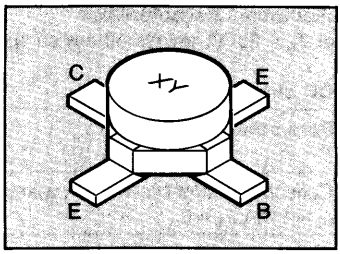
- For low-noise amplifiers in the GHz range, and broadband analog and digital applications in telecommunications systems at collector currents from 1 to 25 mA.
- Hermetically sealed ceramic package.
- HiRel/Mil screening available.



ESD: Electrostatic discharge sensitive device, observe handling precautions!

Type	Marking	Ordering code (tape and reel)	Package[1])
BFQ 74	74	Q 62702 – F778	Cerec-X

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CEO}	16	V
Collector-emitter voltage, $V_{BE} = 0$	V_{CES}	25	V
Collector-base voltage	V_{CBO}	25	V
Emitter-base voltage	V_{EBO}	2	V
Collector current	I_C	35	mA
Peak collector current, $f \geq 10$ MHz	I_{CM}	45	mA
Base current	I_B	5	mA
Total power dissipation, $T_A \leq 100$ °C[2])	P_{tot}	300	mW
Junction temperature	T_j	175	°C
Ambient temperature range	T_A	–65 ... +175	°C
Storage temperature range	T_{stg}	–65 ... +175	°C

Thermal Resistance

Junction – ambient[2])	R_{thJA}	≤250	K/W

1) For detailed dimensions see chapter Package Outlines.
2) Package mounted on alumina 16 mm x 25 mm x 0.7 mm.

Electrical Characteristics
at T_A = 25 °C, unless otherwise specified.

DC characteristics

Parameter	Symbol	Values			Unit
		min	typ	max	
Collector-emitter breakdown voltage I_C = 1 mA, I_B = 0	$V_{(BR)CEO}$	16	–	–	V
Collector-emitter cutoff current V_{CE} = 25 V, V_{BE} = 0	I_{CES}	–	–	100	µA
Collector-base cutoff current V_{CB} = 15 V, I_E = 0	I_{CBO}	–	–	50	nA
Emitter-base cutoff current V_{EB} = 2 V, I_C = 0	I_{EBO}	–	–	10	µA
DC current gain I_C = 5 mA, V_{CE} = 10 V I_C = 15 mA, V_{CE} = 10 V	h_{FE}	 50 50	 – –	 250 –	–
Collector-emitter saturation voltage I_C = 30 mA, I_B = 3 mA	V_{CEsat}	–	0.13	0.3	V
Base-emitter voltage I_C = 10 mA, V_{CE} = 10 V	V_{BE}	–	0.78	–	V

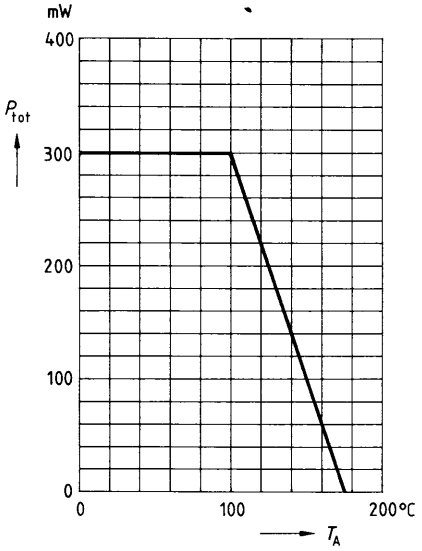
AC characteristics

Parameter	Symbol	Values			Unit
		min	typ	max	
Transition frequency	f_T				GHz
I_C = 5 mA, V_{CE} = 10 V, f = 200 MHz		–	4.4	–	
I_C = 15 mA, V_{CE} = 10 V, f = 200 MHz		–	6	–	
Collector-base capacitance V_{CB} = 10 V, V_{BE} = v_{be} = 0, f = 1 MHz	C_{cb}	–	0.3	0.4	pF
Collector-emitter capacitance V_{CE} = 10 V, V_{BE} = v_{be} = 0, f = 1 MHz	C_{ce}	–	0.4	–	pF
Input capacitance V_{EB} = 0.5 V, I_C = i_c = 0, f = 1 MHz	C_{ibo}	–	1.35	–	pF
Output capacitance V_{CE} = 10 V, V_{BE} = v_{be} = 0, f = 1 MHz	C_{obs}	–	0.7	–	pF
Noise figure	F				dB
I_C = 3 mA, V_{CE} = 10 V, f = 10 MHz, Z_S = 75 Ω		–	0.9	–	
I_C = 5 mA, V_{CE} = 10 V, f = 800 MHz, Z_S = 50 Ω		–	1.4	–	
I_C = 10 mA, V_{CE} = 10 V, f = 2 GHz, Z_S = Z_{Sopt}		–	2.5	2.9	
Power gain					dB
I_C = 15 mA, V_{CE} = 10 V, f = 2 GHz, Z_0 = 50 Ω	G_{ma} [1]	–	14	–	
I_C = 15 mA, V_{CE} = 10 V, f = 4 GHz, Z_0 = 50 Ω	G_{ms} [2]	–	9.8	–	
Transducer gain I_C = 15 mA, V_{CE} = 10 V, f = 2 GHz, Z_0 = 50 Ω	$\lvert S_{21e}\rvert^2$	–	9.8	–	dB
Linear output voltage two-tone intermodulation test I_C = 25 mA, V_{CE} = 10 V, d_{IM} = 60 dB f_1 = 806 MHz, f_2 = 810 MHz, Z_S = Z_L = 50 Ω	V_{o1} = V_{o2}	–	160	–	mV
Third order intercept point I_C = 25 mA, V_{CE} = 10 V, f = 800 MHz	IP_3	–	27	–	dBm

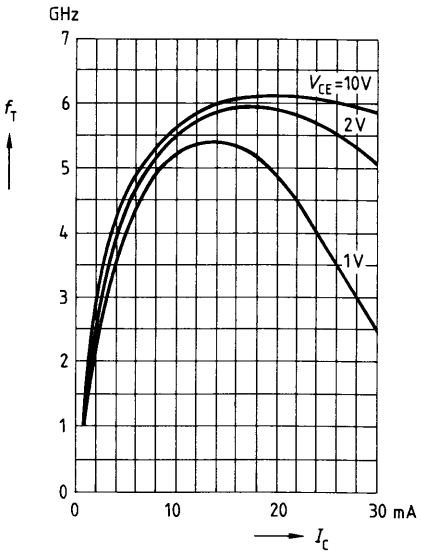
1) $G_{ma} = \frac{|S_{21e}|}{|S_{12e}|} (k - \sqrt{k^2-1})$

2) $G_{ms} = \frac{|S_{21e}|}{|S_{12e}|}$

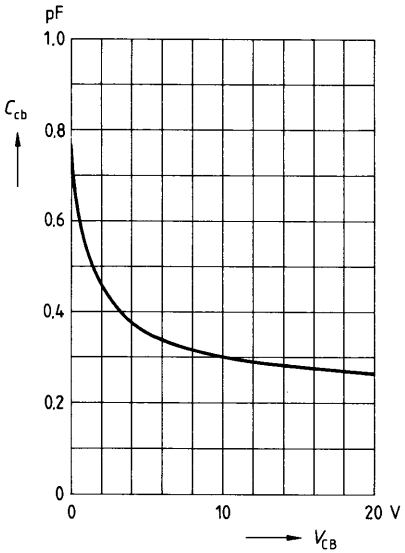
Total power dissipation $P_{tot} = f(T_A)$
Package mounted on alumina



Transition frequency $f_T = f(I_C)$
$f = 200$ MHz



Collector-base capacitance $C_{cb} = f(V_{CB})$
$V_{BE} = v_{be} = 0$, $f = 1$ MHz



Common Emitter Noise Parameters

I_C = 3 mA, V_{CE} = 10 V, Z_0 = 50 Ω

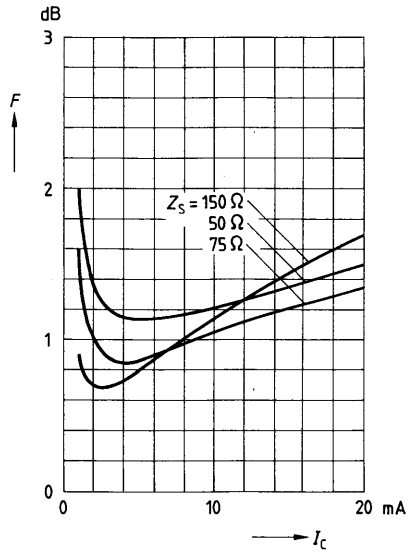
f	F_{min}	G_p (F_{min})	Γ_{opt}		R_N	N	$F_{50\,\Omega}$	G_p ($F_{50\,\Omega}$)
GHz	dB	dB	MAG	ANG	Ω	–	dB	dB
0.01	0.7	–	(Z_S = 150 Ω)		–	–	1.2	–

I_C = 10 mA, V_{CE} = 10 V, Z_0 = 50 Ω

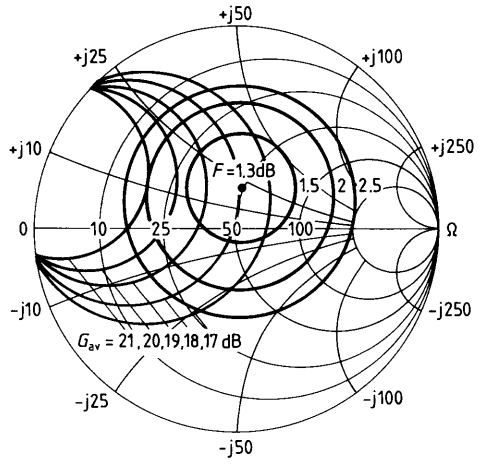
f	F_{min}	G_p (F_{min})	Γ_{opt}		R_N	N	$F_{50\,\Omega}$	G_p ($F_{50\,\Omega}$)
GHz	dB	dB	MAG	ANG	Ω	–	dB	dB
0.01	1.05	–	(Z_S = 75 Ω)		–	–	1.2	–
0.8	1.3	17.5	0.22	82	11.5	0.20	1.4	16.8
2.0	2.5	11.5	0.20	137	23.5	0.60	2.7	10

Noise figure F = f (I_C)

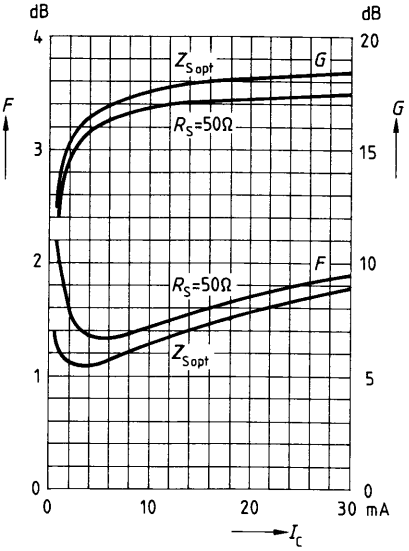
V_{CE} = 10 V, f = 10 MHz



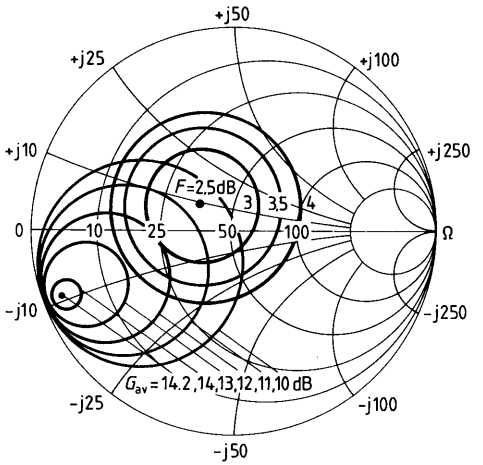
Circles of constant noise figure $F = f(Z_S)$ and available power gain $G_{av} = f(Z_S)$
I_C = 10 mA, V_{CE} = 10 V, f = 800 MHz



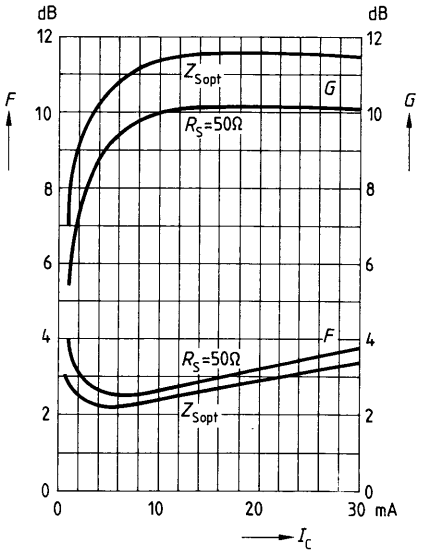
Noise figure $F = f(I_C)$
Power gain $G = f(I_C)$
V_{CE} = 10 V, f = 800 MHz, Z_{Lopt} (G)



Circles of constant noise figure $F = f(Z_S)$ and available power gain $G_{av} = f(Z_S)$
I_C = 10 mA, V_{CE} = 10 V, f = 2 GHz

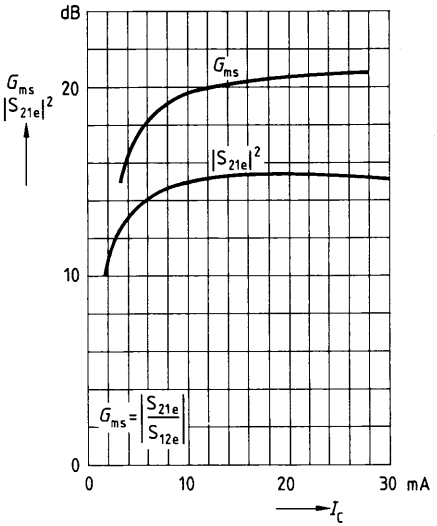


Noise figure $F = f(I_C)$
Power gain $G = f(I_C)$
V_{CE} = 10 V, f = 2 GHz, Z_{Lopt} (G)

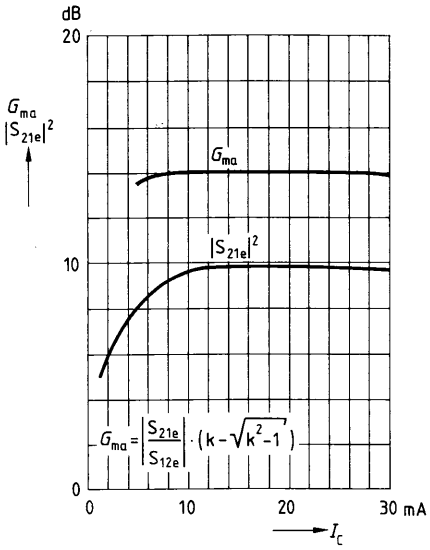


Common Emitter Power Gain

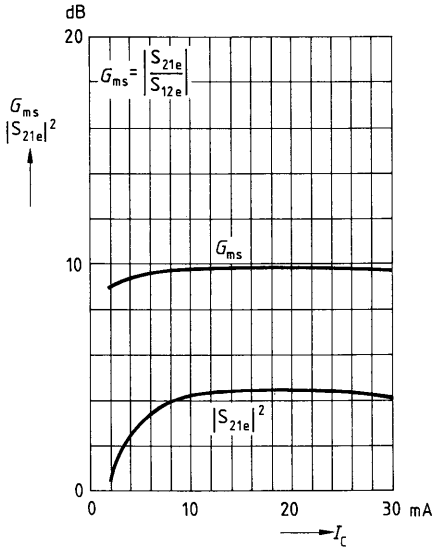
Power gain G_{ms}, $|S_{21e}|^2 = f(I_C)$
$V_{CE} = 10$ V, $f = 1$ GHz, $Z_0 = 50\ \Omega$



