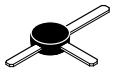
The RF Line

NPN Silicon High-Frequency Transistor

The BFR96 transistor uses the same state–of–the–art microwave transistor chip which features fine–line geometry, ion–implanted arsenic emitters and gold top metallization. This transistor is intended for low–to–medium power amplifiers requiring high gain, low noise figure, and low intermodulation distortion. The BFR96 is particularly suitable for broadband MATV/CATV amplifiers.

BFR96

f_T = 4.5 GHz @ 50 mA
HIGH–FREQUENCY TRANSISTOR
NPN SILICON



CASE 317A–01, STYLE 2

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	V_{CEO}	15	Vdc
Collector–Base Voltage	V_{CBO}	20	Vdc
Emitter–Base Voltage	V_{EBO}	3.0	Vdc
Collector Current — Continuous	I_C	100	mAdc
Total Device Dissipation @ T_C = 100°C (1) Derate above T_C = 100°C	P_D	0.5 10	Watts mW/°C
Storage Temperature	T_{stg}	–65 to +150	°C

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector–Emitter Breakdown Voltage (I_C = 1.0 mAdc, I_B = 0)	$V_{(BR)CEO}$	15	—	—	Vdc
Collector–Base Breakdown Voltage (I_C = 100 μAdc, I_E = 0)	$V_{(BR)CBO}$	20	—	—	Vdc
Emitter–Base Breakdown Voltage (I_E = 100 μAdc, I_C = 0)	$V_{(BR)EBO}$	3.0	—	—	Vdc
Collector Cutoff Current (V_{CB} = 10 Vdc, I_E = 0)	I_{CBO}	—	—	100	nAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 50 mAdc, V_{CE} = 10 Vdc)	h_{FE}	30	—	200	—
DYNAMIC CHARACTERISTICS					
Current–Gain — Bandwidth Product (I_C = 50 mAdc, V_{CE} = 10 Vdc, f = 0.5 GHz)	f_T	—	4.5	—	GHz
Collector–Base Capacitance (V_{CB} = 10 Vdc, Emitter Guarded)	C_{cb}	—	1.2	1.5	pF

NOTE:
1. Case temperature measured on collector lead immediately adjacent to body of package.

(continued)

ELECTRICAL CHARACTERISTICS — continued (T_C = 25°C unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
FUNCTIONAL TESTS					
Noise Figure (I_C = 10 mAdc, V_{CE} = 10 Vdc, f = 0.5 GHz)	NF	—	2.0	—	dB
Maximum Unilateral Gain/Insertion Gain (2) (I_C = 50 mAdc, V_{CE} = 10 Vdc, f = 0.5 GHz)	G_U(max)/ $\|S_{21}\|^2$	—/12	14.5/13	—	dB

