGURE CIRCUIT



- L1 1 3/4 Turns, #18 AWG, 0.5" L, 0.5" Diameter
- L2 2 Turns, #16 AWG, 0.5" L, 0.5" Diameter
- L3 2 Turns, #13 AWG, 0.25" L, 0.5" Diameter (Position 1/4" from L2)

FIGURE 2 - 500 MHz OSCILLATOR CIRCUIT



- Note 1 - Coaxial Line output network consisting of:
 - 2 General Radio Type 874 TEE or equivalent
 - 1 General Radio Type 874-D28 Adjustable Stub or equivalent
 - 1 General Radio Type 874-LA Adjustable Line or equivalent
 - 1 General Radio Type 874-WN3 Short-circuit termination or equivalent
- Note 2 RFC - 0.2 microH Ohmite #2480 or equivalent
- Note 3 Lead Number 4 (case) floating

- L1 2 turns #16 AWG wire, 3/8 inch OD, 1 1/4 inch long
- Q - 2N5179

FIGURE 3 - NOISE FIGURE versus FREQUENCY

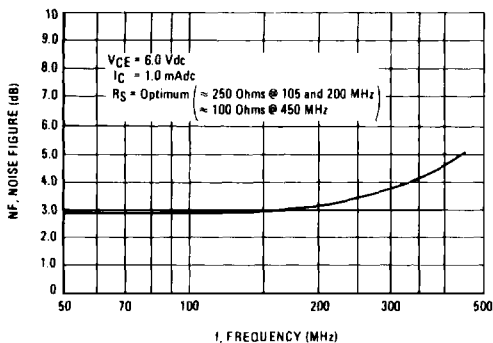


FIGURE 4 - NOISE FIGURE versus SOURCE RESISTANCE and COLLECTOR CURRENT

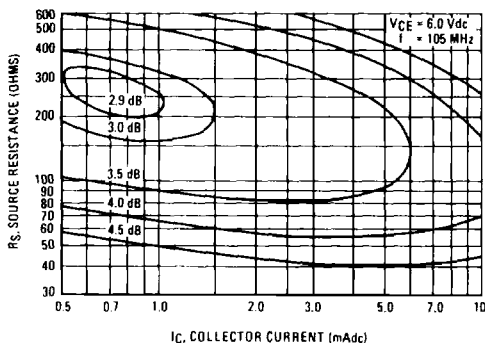


FIGURE 5 - NOISE FIGURE versus SOURCE RESISTANCE and COLLECTOR CURRENT

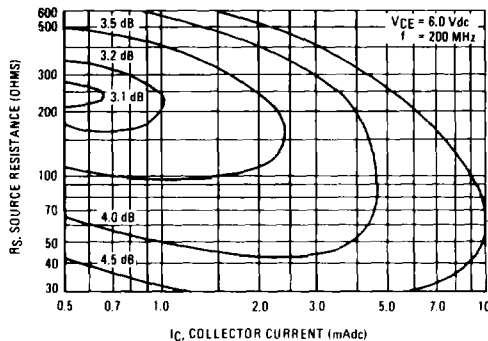
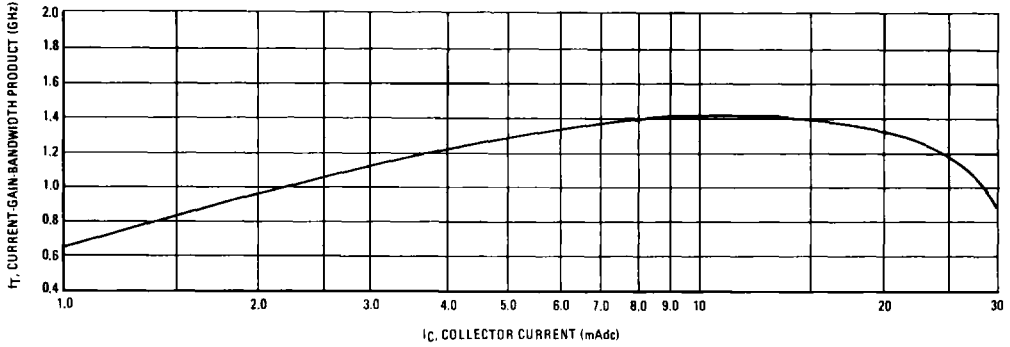