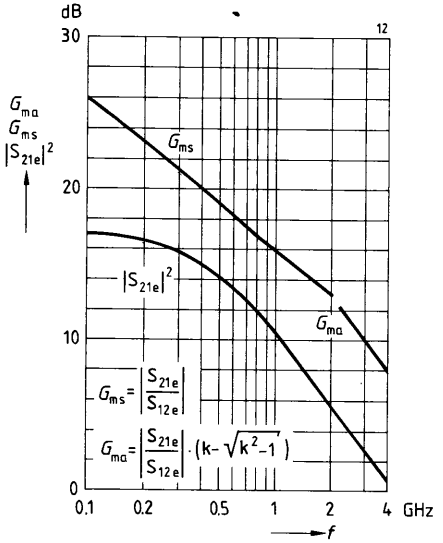
Power gain G_{ma}, $|S_{21e}|^2 = f(I_C)$
$V_{CE} = 10$ V, $f = 2$ GHz, $Z_0 = 50\ \Omega$



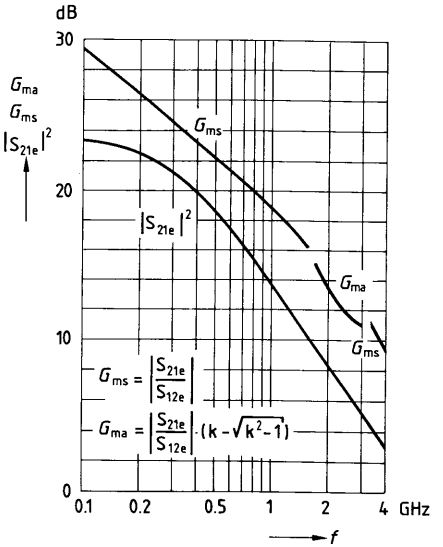
Power gain G_{ms}, $|S_{21e}|^2 = f(I_C)$
$V_{CE} = 10$ V, $f = 4$ GHz, $Z_0 = 50\ \Omega$



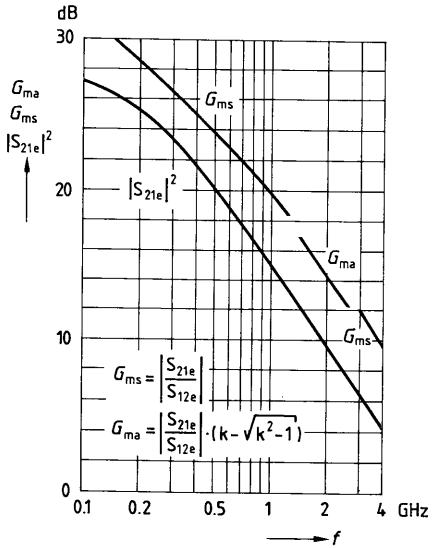
Power gain G_{ma}, G_{ms}, $|S_{21e}|^2 = f(f)$
$I_C = 2$ mA, $V_{CE} = 10$ V, $Z_0 = 50\ \Omega$



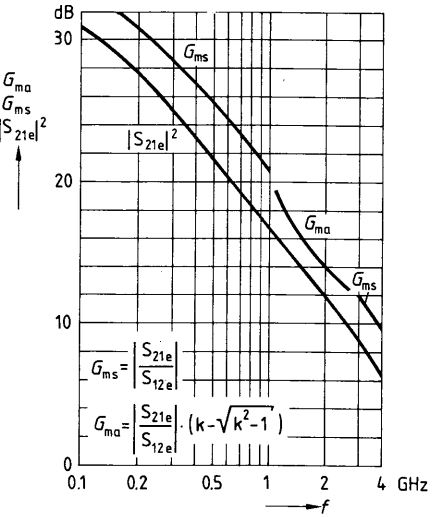
Power gain G_{ma}, G_{ms}, $|S_{21e}|^2 = f(f)$
$I_C = 5$ mA, $V_{CE} = 10$ V, $Z_0 = 50\ \Omega$



Power gain G_{ma}, G_{ms}, $|S_{21e}|^2 = f(f)$
$I_C = 10$ mA, $V_{CE} = 10$ V, $Z_0 = 50\ \Omega$



Power gain G_{ma}, G_{ms}, $|S_{21e}|^2 = f(f)$
$I_C = 25$ mA, $V_{CE} = 10$ V, $Z_0 = 50\ \Omega$



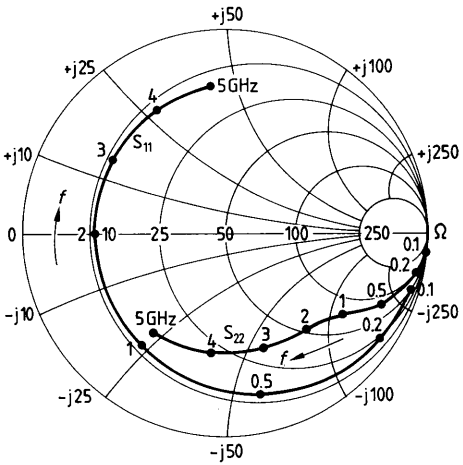
Common Emitter S Parameters

I_C = 2 mA, V_{CE} = 10 V, Z_0 = 50 Ω

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
0.1	0.96	– 16	6.83	169	0.017	79	0.99	– 5
0.2	0.93	– 33	6.61	155	0.034	70	0.96	– 11
0.3	0.88	– 50	6.18	144	0.049	62	0.92	– 16
0.4	0.84	– 64	5.62	134	0.060	54	0.88	– 20
0.6	0.77	– 89	4.78	118	0.076	43	0.81	– 26
0.8	0.71	–110	3.98	104	0.085	34	0.74	– 31
1.0	0.68	–127	3.41	93	0.089	29	0.70	– 34
1.2	0.65	–141	2.95	84	0.091	25	0.67	– 37
1.5	0.63	–158	2.45	72	0.091	22	0.64	– 41
1.8	0.63	–172	2.10	62	0.092	21	0.63	– 46
2.0	0.63	179	1.91	55	0.091	21	0.61	– 49
2.5	0.64	161	1.58	41	0.092	24	0.59	– 60
3.0	0.66	145	1.36	28	0.099	29	0.59	– 71
3.5	0.68	133	1.20	15	0.113	34	0.58	– 83
4.0	0.68	118	1.07	3	0.136	35	0.58	– 97
4.5	0.71	107	0.96	– 8	0.160	34	0.58	–111
5.0	0.72	95	0.85	–18	0.190	29	0.60	–127

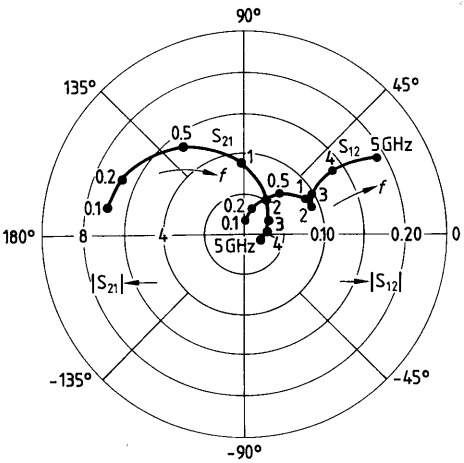
S_{11}, S_{22} = f (f)

I_C = 2 mA, V_{CE} = 10 V, Z_0 = 50 Ω



S_{12}, S_{21} = f (f)

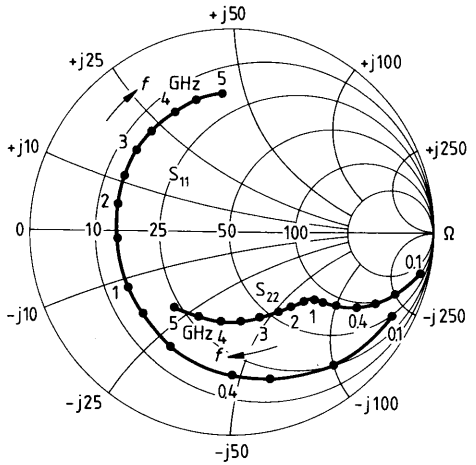
I_C = 2 mA, V_{CE} = 10 V, Z_0 = 50 Ω



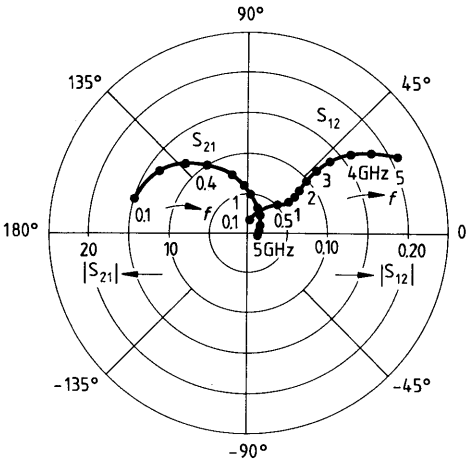
I_C = 5 mA, V_{CE} = 10 V, Z_0 = 50 Ω

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
0.1	0.91	– 25	14.67	163	0.017	78	0.97	– 9
0.2	0.83	– 51	13.37	145	0.031	63	0.89	– 18
0.3	0.75	– 72	11.62	131	0.040	54	0.80	– 24
0.4	0.70	– 89	9.90	121	0.047	47	0.73	– 28
0.6	0.63	–115	7.61	105	0.056	41	0.64	– 32
0.8	0.58	–135	5.97	94	0.061	37	0.58	– 34
1.0	0.57	–150	4.92	85	0.064	36	0.54	– 36
1.2	0.56	–162	4.18	77	0.068	36	0.52	– 37
1.5	0.55	–176	3.40	68	0.073	37	0.50	– 41
1.8	0.56	173	2.87	59	0.080	38	0.49	– 45
2.0	0.57	166	2.60	53	0.084	39	0.47	– 48
2.5	0.59	152	2.13	41	0.098	41	0.46	– 58
3.0	0.61	138	1.83	29	0.116	41	0.45	– 68
3.5	0.63	128	1.61	17	0.135	41	0.44	– 80
4.0	0.64	114	1.44	5	0.161	37	0.45	– 94
4.5	0.68	104	1.29	– 6	0.183	33	0.44	–108
5.0	0.68	93	1.16	–16	0.209	27	0.46	–124

S_{11}, S_{22} = f (f)
I_C = 5 mA, V_{CE} = 10 V, Z_0 = 50 Ω



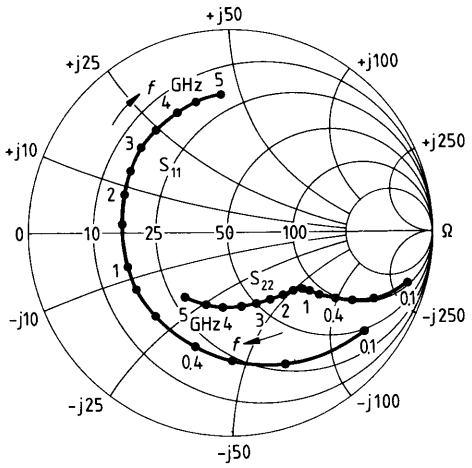
S_{12}, S_{21} = f (f)
I_C = 5 mA, V_{CE} = 10 V, Z_0 = 50 Ω



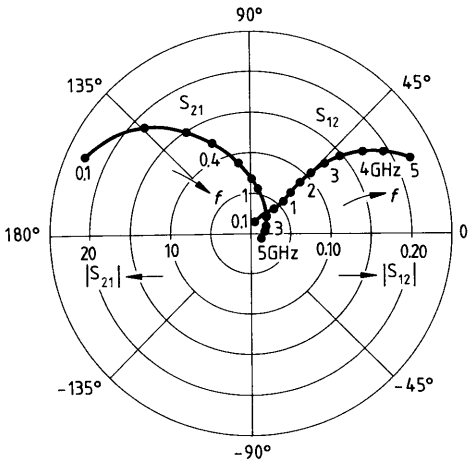
I_C = 10 mA, V_{CE} = 10 V, Z_0 = 50 Ω

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
0.1	0.83	– 35	22.64	155	0.015	70	0.92	– 13
0.2	0.71	– 65	18.55	134	0.026	59	0.80	– 23
0.3	0.63	– 89	14.98	121	0.034	53	0.70	– 27
0.4	0.58	–105	12.22	112	0.039	48	0.63	– 30
0.6	0.55	–130	8.96	98	0.047	46	0.54	– 32
0.8	0.52	–148	6.91	89	0.053	44	0.49	– 34
1.0	0.53	–161	5.64	81	0.058	45	0.46	– 35
1.2	0.52	–171	4.76	75	0.064	45	0.44	– 37
1.5	0.52	176	3.87	65	0.072	46	0.43	– 40
1.8	0.53	167	3.25	57	0.083	46	0.42	– 44
2.0	0.55	161	2.95	52	0.089	47	0.41	– 47
2.5	0.57	148	2.41	40	0.107	46	0.39	– 56
3.0	0.60	135	2.06	29	0.127	43	0.38	– 67
3.5	0.62	125	1.82	18	0.148	41	0.37	– 78
4.0	0.63	112	1.62	6	0.173	36	0.37	– 92
4.5	0.67	103	1.46	– 5	0.194	32	0.37	–106
5.0	0.67	92	1.32	–15	0.217	25	0.38	–123

S_{11}, S_{22} = f (f)
I_C = 10 mA, V_{CE} = 10 V, Z_0 = 50 Ω



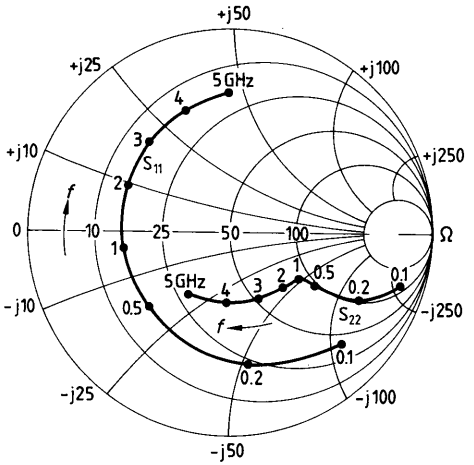
S_{12}, S_{21} = f (f)
I_C = 10 mA, V_{CE} = 10 V, Z_0 = 50 Ω