NOTE: 2. $G_U(max) = \dfrac{|S_{21}|^2}{(1-|S_{11}|^2)(1-|S_{22}|^2)}$

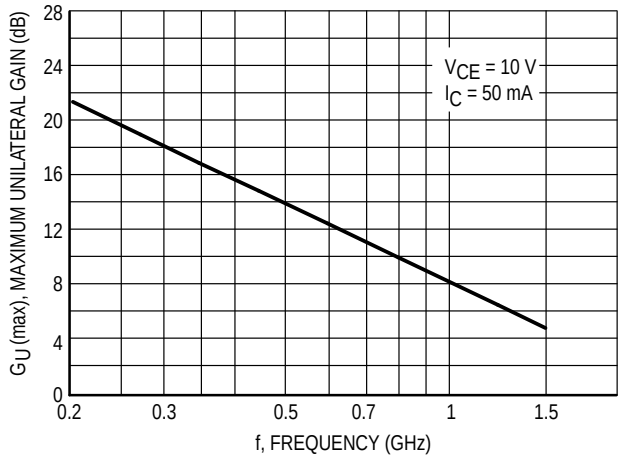


Figure 1. Maximum Unilateral Gain versus Frequency

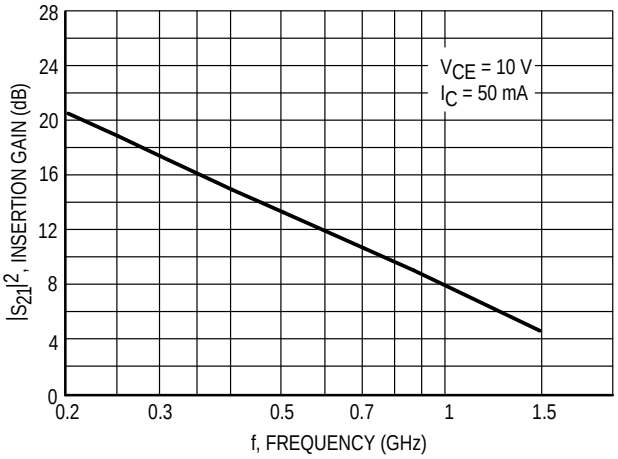


Figure 2. $|S_{21}|^2$ versus Frequency

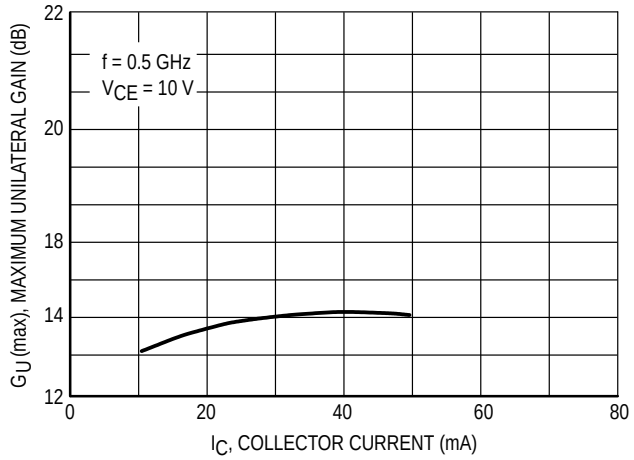


Figure 3. Maximum Unilateral Gain versus Collector Current

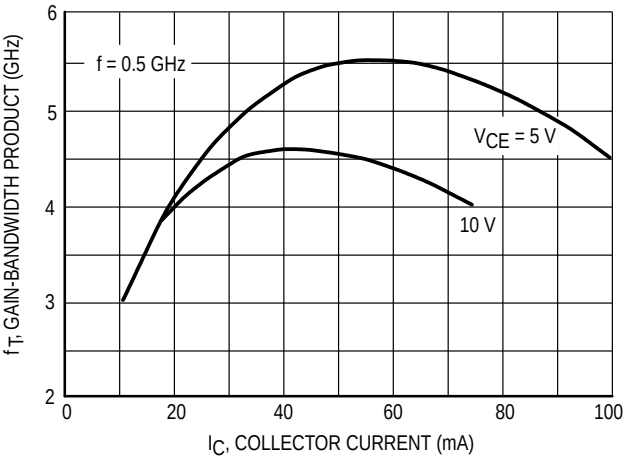


Figure 4. Gain–Bandwidth Product versus Collector Current

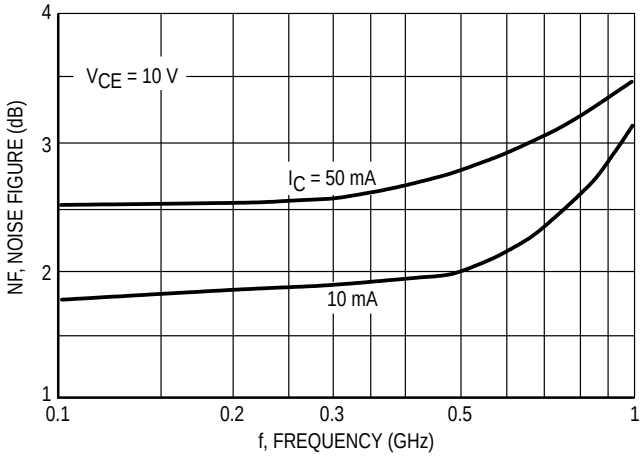