FIGURE 6 – CURRENT-GAIN-BANDWIDTH PRODUCT



2

FIGURE 7 – INPUT ADMITTANCE versus FREQUENCY

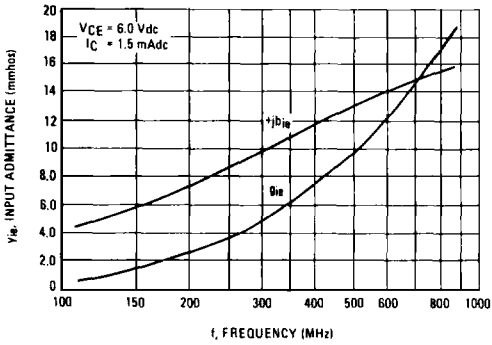


FIGURE 8 – OUTPUT ADMITTANCE versus FREQUENCY

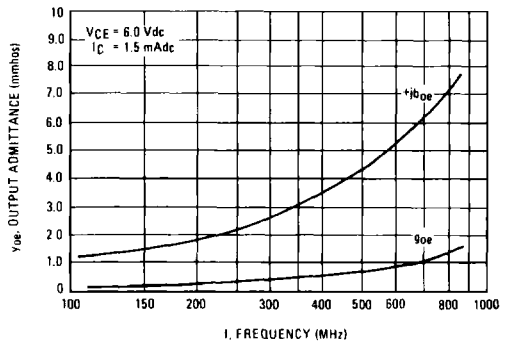


FIGURE 9 – FORWARD TRANSFER ADMITTANCE versus FREQUENCY

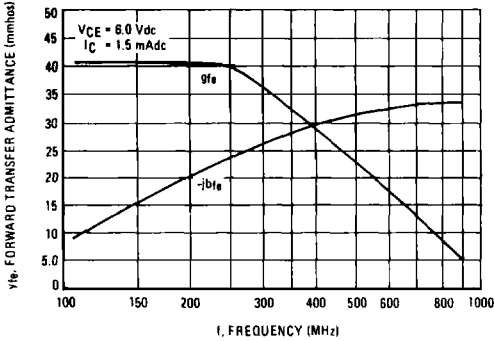


FIGURE 10 – REVERSE TRANSFER ADMITTANCE versus FREQUENCY

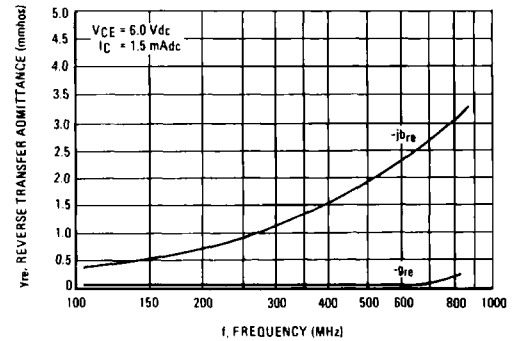