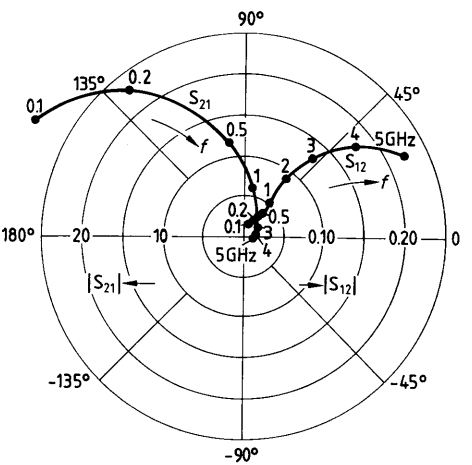
I_C = 15 mA, V_{CE} = 10 V, Z_0 = 50 Ω

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
0.1	0.79	– 44	29.12	151	0.015	66	0.89	– 17
0.2	0.66	– 81	22.58	128	0.023	56	0.73	– 27
0.3	0.59	–107	17.37	115	0.028	50	0.61	– 30
0.4	0.55	–123	13.71	106	0.033	48	0.55	– 31
0.6	0.52	–145	9.66	93	0.039	48	0.48	– 31
0.8	0.51	–161	7.32	85	0.045	50	0.44	– 32
1.0	0.52	–171	5.92	78	0.051	51	0.42	– 33
1.2	0.51	179	4.97	72	0.058	52	0.41	– 34
1.5	0.51	169	4.02	63	0.068	53	0.40	– 37
1.8	0.53	161	3.36	56	0.080	53	0.39	– 42
2.0	0.54	156	3.04	51	0.087	52	0.38	– 45
2.5	0.56	145	2.49	39	0.107	51	0.37	– 54
3.0	0.59	133	2.12	28	0.128	47	0.36	– 65
3.5	0.62	123	1.87	17	0.151	44	0.35	– 77
4.0	0.63	111	1.67	6	0.176	38	0.35	– 91
4.5	0.66	102	1.50	– 5	0.198	33	0.35	–106
5.0	0.67	91	1.35	–15	0.222	26	0.36	–122

S_{11}, S_{22} = f (*f*)
I_C = 15 mA, V_{CE} = 10 V, Z_0 = 50 Ω



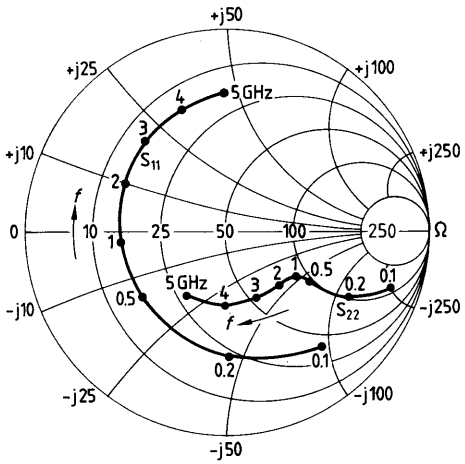
S_{12}, S_{21} = f (*f*)
I_C = 15 mA, V_{CE} = 10 V, Z_0 = 50 Ω



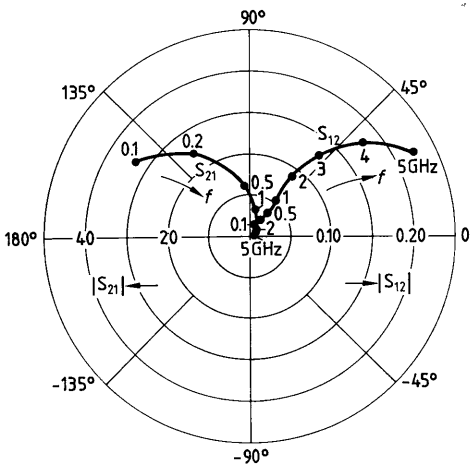
I_C = 20 mA, V_{CE} = 10 V, Z_0 = 50 Ω

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
0.1	0.73	– 51	32.84	147	0.013	69	0.86	– 18
0.2	0.61	– 89	24.03	124	0.021	55	0.69	– 27
0.3	0.56	–115	18.02	111	0.026	50	0.58	– 29
0.4	0.53	–130	14.07	103	0.030	49	0.52	– 30
0.6	0.51	–151	9.80	91	0.036	51	0.46	– 30
0.8	0.50	–165	7.40	83	0.043	53	0.43	– 30
1.0	0.51	–174	5.97	76	0.050	54	0.41	31
1.2	0.51	176	5.01	71	0.057	55	0.40	– 33
1.5	0.51	167	4.04	62	0.068	56	0.39	– 36
1.8	0.53	159	3.38	55	0.080	55	0.39	– 41
2.0	0.55	154	3.06	50	0.087	54	0.38	– 44
2.5	0.57	143	2.50	39	0.108	52	0.36	– 53
3.0	0.59	132	2.13	28	0.130	48	0.36	– 64
3.5	0.62	123	1.87	17	0.152	45	0.34	– 76
4.0	0.63	110	1.67	5	0.178	39	0.35	– 90
4.5	0.67	101	1.50	– 5	0.199	34	0.34	–105
5.0	0.68	91	1.35	–15	0.224	27	0.36	–122

S_{11}, S_{22} = f (f)
I_C = 20 mA, V_{CE} = 10 V, Z_0 = 50 Ω



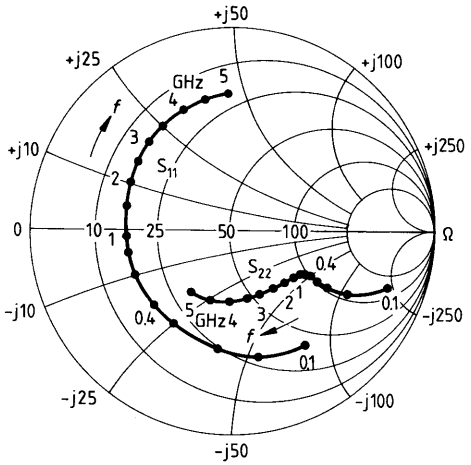
S_{12}, S_{21} = f (f)
I_C = 20 mA, V_{CE} = 10 V, Z_0 = 50 Ω



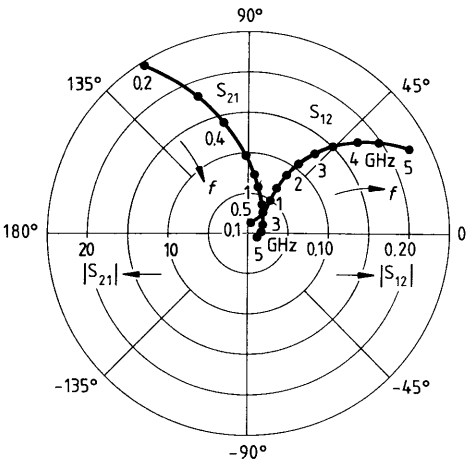
I_C = 25 mA, V_{CE} = 10 V, Z_0 = 50 Ω

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
0.1	0.69	– 55	34.86	143	0.013	66	0.83	– 19
0.2	0.59	– 94	24.49	121	0.020	55	0.66	– 27
0.3	0.54	–120	18.09	109	0.025	50	0.56	– 29
0.4	0.51	–135	14.03	101	0.029	50	0.51	– 28
0.6	0.51	–154	9.73	90	0.035	52	0.45	– 28
0.8	0.50	–167	7.33	82	0.042	54	0.43	– 29
1.0	0.52	–176	5.90	76	0.049	56	0.41	– 30
1.2	0.51	175	4.96	70	0.057	57	0.40	– 32
1.5	0.52	165	4.00	62	0.068	57	0.40	– 35
1.8	0.53	158	3.34	54	0.080	56	0.39	– 40
2.0	0.55	153	3.02	50	0.087	55	0.38	– 43
2.5	0.57	143	2.47	38	0.108	53	0.36	– 52
3.0	0.60	131	2.10	27	0.130	49	0.36	– 63
3.5	0.62	122	1.85	16	0.152	46	0.35	– 75
4.0	0.64	110	1.65	5	0.179	40	0.36	– 90
4.5	0.67	101	1.48	–6	0.200	34	0.35	–105
5.0	0.68	90	1.33	–16	0.224	27	0.36	–122

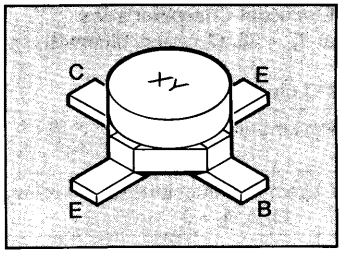
S_{11}, S_{22} = f (*f*), *Z*-plane
I_C = 25 mA, V_{CE} = 10 V, Z_0 = 50 Ω



S_{12}, S_{21} = f (*f*)
I_C = 25 mA, V_{CE} = 10 V, Z_0 = 50 Ω



- For broadband amplifiers up to 2 GHz at collector currents from 5 to 30 mA.
- Complementary type: BFQ 72 (NPN).



ESD: **E**lectro**s**tatic **d**ischarge sensitive device, observe handling precautions!

Type	Marking	Ordering code (tape and reel)	Package[1])
BFQ 75	75	Q 62702 – F803	Cerec-X

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CEO}	12	V
Collector-emitter voltage, $V_{BE} = 0$	V_{CES}	1	V
Collector-base voltage	V_{CBO}	15	V
Emitter-base voltage	V_{EBO}	2	V
Collector current	I_C	50	mA
Total power dissipation, $T_A \leq 105$ °C[2])	P_{tot}	350	mW
Junction temperature	T_j	175	°C
Ambient temperature range	T_A	–65 ... +175	°C
Storage temperature range	T_{stg}	–65 ... +175	°C

Thermal Resistance

Junction – ambient[2])	R_{thJA}	≤200	K/W

1) For detailed dimensions see chapter Package Outlines.
2) Package mounted on alumina 16 mm × 25 mm × 0.7 mm.

Electrical Characteristics
at T_A = 25 °C, unless otherwise specified.

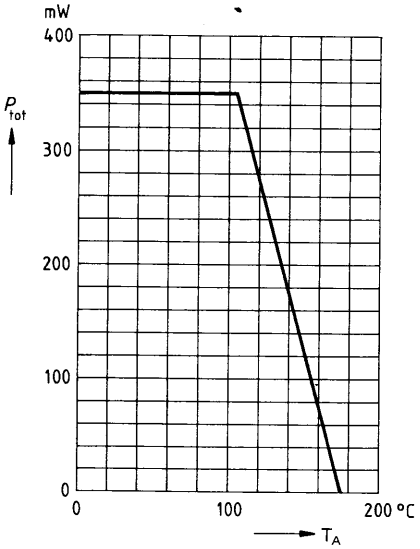
DC characteristics

Parameter	Symbol	Values			Unit
		min	typ	max	
Collector-emitter breakdown voltage I_C = 1 mA, I_B = 0	$V_{(BR)CEO}$	12	–	–	V
Collector-base cutoff current V_{CB} = 5 V, I_E = 0	I_{CBO}	–	–	50	nA
Emitter-base cutoff current V_{EB} = 2 V, I_C = 0	I_{EBO}	–	–	10	µA
DC current gain I_C = 30 mA, V_{CE} = 5 V	h_{FE}	20	50	–	–

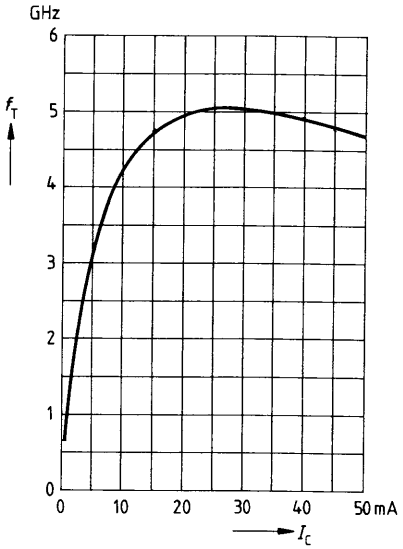
AC characteristics

Parameter	Symbol	Values			Unit
		min	typ	max	
Transition frequency I_C = 30 mA, V_{CE} = 5 V, f = 500 MHz	f_T	–	5	–	GHz
Collector-base capacitance V_{CB} = 10 V, V_{BE} = v_{be} = 0, f = 1 MHz	C_{cb}	–	0.75	–	pF
Input capacitance V_{EB} = 0.5 V, I_C = i_c = 0, f = 1 MHz	C_{ibo}	–	1.6	–	pF
Output capacitance V_{CE} = 10 V, V_{BE} = v_{be} = 0, f = 1 MHz	C_{obs}	–	1.1	–	pF
Noise figure I_C = 10 mA, V_{CE} = 8 V, f = 10 MHz, Z_S = 50 Ω I_C = 10 mA, V_{CE} = 8 V, f = 800 MHz, Z_S = 50 Ω	F	– –	2.2 3	– –	dB
Power gain I_C = 30 mA, V_{CE} = 8 V, f = 800 MHz, Z_S = Z_{Sopt}, Z_L = Z_{Lopt}	G_{pe}	–	14	–	dB

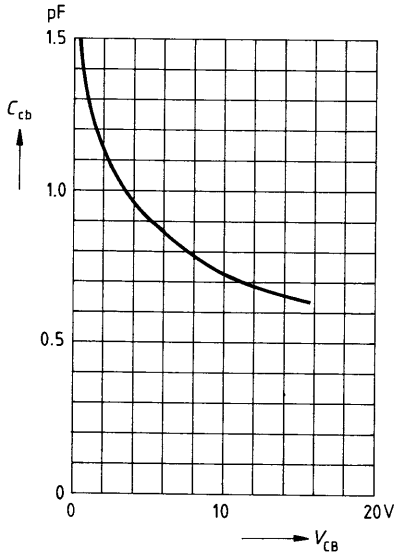
Total power dissipation $P_{tot} = f(T_A)$
Package mounted on alumina



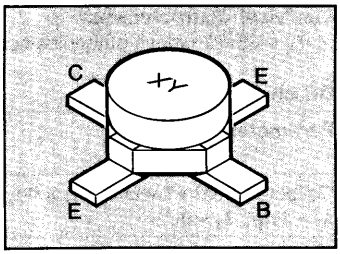
Transition frequency $f_T = f(I_C)$
$V_{CE} = 5$ V, $f = 500$ MHz



Collector-base capacitance $C_{cb} = f(V_{CB})$
$V_{BE} = v_{be} = 0$, $f = 1$ MHz



- For broadband amplifiers up to 2 GHz at collector currents up to 20 mA.
- Complementary type: BFQ 71 (NPN).



ESD: Electrostatic discharge sensitive device, observe handling precautions!

Type	Marking	Ordering code (tape and reel)	Package[1])
BFQ 76	76	Q 62702 – F804	Cerec-X

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CEO}	15	V
Collector-base voltage	V_{CBO}	20	V
Emitter-base voltage	V_{EBO}	2	V
Collector current	I_C	30	mA
Total power dissipation, $T_A \leq 110$ °C[2])	P_{tot}	250	mW
Junction temperature	T_j	175	°C
Ambient temperature range	T_A	–65 ... +175	°C
Storage temperature range	T_{stg}	–65 ... +175	°C

Thermal Resistance

Junction – ambient[2])	R_{thJA}	≤250	K/W

1) For detailed dimensions see chapter Package Outlines.
2) Package mounted on alumina 16 mm × 25 mm × 0.7 mm.