Figure 5. Noise Figure versus Frequency

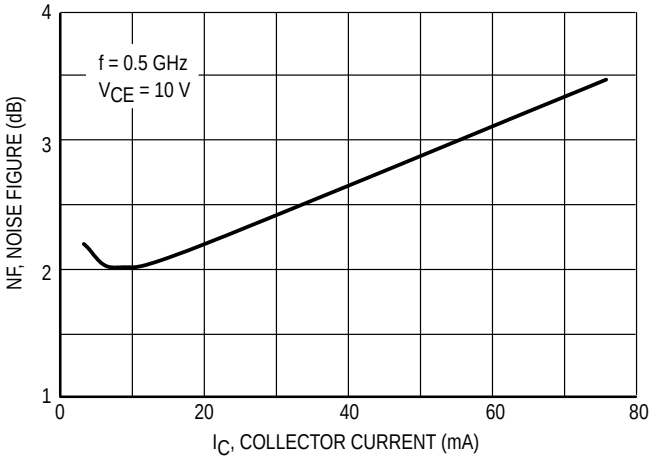


Figure 6. Noise Figure versus Collector Current

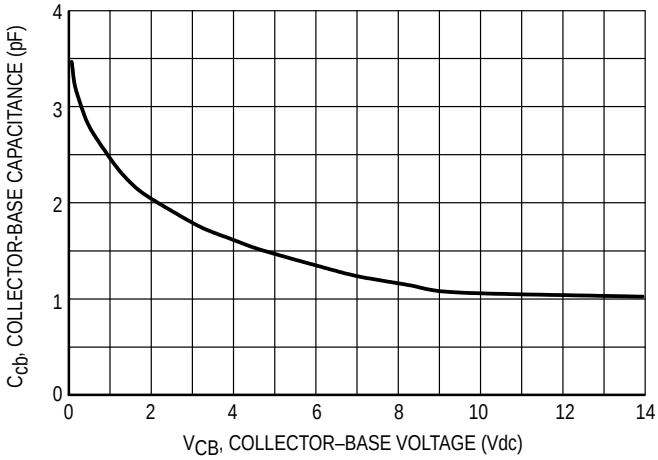


Figure 7. Collector–Base Capacitance versus Collector–Base Voltage

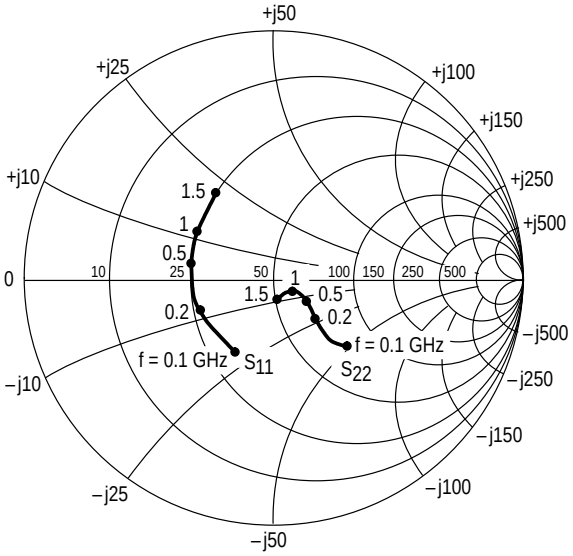


Figure 8. Input/Output Reflection Coefficients versus Frequency (V_{CE} = 10 V, I_C = 50 mA)

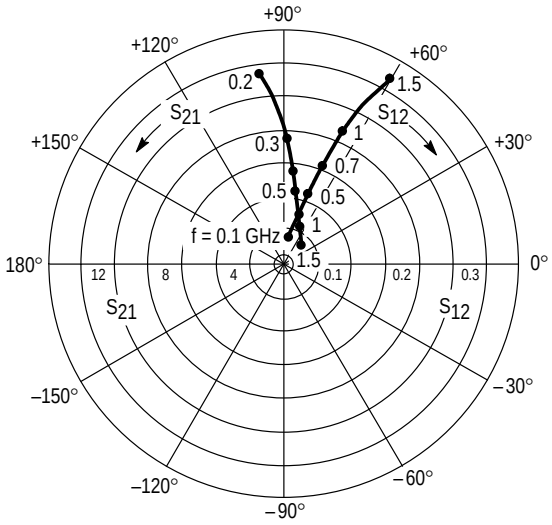
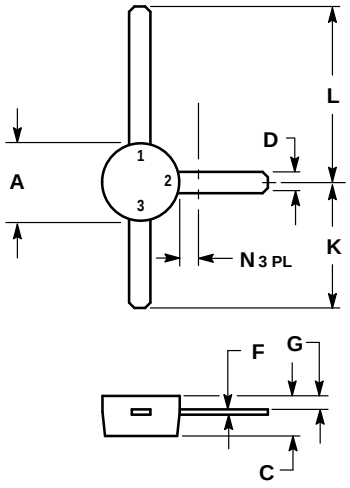