FIGURE 11— S_{11} , INPUT REFLECTION COEFFICIENT

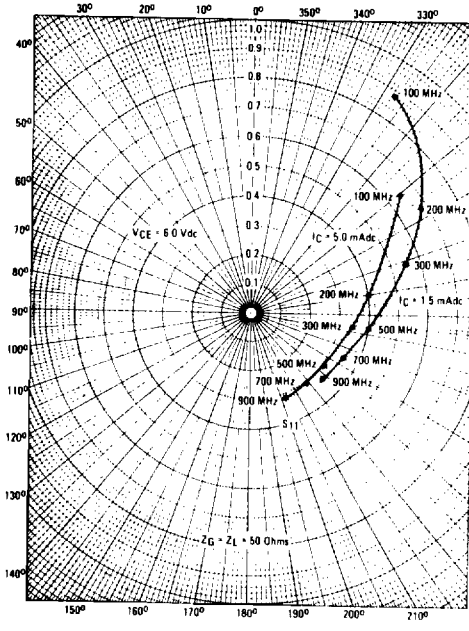


FIGURE 12— S_{22} , OUTPUT REFLECTION COEFFICIENT

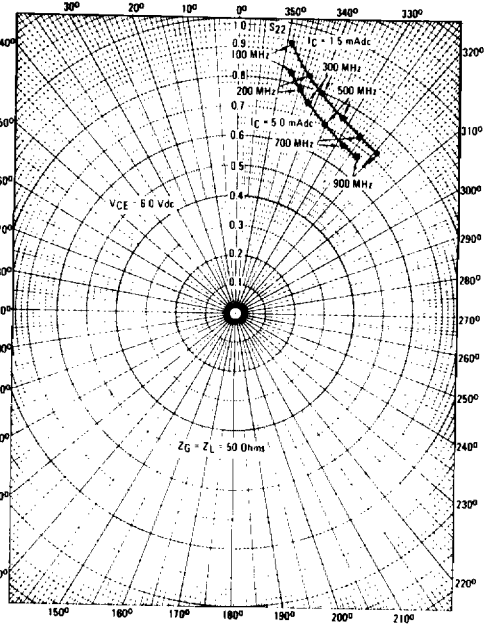


FIGURE 13— S_{12} , REVERSE TRANSMISSION COEFFICIENT

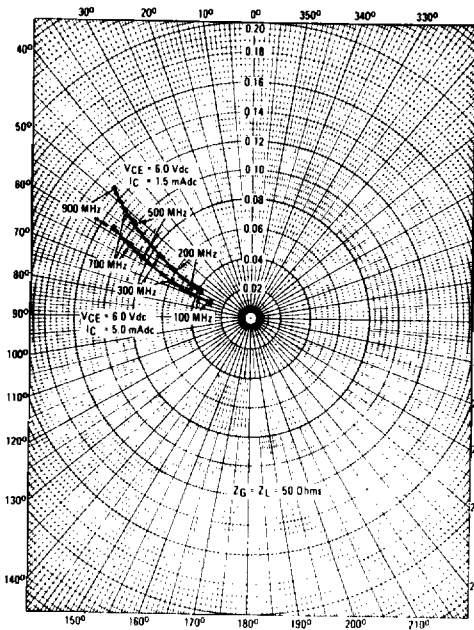
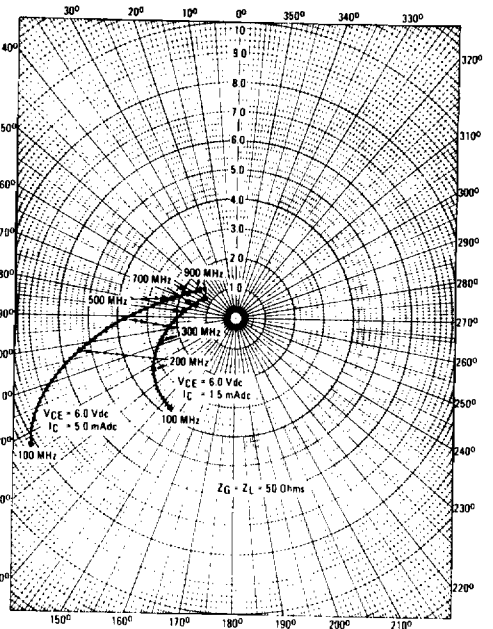


FIGURE 14— S_{21} , FORWARD TRANSMISSION COEFFICIENT



2

FIGURE 15— S_{11} , INPUT REFLECTION COEFFICIENT AND S_{22} , OUTPUT REFLECTION COEFFICIENT