Electrical Characteristics
at T_A = 25 °C, unless otherwise specified.

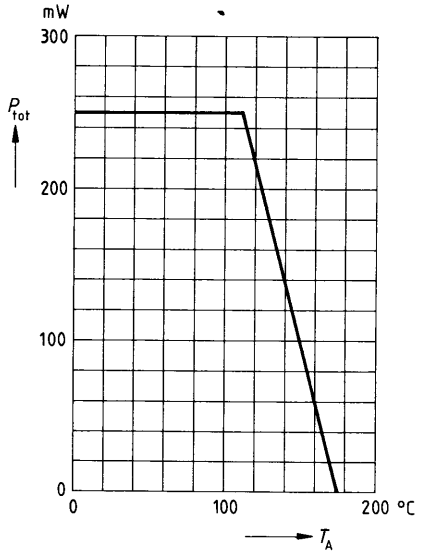
DC characteristics

Parameter	Symbol	Values			Unit
		min	typ	max	
Collector-emitter breakdown voltage I_C = 1 mA, I_B = 0	$V_{(BR)CEO}$	15	–	–	V
Collector-base cutoff current V_{CB} = 10 V, I_E = 0	I_{CBO}	–	–	50	nA
Emitter-base cutoff current V_{EB} = 2 V, I_C = 0	I_{EBO}	–	–	10	µA
DC current gain I_C = 14 mA, V_{CE} = 10 V	h_{FE}	20	50	–	–

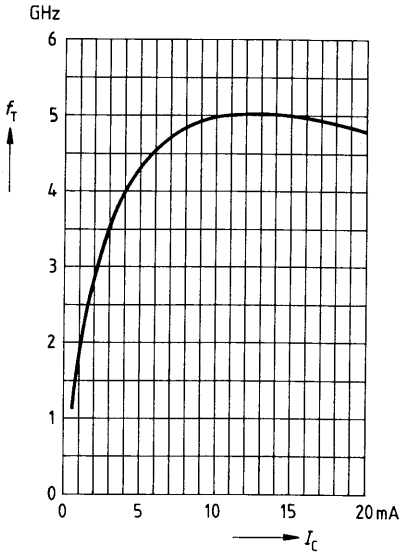
AC characteristics

Parameter	Symbol	Values			Unit
		min	typ	max	
Transition frequency I_C = 14 mA, V_{CE} = 10 V, f = 500 MHz	f_T	–	5	–	GHz
Collector-base capacitance V_{CB} = 10 V, V_{BE} = v_{be} = 0, f = 1 MHz	C_{cb}	–	0.55	–	pF
Input capacitance V_{EB} = 0.5 V, I_C = i_c = 0, f = 1 MHz	C_{ibo}	–	1.2	–	pF
Output capacitance V_{CE} = 10 V, V_{BE} = v_{be} = 0, f = 1 MHz	C_{obs}	–	0.9	–	pF
Noise figure I_C = 5 mA, V_{CE} = 6 V, f = 10 MHz, Z_S = 75 Ω I_C = 4 mA, V_{CE} = 10 V, f = 800 MHz, Z_S = Z_{Sopt}	F	 – –	 1.8 2.5	 – –	dB
Power gain I_C = 14 mA, V_{CE} = 10 V, f = 800 MHz, Z_S = Z_{Sopt}, Z_L = Z_{Lopt}	G_{pe}	–	17	–	dB

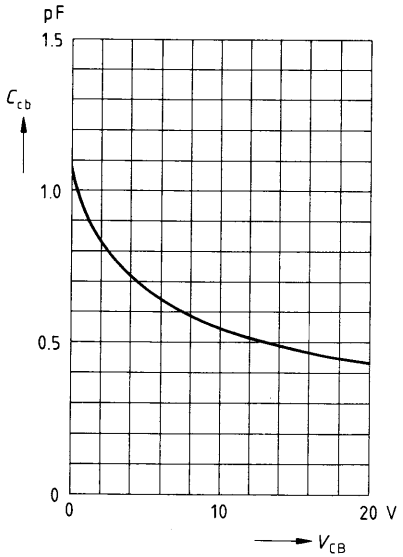
Total power dissipation $P_{tot} = f(T_A)$
Package mounted on alumina



Transition frequency $f_T = f(I_C)$
$V_{CE} = 10$ V, $f = 200$ MHz

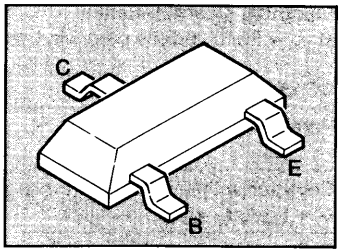


Collector-base capacitance $C_{cb} = f(V_{CB})$
$V_{BE} = v_{be} = 0$, $f = 1$ MHz



- For low-noise amplifiers up to 2 GHz and broadband analog and digital applications in telecommunications systems at collector currents from 0.5 to 20 mA.

- CECC-type available: CECC 50002/257.



ESD: Electrostatic discharge sensitive device, observe handling precautions!

Type	Marking	Ordering code (tape and reel)	Package[1])
BFQ 81	RA	Q 62702 – F1049	SOT-23

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CEO}	16	V
Collector-base voltage	V_{CBO}	25	V
Emitter-base voltage	V_{EBO}	2	V
Collector current	I_C	30	mA
Total power dissipation, $T_A \leq 25$ °C[2])	P_{tot}	280	mW
Junction temperature	T_j	150	°C
Ambient temperature range	T_A	–65 ... +150	°C
Storage temperature range	T_{stg}	–65 ... +150	°C

Thermal Resistance

Junction – ambient[2])	R_{thJA}	≤450	K/W

1) For detailed dimensions see chapter Package Outlines.
2) Package mounted on alumina 15 mm × 16.7 mm × 0.7 mm.

Electrical Characteristics
at T_A = 25 °C, unless otherwise specified.

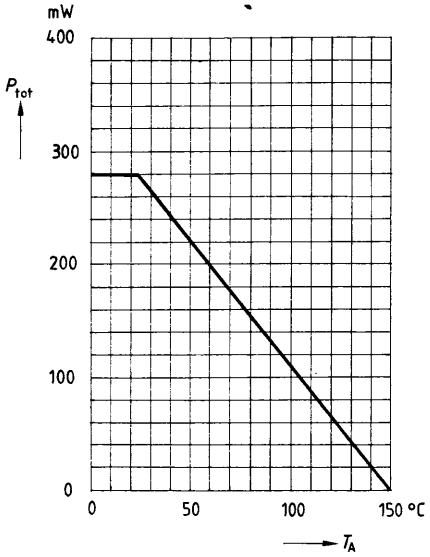
DC characteristics

Parameter	Symbol	Values			Unit
		min	typ	max	
Collector-emitter breakdown voltage I_C = 1 mA, I_B = 0	$V_{(BR)CEO}$	16	–	–	V
Collector-base cutoff current V_{CB} = 15 V, I_E = 0	I_{CBO}	–	–	100	nA
Emitter-base cutoff current V_{EB} = 2 V, I_C = 0	I_{EBO}	–	–	10	µA
DC current gain I_C = 5 mA, V_{CE} = 10 V I_C = 15 mA, V_{CE} = 10 V	h_{FE}	 50 50	 – –	 250 –	–
Collector-emitter saturation voltage I_C = 30 mA, I_B = 3 mA	V_{CEsat}	–	0.2	0.4	V
Base-emitter voltage I_C = 10 mA, V_{CE} = 10 V	V_{BE}	–	0.78	–	V

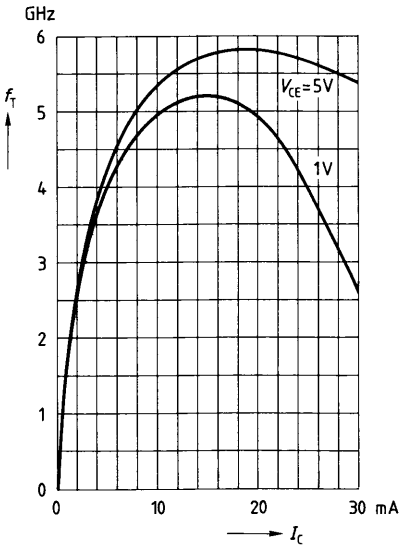
AC characteristics

Parameter	Symbol	Values			Unit
		min	typ	max	
Transition frequency I_C = 5 mA, V_{CE} = 10 V, f = 200 MHz I_C = 15 mA, V_{CE} = 10 V, f = 200 MHz	f_T	 – –	 4.2 5.8	 – –	GHz
Collector-base capacitance V_{CB} = 10 V, V_{BE} = v_{be} = 0, f = 1 MHz	C_{cb}	–	0.38	–	pF
Collector-emitter capacitance V_{CE} = 10 V, V_{BE} = v_{be} = 0, f = 1 MHz	C_{ce}	–	0.22	–	pF
Input capacitance V_{EB} = 0.5 V, I_C = i_c = 0, f = 1 MHz	C_{ibo}	–	1.27	–	pF
Output capacitance V_{CE} = 10 V, V_{BE} = v_{be} = 0, f = 1 MHz	C_{obs}	–	0.6	–	pF
Noise figure I_C = 3 mA, V_{CE} = 10 V, f = 10 MHz, Z_S = 75 Ω I_C = 5 mA, V_{CE} = 10 V, f = 800 MHz, Z_S = 50 Ω I_C = 10 mA, V_{CE} = 10 V, f = 2 GHz, Z_S = Z_{Sopt}	F	 – – –	 0.9 1.4 2.5	 – – –	dB
Power gain I_C = 5 mA, V_{CE} = 10 V, f = 800 MHz, Z_S = 50 Ω, Z_L = Z_{Lopt}	G_{pe}	–	15	–	dB
Transducer gain I_C = 20 mA, V_{CE} = 10 V, f = 1 GHz, Z_0 = 50 Ω	$\lvert S_{21e}\rvert^2$	–	12.4	–	dB
Linear output voltage two-tone intermodulation test I_C = 25 mA, V_{CE} = 10 V, d_{IM} = 60 dB f_1 = 806 MHz, f_2 = 810 MHz, Z_S = Z_L = 50 Ω	V_{o1} = V_{o2}	–	160	–	mV
Third order intercept point I_C = 25 mA, V_{CE} = 10 V, f = 800 MHz	IP_3	–	27	–	dBm

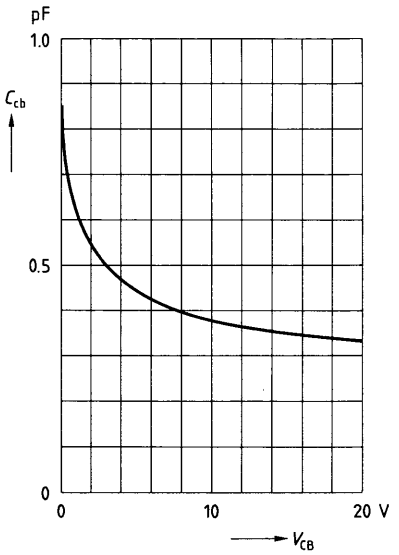
Total power dissipation $P_{tot} = f(T_A)$
Package mounted on alumina



Transition frequency $f_T = f(I_C)$
$f = 200$ MHz



Collector-base capacitance $C_{cb} = f(V_{CB})$
$V_{BE} = v_{be} = 0$, $f = 1$ MHz



Common Emitter Noise Parameters

I_C = 3 mA, V_{CE} = 10 V, Z_0 = 50 Ω

f	F_{min}	G_p (F_{min})	Γ_{opt}		R_N	N	$F_{50\,\Omega}$	G_p ($F_{50\,\Omega}$)
GHz	dB	dB	MAG	ANG	Ω	–	dB	dB
0.01	0.7	–	(Z_S = 150 Ω)		–	–	1.2	–

I_C = 5 mA, V_{CE} = 10 V, Z_0 = 50 Ω

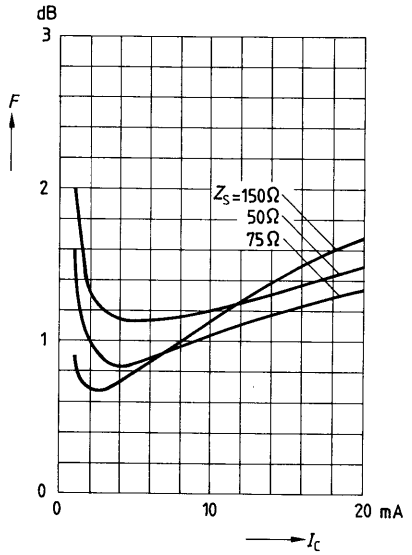
f	F_{min}	G_p (F_{min})	Γ_{opt}		R_N	N	$F_{50\,\Omega}$	G_p ($F_{50\,\Omega}$)
GHz	dB	dB	MAG	ANG	Ω	–	dB	dB
0.01	0.8	–	(Z_S = 150 Ω)		–	–	1.15	–
0.8	1.3	14.2	0.22	71.5	11.7	0.19	1.4	14

I_C = 10 mA, V_{CE} = 10 V, Z_0 = 50 Ω

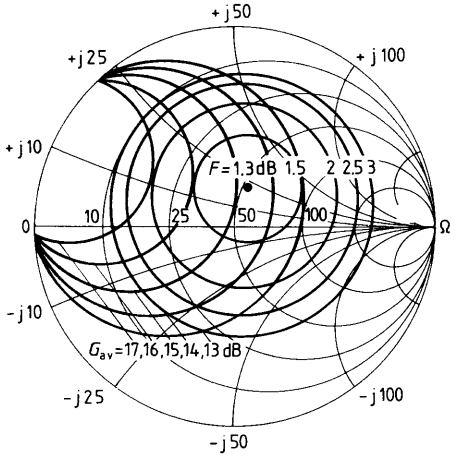
f	F_{min}	G_p (F_{min})	Γ_{opt}		R_N	N	$F_{50\,\Omega}$	G_p ($F_{50\,\Omega}$)
GHz	dB	dB	MAG	ANG	Ω	–	dB	dB
2.0	2.5	8.5	0.27	–139	14.2	0.39	2.8	–

Noise figure $F = f(I_C)$

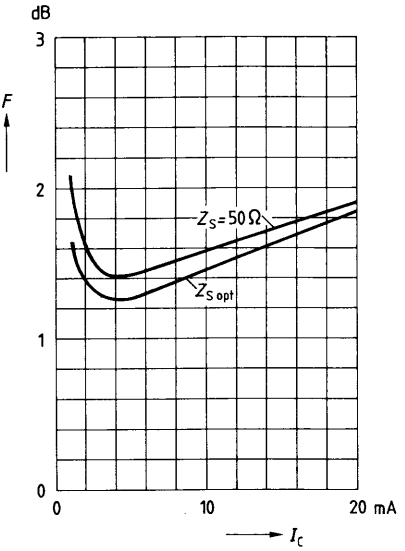
V_{CE} = 10 V, f = 10 MHz



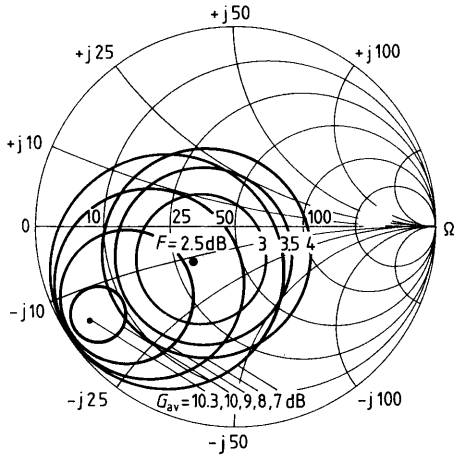
Circles of constant noise figure $F = f(Z_S)$ and available power gain $G_{av} = f(Z_S)$
$I_C = 5$ mA, $V_{CE} = 10$ V, $f = 800$ MHz