Figure 9. Forward/Reverse Transmission Coefficients versus Frequency (V_{CE} = 10 V, I_C = 50 mA)

V_{CE} (Volts)	I_C (mA)	f (MHz)	S_{11}		S_{21}		S_{12}		S_{22}	
			$\|S_{11}\|$	ϕ	$\|S_{21}\|$	ϕ	$\|S_{12}\|$	ϕ	$\|S_{22}\|$	ϕ
5.0	10	100	0.51	–95	15.04	121	0.047	54	0.58	–48
		300	0.43	–163	5.87	92	0.082	58	0.26	–63
		500	0.46	174	3.61	79	0.120	63	0.19	–63
		700	0.48	162	2.65	68	0.161	63	0.15	–64
		1000	0.48	146	1.92	57	0.220	63	0.12	–79
		1500	0.54	121	1.40	43	0.320	58	0.13	–118
	25	100	0.39	–122	19.41	112	0.037	60	0.42	–68
		300	0.39	–176	6.81	89	0.079	68	0.16	–94
		500	0.42	166	4.11	78	0.129	70	0.10	–103
		700	0.44	156	3.05	69	0.176	68	0.06	–119
		1000	0.44	142	2.20	59	0.244	64	0.06	–159
		1500	0.49	118	1.62	45	0.348	57	0.10	177
	50	100	0.35	–140	21.10	106	0.032	64	0.33	–81
		300	0.38	176	7.11	88	0.081	72	0.13	–116
		500	0.42	162	4.28	78	0.133	72	0.09	–136
		700	0.43	153	3.16	70	0.183	69	0.07	–163
		1000	0.42	140	2.28	60	0.252	65	0.08	165
		1500	0.47	116	1.66	47	0.357	57	0.12	155
10	10	100	0.53	–83	15.96	124	0.039	58	0.65	–36
		300	0.38	–154	6.44	94	0.070	59	0.35	–41
		500	0.41	–179	3.98	81	0.102	64	0.30	–39
		700	0.42	166	2.94	70	0.138	65	0.27	–39
		1000	0.42	151	2.12	60	0.191	66	0.24	–47
		1500	0.49	125	1.50	44	0.278	63	0.22	–72
	25	100	0.38	–104	20.85	115	0.032	60	0.48	–48
		300	0.32	–169	7.54	91	0.070	68	0.23	–48
		500	0.35	170	4.61	80	0.109	71	0.19	–43
		700	0.37	160	3.37	70	0.152	69	0.16	–39
		1000	0.37	146	2.43	61	0.210	67	0.13	–44
		1500	0.43	121	1.73	47	0.304	61	0.10	–74
	50	100	0.33	–119	22.59	109	0.029	63	0.39	–51
		300	0.30	–176	7.74	88	0.069	72	0.19	–47
		500	0.34	166	4.70	79	0.113	73	0.16	–40
		700	0.36	158	3.45	70	0.156	70	0.14	–35
		1000	0.36	144	2.46	61	0.217	66	0.11	–39
		1500	0.42	119	1.75	47	0.310	60	0.08	–72

Table 1. Common–Emitter S–Parameters

PACKAGE DIMENSIONS



NOTES:
1. DIMENSION D NOT APPLICABLE IN ZONE N.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	4.44	5.21	0.175	0.205
C	1.90	2.54	0.075	0.100
D	0.84	0.99	0.033	0.039
F	0.20	0.30	0.008	0.012
G	0.76	1.14	0.030	0.045
K	7.24	8.13	0.285	0.320
L	10.54	11.43	0.415	0.450
N	—	1.65	—	0.065

STYLE 2:
PIN 1. COLLECTOR
2. EMITTER
3. BASE

CASE 317A–01
ISSUE B

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