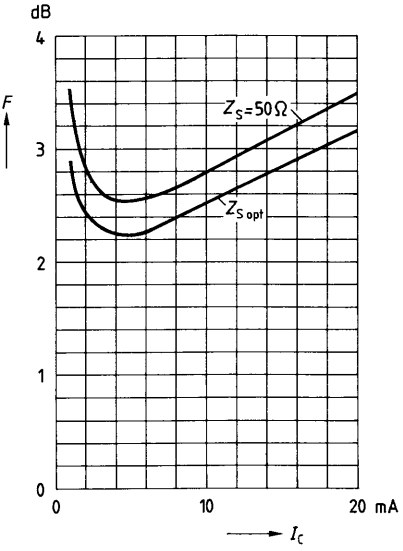
Noise figure $F = f(I_C)$
$V_{CE} = 10$ V, $f = 800$ MHz, Z_{Lopt} (G)



Circles of constant noise figure $F = f(Z_S)$ and available power gain $G_{av} = f(Z_S)$
$I_C = 10$ mA, $V_{CE} = 10$ V, $f = 2$ GHz

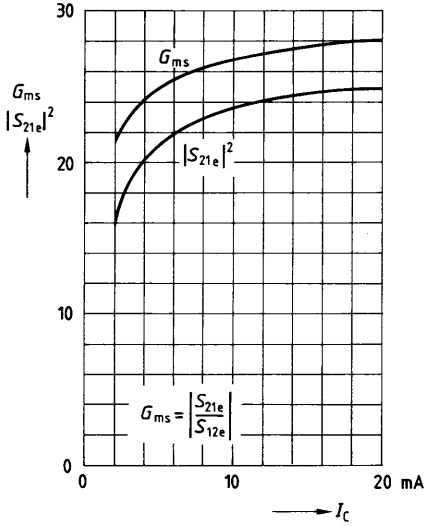


Noise figure $F = f(I_C)$
$V_{CE} = 10$ V, $f = 2$ GHz, Z_{Lopt} (G)

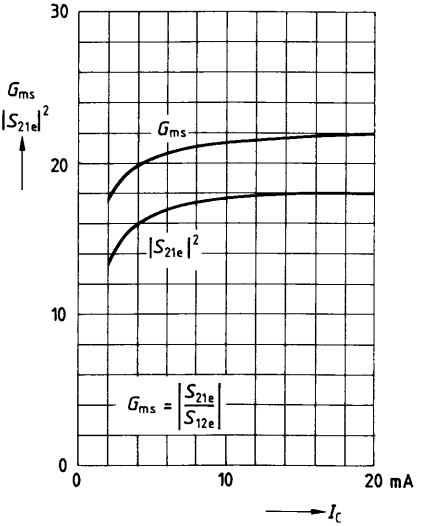


Common Emitter Power Gain

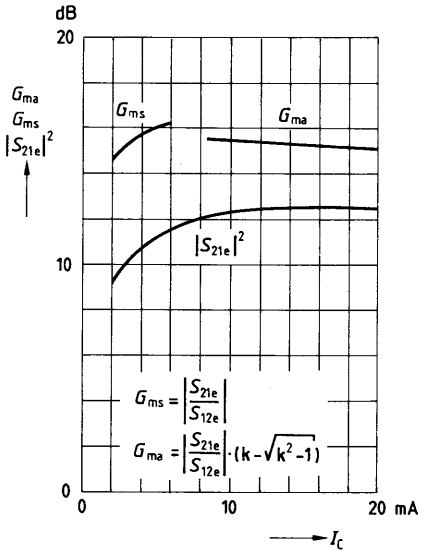
Power gain G_{ms}, $|S_{21e}|^2 = f(I_C)$
V_{CE} = 10 V, f = 200 MHz, Z_0 = 50 Ω



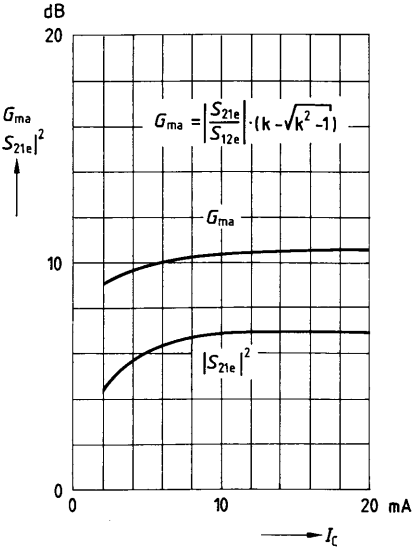
Power gain G_{ms}, $|S_{21e}|^2 = f(I_C)$
V_{CE} = 10 V, f = 500 MHz, Z_0 = 50 Ω



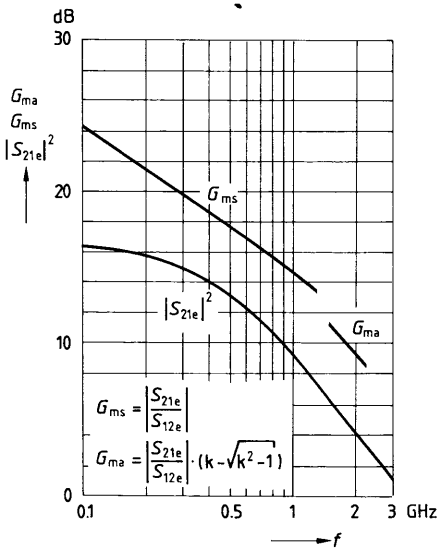
Power gain G_{ma}, G_{ms}, $|S_{21e}|^2 = f(I_C)$
V_{CE} = 10 V, f = 1 GHz, Z_0 = 50 Ω



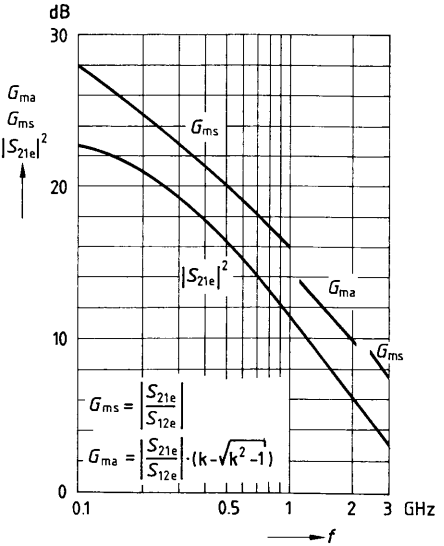
Power gain G_{ma}, $|S_{21e}|^2 = f(I_C)$
V_{CE} = 10 V, f = 2 GHz, Z_0 = 50 Ω



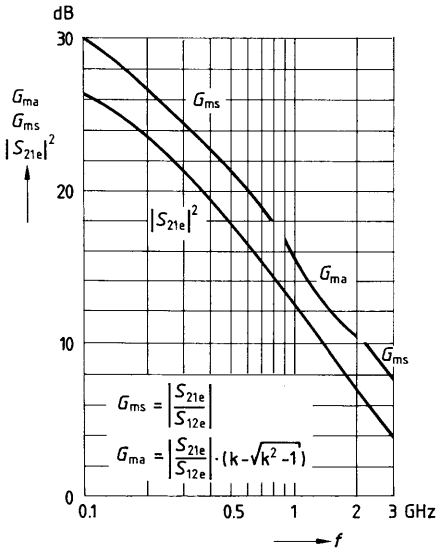
Power gain G_{ma}, G_{ms}, $|S_{21e}|^2 = f(f)$
$I_C = 2$ mA, $V_{CE} = 10$ V, $Z_0 = 50\ \Omega$



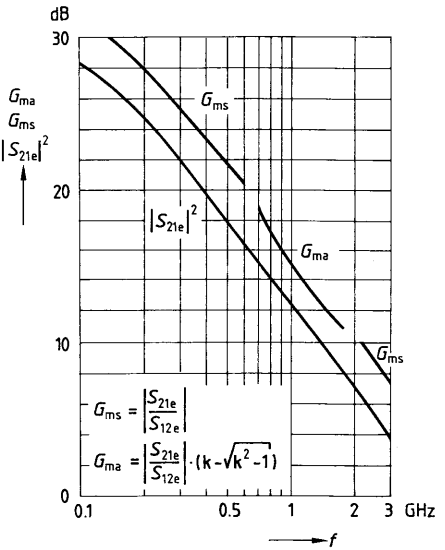
Power gain G_{ma}, G_{ms}, $|S_{21e}|^2 = f(f)$
$I_C = 5$ mA, $V_{CE} = 10$ V, $Z_0 = 50\ \Omega$



Power gain G_{ma}, G_{ms}, $|S_{21e}|^2 = f(f)$
$I_C = 10$ mA, $V_{CE} = 10$ V, $Z_0 = 50\ \Omega$



Power gain G_{ma}, G_{ms}, $|S_{21e}|^2 = f(f)$
$I_C = 20$ mA, $V_{CE} = 10$ V, $Z_0 = 50\ \Omega$



Common Emitter S Parameters

I_C = 1 mA, V_{CE} = 1 V, $\underset{\sim}{Z}_0$ = 50 Ω

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
0.10	0.950	– 18.8	3.58	165.3	0.046	78.6	0.980	– 8.6
0.15	0.931	– 28.0	3.51	158.2	0.067	73.2	0.962	–12.5
0.20	0.910	– 36.9	3.42	151.3	0.087	68.1	0.939	–16.3
0.25	0.882	– 45.5	3.30	144.8	0.105	63.2	0.913	–19.8
0.30	0.854	– 53.6	3.17	138.6	0.120	58.7	0.885	–22.9
0.40	0.797	– 68.8	2.90	127.5	0.145	50.9	0.827	–28.3
0.50	0.743	– 82.4	2.64	117.9	0.163	44.6	0.775	–32.7
0.60	0.700	– 94.9	2.41	109.3	0.175	39.5	0.729	–36.2
0.70	0.659	–106.5	2.21	101.8	0.184	35.3	0.690	–39.1
0.80	0.636	–116.6	2.04	94.9	0.190	31.7	0.657	–41.4
0.90	0.612	–126.7	1.90	88.6	0.192	28.9	0.628	–43.6
1.00	0.590	–136.0	1.76	82.7	0.192	26.9	0.603	–45.5
1.20	0.566	–152.5	1.54	72.7	0.190	24.5	0.567	–49.0
1.40	0.551	–167.0	1.37	64.2	0.185	24.1	0.544	–52.7
1.50	0.546	–173.7	1.31	60.6	0.182	24.9	0.535	–54.6
1.60	0.547	–179.7	1.25	56.7	0.181	26.0	0.529	–56.6
1.80	0.548	168.9	1.15	49.8	0.179	29.1	0.518	–60.8
2.00	0.559	158.6	1.06	43.5	0.180	33.3	0.506	–65.5

I_C = 2 mA, V_{CE} = 1 V, Z_0 = 50 Ω

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
0.10	0.904	– 25.9	6.71	160.4	0.045	75.4	0.955	–13.1
0.15	0.869	– 38.1	6.42	151.4	0.064	68.8	0.917	–18.8
0.20	0.829	– 49.5	6.06	143.2	0.081	63.1	0.870	–23.8
0.25	0.784	– 60.0	5.67	135.9	0.094	58.1	0.823	–28.1
0.30	0.742	– 69.7	5.27	129.2	0.106	53.9	0.776	–31.7
0.40	0.668	– 86.8	4.57	118.2	0.122	47.5	0.692	–37.2
0.50	0.611	–101.3	3.99	109.1	0.133	43.1	0.627	–41.0
0.60	0.569	–114.0	3.51	101.5	0.141	40.2	0.575	–43.8
0.70	0.535	–125.4	3.14	95.0	0.147	38.3	0.535	–46.0
0.80	0.518	–135.0	2.83	89.1	0.152	37.0	0.503	–47.6
0.90	0.501	–144.8	2.59	83.8	0.156	36.4	0.476	–49.2
1.00	0.488	–153.4	2.37	78.9	0.159	36.3	0.454	–50.4
1.20	0.476	–168.4	2.04	70.6	0.166	37.3	0.422	–53.0
1.40	0.472	178.6	1.79	63.3	0.173	38.9	0.401	–56.0
1.50	0.468	172.8	1.69	60.0	0.178	40.1	0.395	–57.6
1.60	0.473	167.8	1.62	56.6	0.183	41.1	0.390	–59.4
1.80	0.477	157.8	1.48	50.5	0.195	43.0	0.380	–63.2
2.00	0.493	149.4	1.36	44.7	0.209	44.7	0.367	–67.8

I_C = 2 mA, V_{CE} = 3 V, Z_0 = 50 Ω

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
0.10	0.916	– 21.7	6.74	163.0	0.032	77.8	0.970	– 9.3
0.15	0.886	– 32.2	6.52	155.0	0.046	72.3	0.943	–13.4
0.20	0.851	– 42.0	6.25	147.6	0.058	67.2	0.911	–17.1
0.25	0.810	– 51.2	5.92	140.8	0.069	62.8	0.875	–20.3
0.30	0.770	– 59.9	5.58	134.5	0.078	58.9	0.840	–23.1
0.40	0.695	– 75.5	4.94	123.8	0.093	52.8	0.773	–27.2
0.50	0.629	– 89.2	4.37	114.9	0.102	48.4	0.718	–30.2
0.60	0.580	–101.6	3.90	107.3	0.110	45.6	0.673	–32.4
0.70	0.534	–112.8	3.51	100.7	0.115	43.8	0.639	–34.0
0.80	0.511	–122.7	3.18	94.8	0.120	42.5	0.611	–35.2
0.90	0.486	–132.7	2.91	89.5	0.123	42.0	0.586	–36.3
1.00	0.466	–141.9	2.68	84.6	0.126	42.1	0.567	–37.2
1.20	0.444	–158.1	2.30	76.2	0.132	43.2	0.538	–39.1
1.40	0.431	–172.8	2.03	68.9	0.139	45.4	0.520	–41.3
1.50	0.424	–179.2	1.91	65.6	0.143	46.9	0.515	–42.5
1.60	0.427	175.2	1.82	62.3	0.148	48.3	0.511	–43.9
1.80	0.426	164.1	1.66	56.3	0.159	50.9	0.503	–46.8
2.00	0.440	154.8	1.52	50.5	0.172	53.1	0.491	–50.2
2.50	0.491	133.9	1.26	38.6	0.216	57.5	0.465	–60.6
3.00	0.518	117.9	1.10	28.4	0.273	57.9	0.457	–71.6

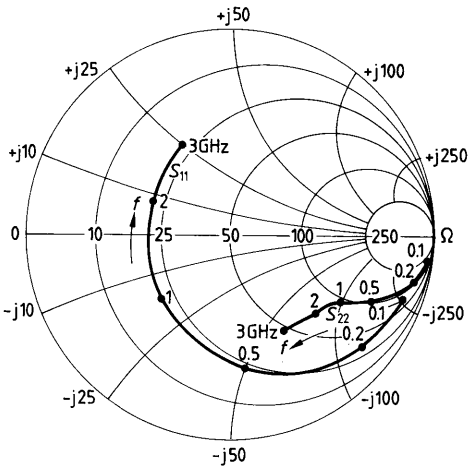
I_C = 5 mA, V_{CE} = 3 V, Z_0 = 50 Ω

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
0.10	0.807	– 34.6	14.10	153.1	0.029	72.7	0.912	–16.5
0.15	0.741	– 49.5	12.83	142.1	0.040	66.2	0.842	–22.4
0.20	0.673	– 62.5	11.53	132.9	0.049	61.7	0.773	–26.7
0.25	0.611	– 73.9	10.31	125.4	0.055	58.6	0.711	–29.8
0.30	0.558	– 84.1	9.23	119.2	0.061	56.4	0.659	–31.8
0.40	0.479	–101.1	7.55	109.4	0.070	54.3	0.579	–34.0
0.50	0.425	–115.1	6.33	102.1	0.078	54.0	0.527	–35.1
0.60	0.389	–127.2	5.44	96.1	0.085	54.4	0.491	–35.4
0.70	0.363	–138.1	4.77	90.9	0.093	55.2	0.465	–35.9
0.80	0.351	–146.9	4.24	86.5	0.101	55.8	0.447	–36.1
0.90	0.340	–156.1	3.82	82.3	0.108	56.6	0.431	–36.6
1.00	0.335	–164.3	3.47	78.5	0.116	57.5	0.418	–36.9
1.20	0.331	–178.1	2.95	72.0	0.132	58.6	0.399	–38.1
1.40	0.333	168.8	2.57	66.0	0.149	59.3	0.388	–39.8
1.50	0.329	163.5	2.41	63.3	0.158	59.6	0.386	–40.9
1.60	0.335	159.1	2.29	60.5	0.168	59.7	0.383	–42.2
1.80	0.341	150.4	2.07	55.3	0.186	59.5	0.378	–45.3
2.00	0.359	143.3	1.89	50.4	0.205	59.0	0.366	–48.6
2.50	0.413	126.8	1.57	39.6	0.255	57.2	0.336	–58.4
3.00	0.444	114.2	1.37	29.7	0.308	54.0	0.326	–69.1

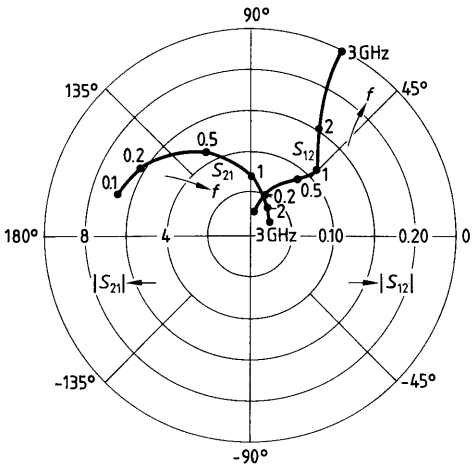
I_C = 2 mA, V_{CE} = 6 V, Z_0 = 50 Ω

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
0.10	0.924	– 20.0	6.69	164.0	0.026	78.8	0.976	– 7.7
0.15	0.896	– 29.6	6.50	156.5	0.038	73.5	0.954	–11.2
0.20	0.863	– 38.8	6.25	149.4	0.048	69.0	0.927	–14.2
0.25	0.824	– 47.5	5.96	142.8	0.058	64.8	0.898	–16.9
0.30	0.785	– 55.6	5.64	136.7	0.066	61.1	0.868	–19.2
0.40	0.709	– 70.5	5.04	126.2	0.079	55.1	0.811	–22.8
0.50	0.642	– 83.6	4.49	117.4	0.088	51.0	0.763	–25.4
0.60	0.588	– 95.6	4.03	109.8	0.094	48.2	0.723	–27.2
0.70	0.539	–106.7	3.64	103.2	0.099	46.4	0.692	–28.6
0.80	0.511	–116.4	3.31	97.3	0.104	45.2	0.667	–29.7
0.90	0.481	–126.5	3.04	92.0	0.107	44.7	0.645	–30.6
1.00	0.457	–135.8	2.80	87.1	0.110	44.9	0.627	–31.4
1.20	0.427	–152.6	2.41	78.7	0.115	46.3	0.602	–33.1
1.40	0.410	–167.9	2.12	71.3	0.121	48.7	0.586	–35.0
1.50	0.402	–174.6	2.00	68.0	0.125	50.5	0.582	–36.1
1.60	0.403	179.4	1.90	64.7	0.129	52.0	0.579	–37.2
1.80	0.402	167.6	1.72	58.7	0.139	55.1	0.573	–39.8
2.00	0.415	157.7	1.58	53.1	0.151	57.8	0.563	–42.7
2.50	0.465	135.6	1.31	41.0	0.193	63.0	0.540	–51.7
3.00	0.492	119.2	1.14	30.7	0.248	64.1	0.535	–61.2

S_{11}, S_{22} = f (f)
I_C = 2 mA, V_{CE} = 6 V, Z_0 = 50 Ω



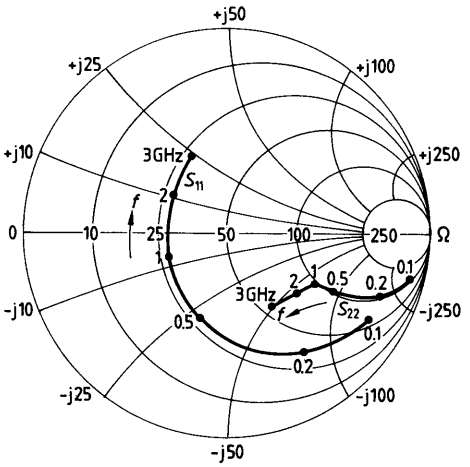
S_{12}, S_{21} = f (f)
I_C = 2 mA, V_{CE} = 6 V, Z_0 = 50 Ω



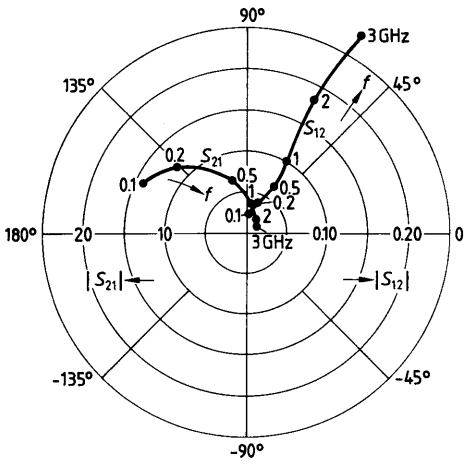
I_C = 5 mA, V_{CE} = 6 V, Z_0 = 50 Ω

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
0.10	0.827	– 31.1	13.95	154.8	0.024	74.1	0.929	–13.4
0.15	0.764	– 44.7	12.83	144.3	0.034	68.3	0.872	–18.3
0.20	0.698	– 56.7	11.65	135.4	0.041	63.9	0.813	–21.9
0.25	0.634	– 67.4	10.51	127.9	0.048	60.7	0.759	–24.4
0.30	0.577	– 76.8	9.48	121.7	0.053	58.5	0.713	–26.1
0.40	0.490	– 93.0	7.83	111.8	0.061	56.2	0.641	–27.8
0.50	0.426	–106.3	6.60	104.3	0.068	55.7	0.594	–28.6
0.60	0.385	–118.4	5.69	98.2	0.075	56.2	0.561	–29.0
0.70	0.352	–129.1	4.99	93.0	0.081	57.0	0.538	–29.2
0.80	0.332	–138.4	4.45	88.5	0.088	57.7	0.521	–29.5
0.90	0.318	–147.9	4.02	84.3	0.095	58.6	0.507	–29.9
1.00	0.308	–156.8	3.66	80.5	0.102	59.4	0.497	–30.2
1.20	0.300	–171.9	3.10	74.0	0.116	61.0	0.480	–31.3
1.40	0.297	173.9	2.70	68.0	0.131	61.9	0.470	–32.9
1.50	0.294	168.2	2.53	65.2	0.139	62.5	0.469	–33.8
1.60	0.298	162.9	2.40	62.6	0.147	62.7	0.467	–35.0
1.80	0.303	153.6	2.17	57.4	0.164	63.0	0.463	–37.6
2.00	0.321	146.0	1.98	52.6	0.181	62.8	0.453	–40.4
2.50	0.379	128.4	1.65	41.8	0.228	61.8	0.426	–48.6
3.00	0.408	115.3	1.43	31.9	0.278	59.4	0.419	–57.5

S_{11}, S_{22} = f (*f*)
I_C = 5 mA, V_{CE} = 6 V, Z_0 = 50 Ω



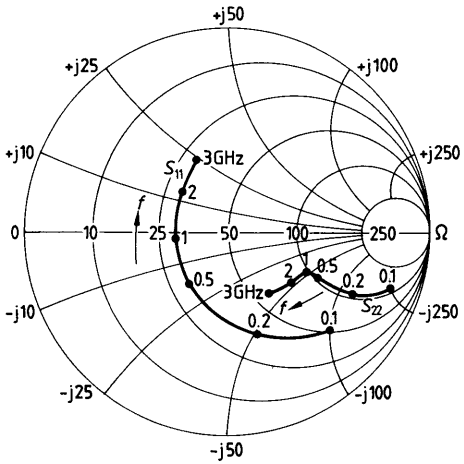
S_{12}, S_{21} = f (*f*)
I_C = 5 mA, V_{CE} = 6 V, Z_0 = 50 Ω



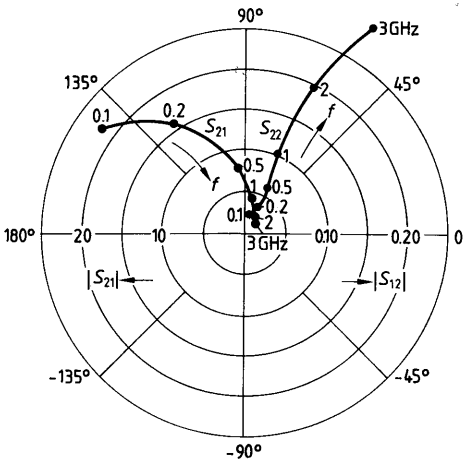
I_C = 10 mA, V_{CE} = 6 V, Z_0 = 50 Ω

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
0.10	0.704	– 43.8	21.34	144.8	0.022	70.4	0.855	–19.0
0.15	0.610	– 60.5	18.27	132.6	0.029	65.1	0.763	–23.8
0.20	0.529	– 74.2	15.62	123.4	0.035	62.6	0.687	–26.4
0.25	0.465	– 85.5	13.44	116.4	0.039	61.7	0.629	–27.5
0.30	0.415	– 95.3	11.72	110.9	0.044	61.3	0.586	–27.8
0.40	0.348	–111.8	9.26	102.7	0.052	62.1	0.528	–27.5
0.50	0.304	–125.2	7.62	96.6	0.060	63.3	0.496	–27.1
0.60	0.278	–137.0	6.46	91.6	0.068	64.6	0.474	–26.7
0.70	0.261	–147.1	5.61	87.4	0.077	65.6	0.461	–26.8
0.80	0.254	–156.0	4.96	83.7	0.086	66.1	0.451	–26.9
0.90	0.248	–164.7	4.45	80.3	0.094	66.6	0.442	–27.2
1.00	0.248	–172.2	4.04	77.0	0.103	67.0	0.436	–27.5
1.20	0.250	174.1	3.41	71.4	0.121	67.2	0.424	–28.8
1.40	0.256	161.4	2.96	66.0	0.139	66.9	0.418	–30.5
1.50	0.255	156.4	2.78	63.6	0.148	66.8	0.418	–31.6
1.60	0.260	152.1	2.63	61.2	0.158	66.4	0.417	–32.8
1.80	0.266	144.3	2.37	56.5	0.177	65.6	0.413	–35.7
2.00	0.286	138.5	2.16	52.2	0.195	64.4	0.403	–38.6
2.50	0.346	123.8	1.79	41.9	0.244	61.5	0.375	–46.7
3.00	0.377	112.9	1.55	32.4	0.293	57.8	0.366	–55.6

S_{11}, S_{22} = f (f)
I_C = 10 mA, V_{CE} = 6 V, Z_0 = 50 Ω



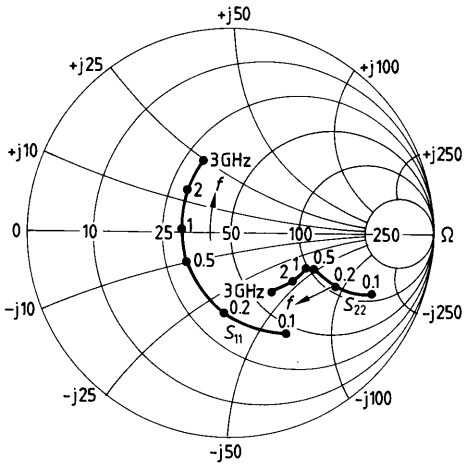
S_{12}, S_{21} = f (f)
I_C = 10 mA, V_{CE} = 6 V, Z_0 = 50 Ω



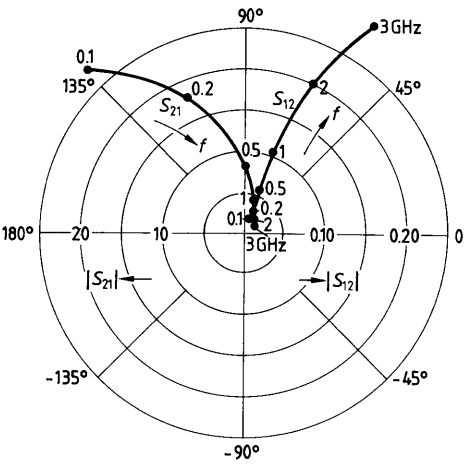
I_C = 20 mA, V_{CE} = 6 V, Z_0 = 50 Ω

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
0.10	0.566	– 59.2	27.49	134.2	0.019	67.5	0.760	–22.9
0.15	0.464	– 78.4	21.82	121.9	0.024	64.6	0.655	–25.9
0.20	0.394	– 93.3	17.76	113.6	0.029	64.7	0.584	–26.3
0.25	0.345	–105.1	14.82	107.7	0.034	65.3	0.538	–25.9
0.30	0.311	–115.2	12.67	103.1	0.038	66.3	0.507	–25.1
0.40	0.271	–131.9	9.78	96.4	0.047	68.2	0.469	–23.6
0.50	0.247	–144.7	7.93	91.4	0.056	69.6	0.451	–22.9
0.60	0.236	–155.3	6.68	87.2	0.065	70.6	0.439	–22.6
0.70	0.229	–164.1	5.78	83.6	0.075	71.1	0.431	–22.8
0.80	0.228	–171.4	5.09	80.4	0.084	71.2	0.426	–23.2
0.90	0.231	–178.8	4.56	77.3	0.094	71.3	0.421	–23.8
1.00	0.232	174.7	4.13	74.4	0.103	71.2	0.417	–24.3
1.20	0.242	163.6	3.48	69.3	0.122	70.6	0.409	–25.9
1.40	0.253	152.6	3.02	64.3	0.141	69.7	0.404	–27.9
1.50	0.253	148.5	2.83	62.0	0.151	69.3	0.405	–29.1
1.60	0.258	144.9	2.68	59.7	0.161	68.6	0.404	–30.5
1.80	0.266	138.1	2.41	55.2	0.180	67.3	0.401	–33.6
2.00	0.284	133.9	2.19	51.0	0.200	65.8	0.391	–36.7
2.50	0.345	121.1	1.82	41.0	0.249	62.2	0.363	–44.8
3.00	0.374	110.8	1.58	31.7	0.297	58.1	0.353	–53.9

S_{11}, S_{22} = f (f)
I_C = 20 mA, V_{CE} = 6 V, Z_0 = 50 Ω



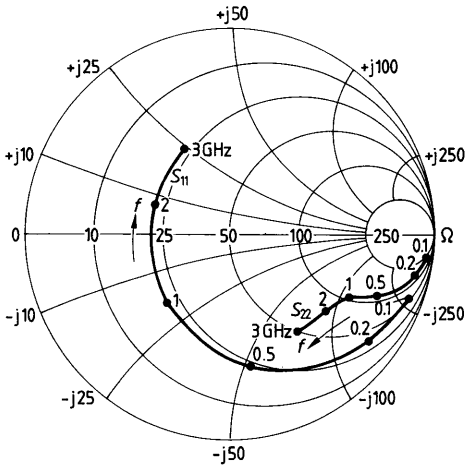
S_{12}, S_{21} = f (f)
I_C = 20 mA, V_{CE} = 6 V, Z_0 = 50 Ω



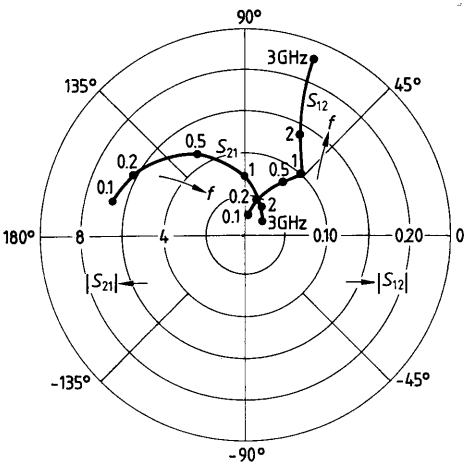
I_C = 2 mA, V_{CE} = 10 V, Z_0 = 50 Ω

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
0.10	0.931	– 18.9	6.59	164.6	0.023	79.4	0.978	– 6.7
0.15	0.905	– 28.2	6.41	157.4	0.034	74.4	0.960	– 9.8
0.20	0.874	– 36.9	6.19	150.4	0.043	70.0	0.937	–12.5
0.25	0.836	– 45.2	5.92	144.1	0.052	65.9	0.911	–14.9
0.30	0.796	– 53.0	5.62	138.0	0.059	62.5	0.884	–17.0
0.40	0.722	– 67.4	5.05	127.7	0.071	56.5	0.833	–20.1
0.50	0.654	– 80.2	4.52	118.9	0.079	52.4	0.789	–22.4
0.60	0.597	– 91.9	4.06	111.3	0.085	49.7	0.753	–24.1
0.70	0.544	–102.7	3.68	104.7	0.090	47.9	0.725	–25.4
0.80	0.513	–112.3	3.35	98.9	0.094	46.6	0.702	–26.3
0.90	0.481	–122.3	3.09	93.5	0.097	46.2	0.681	–27.2
1.00	0.455	–131.7	2.85	88.5	0.100	46.5	0.666	–27.9
1.20	0.421	–148.7	2.45	80.0	0.105	47.9	0.642	–29.5
1.40	0.399	–164.4	2.16	72.6	0.110	50.5	0.628	–31.2
1.50	0.390	–171.2	2.03	69.4	0.114	52.4	0.625	–32.2
1.60	0.390	–177.8	1.93	66.1	0.118	54.0	0.622	–33.3
1.80	0.385	170.4	1.76	60.1	0.127	57.3	0.617	–35.6
2.00	0.398	160.0	1.61	54.4	0.138	60.2	0.609	–38.2
2.50	0.447	136.9	1.33	42.3	0.177	66.0	0.589	–46.2
3.00	0.478	119.7	1.15	31.8	0.229	67.7	0.587	–54.8

S_{11}, S_{22} = f (*f*)
I_C = 2 mA, V_{CE} = 10 V, Z_0 = 50 Ω



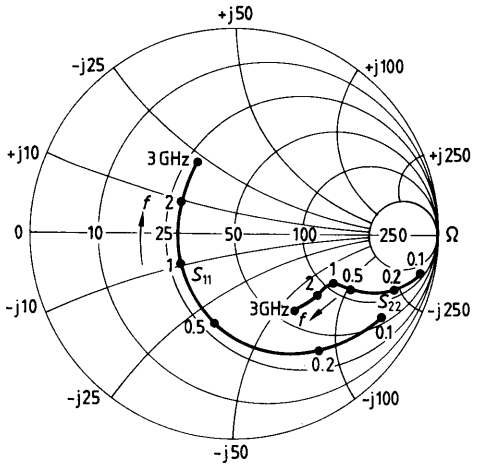
S_{12}, S_{21} = f (*f*)
I_C = 2 mA, V_{CE} = 10 V, Z_0 = 50 Ω



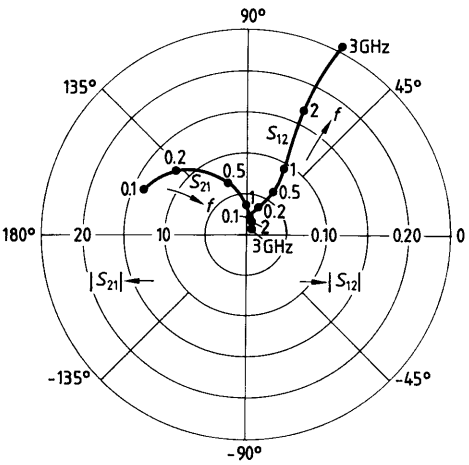
I_C = 5 mA, V_{CE} = 10 V, Z_0 = 50 Ω

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
0.10	0.847	– 28.9	13.60	156.0	0.022	75.1	0.939	–11.5
0.15	0.786	– 41.7	12.60	145.9	0.030	69.5	0.889	–15.8
0.20	0.721	– 53.1	11.53	137.1	0.038	65.1	0.837	–19.0
0.25	0.657	– 63.1	10.46	129.7	0.043	61.9	0.790	–21.2
0.30	0.599	– 72.1	9.48	123.4	0.048	59.7	0.747	–22.7
0.40	0.506	– 87.6	7.89	113.5	0.056	57.2	0.682	–24.3
0.50	0.437	–100.4	6.68	105.9	0.062	56.7	0.639	–25.0
0.60	0.389	–112.2	5.77	99.6	0.069	57.0	0.607	–25.3
0.70	0.351	–122.8	5.08	94.4	0.075	57.8	0.586	–25.6
0.80	0.329	–132.0	4.53	89.8	0.081	58.5	0.570	–25.9
0.90	0.310	–141.8	4.10	85.6	0.087	59.4	0.557	–26.2
1.00	0.296	–150.7	3.73	81.7	0.093	60.4	0.548	–26.5
1.20	0.283	–166.8	3.17	75.2	0.106	61.9	0.532	–27.6
1.40	0.278	178.1	2.76	69.1	0.120	63.1	0.524	–29.0
1.50	0.273	171.8	2.58	66.4	0.127	63.9	0.523	–29.9
1.60	0.278	166.1	2.45	63.7	0.134	64.2	0.522	–31.0
1.80	0.280	156.3	2.21	58.7	0.150	64.8	0.518	–33.3
2.00	0.298	148.3	2.02	53.8	0.166	64.9	0.510	–35.9
2.50	0.357	129.4	1.67	42.9	0.209	64.6	0.487	–43.1
3.00	0.390	116.1	1.45	33.1	0.257	62.8	0.482	–51.1

S_{11}, S_{22} = f (*f*)
I_C = 5 mA, V_{CE} = 10 V, Z_0 = 50 Ω



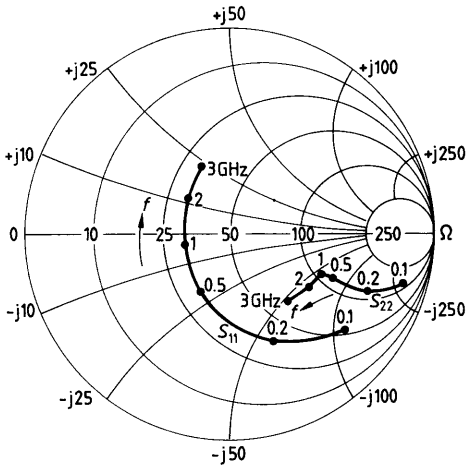
S_{12}, S_{21} = f (*f*)
I_C = 5 mA, V_{CE} = 10 V, Z_0 = 50 Ω



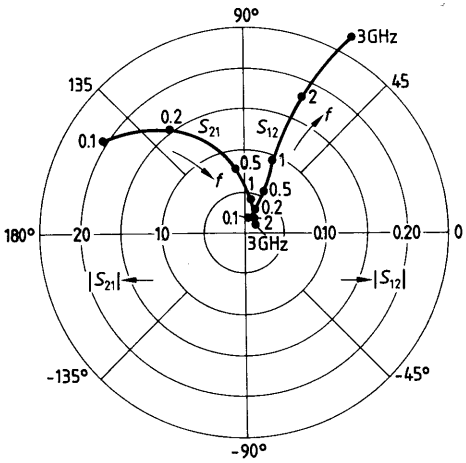
I_C = 10 mA, V_{CE} = 10 V, Z_0 = 50 Ω

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
0.10	0.744	– 39.7	20.56	146.8	0.020	71.5	0.877	–16.2
0.15	0.650	– 55.4	17.86	134.8	0.027	66.3	0.798	–20.4
0.20	0.566	– 68.1	15.44	125.6	0.032	63.4	0.729	–22.7
0.25	0.497	– 78.7	13.39	118.5	0.037	62.1	0.675	–23.8
0.30	0.441	– 88.0	11.74	112.8	0.041	61.7	0.635	–24.1
0.40	0.362	–103.8	9.33	104.4	0.048	62.2	0.580	–23.9
0.50	0.310	–116.5	7.70	98.1	0.055	63.3	0.549	–23.6
0.60	0.277	–128.3	6.54	93.0	0.063	64.6	0.529	–23.3
0.70	0.254	–138.5	5.70	88.6	0.071	65.7	0.516	–23.4
0.80	0.242	–147.7	5.04	84.9	0.079	66.3	0.507	–23.6
0.90	0.234	–157.0	4.52	81.4	0.086	67.0	0.499	–23.9
1.00	0.229	–165.8	4.10	78.1	0.094	67.5	0.493	–24.2
1.20	0.227	179.4	3.46	72.4	0.111	67.9	0.483	–25.4
1.40	0.232	165.5	3.01	67.1	0.127	67.8	0.477	–27.0
1.50	0.231	159.6	2.82	64.6	0.135	68.0	0.477	–28.0
1.60	0.237	155.1	2.67	62.2	0.144	67.7	0.476	–29.1
1.80	0.242	146.5	2.40	57.6	0.161	67.2	0.474	–31.7
2.00	0.261	140.5	2.19	53.2	0.179	66.3	0.465	–34.3
2.50	0.324	124.8	1.82	42.9	0.224	64.0	0.440	–41.4
3.00	0.355	113.5	1.57	33.4	0.270	61.0	0.433	–49.3

S_{11}, S_{22} = f (f)
I_C = 10 mA, V_{CE} = 10 V, Z_0 = 50 Ω



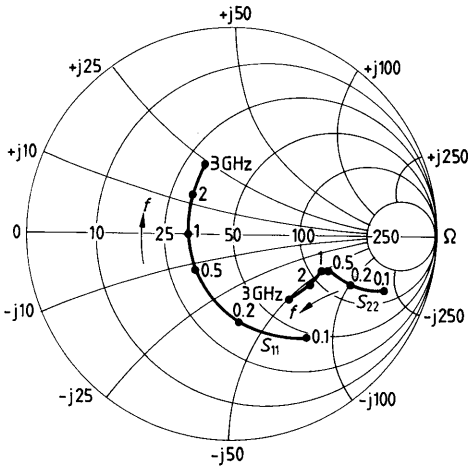
S_{12}, S_{21} = f (f)
I_C = 10 mA, V_{CE} = 10 V, Z_0 = 50 Ω



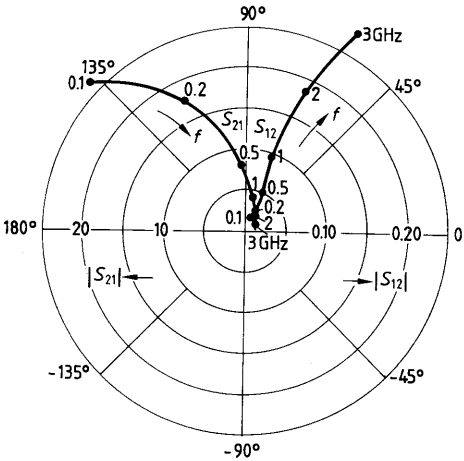
I_C = 20 mA, V_{CE} = 10 V, Z_0 = 50 Ω

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
0.10	0.628	– 52.7	26.24	137.1	0.018	68.5	0.800	–19.4
0.15	0.517	– 70.3	21.27	124.7	0.023	65.1	0.705	–22.1
0.20	0.435	– 84.1	17.51	116.0	0.028	64.3	0.639	–22.7
0.25	0.376	– 95.1	14.71	109.8	0.032	64.8	0.595	–22.4
0.30	0.332	–104.6	12.62	105.0	0.036	65.6	0.565	–21.8
0.40	0.277	–121.1	9.79	98.0	0.044	67.3	0.528	–20.6
0.50	0.243	–133.6	7.97	92.7	0.052	68.9	0.510	–20.1
0.60	0.227	–145.2	6.72	88.4	0.060	70.0	0.498	–19.9
0.70	0.215	–155.2	5.82	84.7	0.069	70.7	0.492	–20.1
0.80	0.211	–163.0	5.13	81.4	0.078	71.0	0.486	–20.5
0.90	0.210	–171.5	4.59	78.3	0.086	71.2	0.481	–21.0
1.00	0.210	–179.1	4.16	75.4	0.095	71.3	0.477	–21.6
1.20	0.218	168.5	3.50	70.1	0.112	71.1	0.470	–23.0
1.40	0.227	156.3	3.04	65.0	0.130	70.4	0.466	–24.9
1.50	0.228	151.2	2.84	62.7	0.139	70.2	0.467	–26.0
1.60	0.234	147.5	2.69	60.4	0.147	69.7	0.467	–27.3
1.80	0.241	140.0	2.42	56.0	0.165	68.7	0.465	–30.0
2.00	0.260	135.5	2.21	51.7	0.183	67.5	0.456	–32.8
2.50	0.324	122.0	1.83	41.7	0.229	64.5	0.431	–40.0
3.00	0.355	111.7	1.58	32.3	0.275	61.1	0.424	–48.1

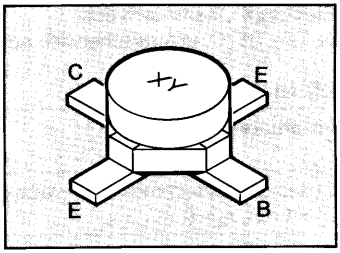
S_{11}, S_{22} = f (f)
I_C = 20 mA, V_{CE} = 10 V, Z_0 = 50 Ω



S_{12}, S_{21} = f (f)
I_C = 20 mA, V_{CE} = 10 V, Z_0 = 50 Ω



- For low-noise, high-gain amplifiers up to 2 GHz.
- Linear broadband applications at collector currents up to 40 mA.
- Hermetically sealed ceramic package.
- f_T = 8 GHz
  F = 1.1 dB at 800 MHz.



ESD: Electrostatic discharge sensitive device, observe handling precautions!

Type	Marking	Ordering code (tape and reel)	Package[1])
BFQ 82	82	Q 62702 – F1189	Cerec-X

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CEO}	12	V
Collector-emitter voltage, V_{BE} = 0	V_{CES}	20	V
Collector-base voltage	V_{CBO}	20	V
Emitter-base voltage	V_{EBO}	2	V
Collector current	I_C	80	mA
Base current	I_B	10	mA
Total power dissipation, $T_A \leq 95$ °C[2])	P_{tot}	400	mW
Junction temperature	T_j	175	°C
Ambient temperature range	T_A	–65 ... +175	°C
Storage temperature range	T_{stg}	–65 ... +175	°C

Thermal Resistance

Junction – ambient[2])	R_{thJA}	≤200	K/W

1) For detailed dimensions see chapter Package Outlines.
2) Package mounted on alumina 16 mm × 25 mm × 0.7 mm.

Electrical Characteristics
at T_A = 25 °C, unless otherwise specified.

DC characteristics

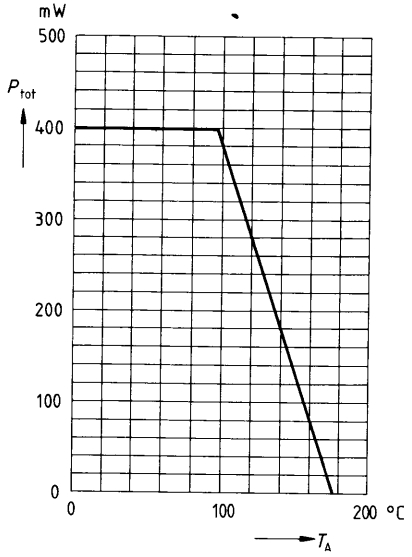
Parameter	Symbol	Values			Unit
		min	typ	max	
Collector-emitter breakdown voltage I_C = 1 mA, I_B = 0	$V_{(BR)CEO}$	12	–	–	V
Collector-emitter cutoff current V_{CE} = 20 V, V_{BE} = 0	I_{CES}	–	–	100	µA
Collector-base cutoff current V_{CB} = 10 V, I_E = 0 V_{CB} = 10 V, I_E = 0, T_A = 125° C	I_{CBO}	 – –	 – –	 0.05 5	µA
Emitter-base cutoff current V_{EB} = 1 V, I_C = 0	I_{EBO}	–	–	1	µA
DC current gain I_C = 5 mA, V_{CE} = 8 V I_C = 30 mA, V_{CE} = 8 V	h_{FE}	 – –	 110 120	 – –	–

AC characteristics

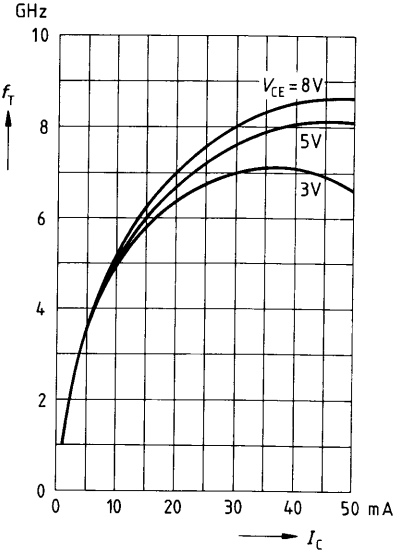
Parameter	Symbol	Values min	typ	max	Unit
Transition frequency I_C = 5 mA, V_{CE} = 8 V, f = 500 MHz I_C = 30 mA, V_{CE} = 8 V, f = 500 MHz	f_T	 – –	 3.6 8	 – –	GHz
Collector-base capacitance V_{CB} = 10 V, V_{BE} = v_{be} = 0, f = 1 MHz	C_{cb}	–	0.62	–	pF
Collector-emitter capacitance V_{CE} = 10 V, V_{BE} = v_{be} = 0, f = 1 MHz	C_{ce}	–	0.4	–	pF
Input capacitance V_{EB} = 0.5 V, I_C = i_c = 0, f = 1 MHz	C_{ibo}	–	2.5	–	pF
Output capacitance V_{CE} = 10 V, V_{BE} = v_{be} = 0, f = 1 MHz	C_{obs}	–	1.0	–	pF
Noise figure I_C = 5 mA, V_{CE} = 8 V, f = 10 MHz, Z_S = 75 Ω I_C = 30 mA, V_{CE} = 8 V, f = 800 MHz, Z_S = Z_{Sopt} I_C = 10 mA, V_{CE} = 8 V, f = 2 GHz, Z_S = Z_{Sopt}	F	 – – –	 0.7 1.6 2.3	 – – –	dB
Power gain I_C = 30 mA, V_{CE} = 8 V, f = 1 GHz, Z_0 = 50 Ω I_C = 30 mA, V_{CE} = 8 V, f = 2 GHz, Z_0 = 50 Ω	G_{ma} [1]	 – –	 17 11	 – –	dB
Transducer gain I_C = 30 mA, V_{CE} = 8 V, f = 1 GHz, Z_0 = 50 Ω	$\lvert S_{21e}\rvert^2$	–	13.5	–	dB
Linear output voltage two-tone intermodulation test I_C = 40 mA, V_{CE} = 8 V, d_{IM} = 60 dB f_1 = 806 MHz, f_2 = 810 MHz, Z_S = Z_L = 50 Ω	$V_{o1} = V_{o2}$	 –	 280	 –	mV
Third order intercept point I_C = 40 mA, V_{CE} = 8 V, f = 800 MHz	IP_3	–	32	–	dBm

1) $G_{ma} = \frac{|S_{21e}|}{|S_{12e}|} (k - \sqrt{k^2-1})$

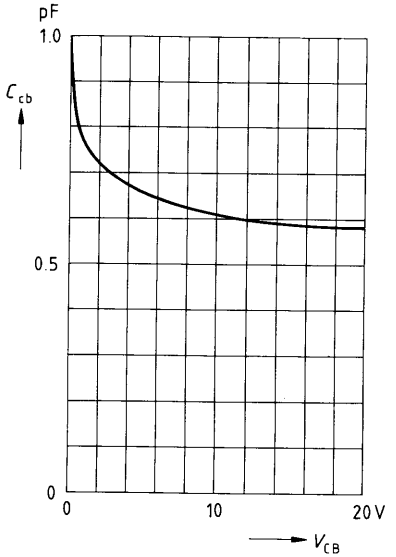
Total power dissipation $P_{tot} = f(T_A)$
Package mounted on alumina



Transition frequency $f_T = f(I_C)$
$f = 500$ MHz



Collector-base capacitance $C_{cb} = f(V_{CB})$
$V_{BE} = v_{be} = 0$, $f = 1$ MHz



Common Emitter Noise Parameters

I_C = 10 mA, V_{CE} = 8 V, Z_0 = 50 Ω

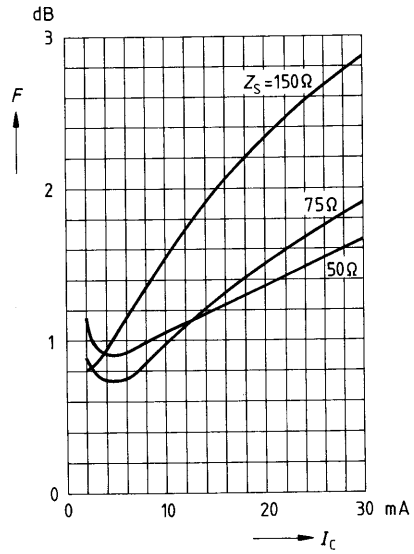
f	F_{min}	G_p (F_{min})	Γ_{opt}		R_N	N	$F_{50\,\Omega}$	G_p ($F_{50\,\Omega}$)
GHz	dB	dB	MAG	ANG	Ω	–	dB	dB
0.01	1	–	(Z_S = 75 Ω)		–	–	1.05	–
0.8	1.15	15.7	–	–	–	–	1.35	14.7
2.0	2.3	9.5	–	–	–	–	2.8	7.5

I_C = 30 mA, V_{CE} = 8 V, Z_0 = 50 Ω

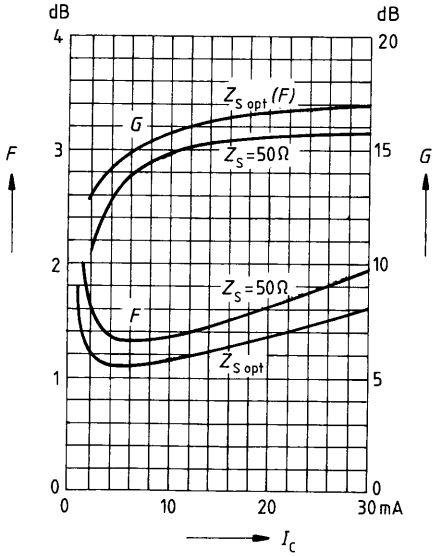
f	F_{min}	G_p (F_{min})	Γ_{opt}		R_N	N	$F_{50\,\Omega}$	G_p ($F_{50\,\Omega}$)
GHz	dB	dB	MAG	ANG	Ω	–	dB	dB
0.01	1.65	–	(Z_S = 50 Ω)		–	–	1.65	–
0.8	1.6	17	–	–	–	–	1.95	15.8
2.0	2.6	10	–	–	–	–	3.3	8

Noise figure $F = f(I_C)$

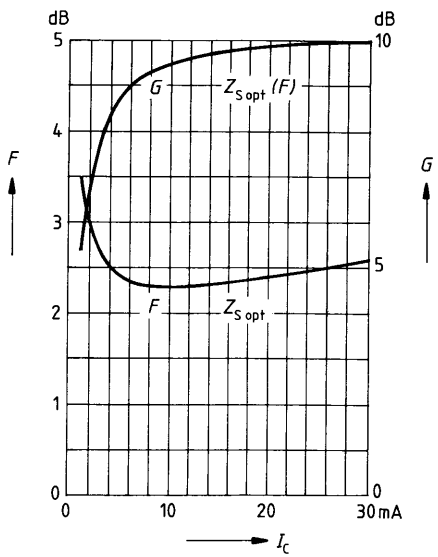
V_{CE} = 8 V, f = 10 MHz



Noise figure $F = f(I_C)$
Power gain $G = f(I_C)$
$V_{CE} = 8$ V, $f = 800$ MHz, Z_{Lopt} (G)

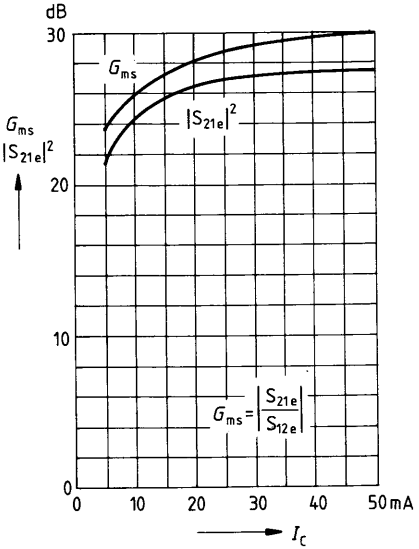


Noise figure $F = f(I_C)$
Power gain $G = f(I_C)$
$V_{CE} = 8$ V, $f = 2$ GHz, Z_{Lopt} (G)

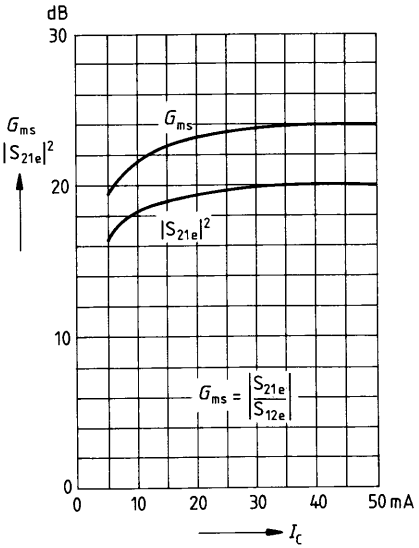


Common Emitter Power Gain

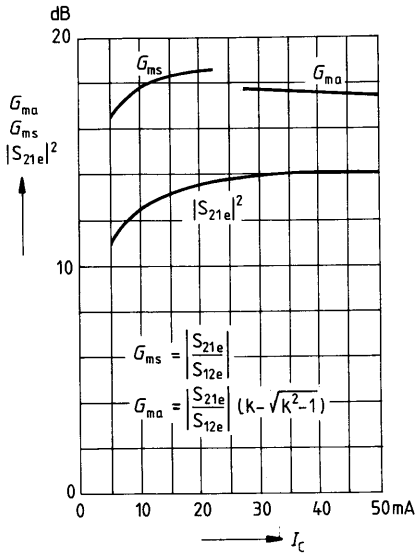
Power gain G_{ms}, $|S_{21e}|^2 = f(I_C)$
$V_{CE} = 8$ V, $f = 200$ MHz, $Z_0 = 50\ \Omega$



Power gain G_{ms}, $|S_{21e}|^2 = f(I_C)$
$V_{CE} = 8$ V, $f = 500$ MHz, $Z_0 = 50\ \Omega$



Power gain G_{ma}, G_{ms}, $|S_{21e}|^2 = f(I_C)$
$V_{CE} = 8$ V, $f = 1$ GHz, $Z_0 = 50\ \Omega$



Power gain G_{ma}, $|S_{21e}|^2 = f(I_C)$
$V_{CE} = 8$ V, $f = 2$ GHz, $Z_0 = 50\ \Omega$