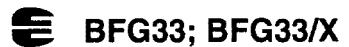


NPN 12 GHz wideband transistor



FEATURES

- High power gain
- Low noise figure
- Gold metallization ensures excellent reliability.

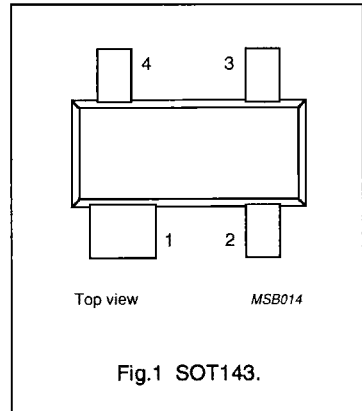
DESCRIPTION

The BFG33 is a silicon npn transistor, primarily intended for wideband applications in the 2 GHz range, such as portable RF communications equipment (DECT, PCN cellular).

The transistor is encapsulated in a 4-pin, dual-emitter plastic SOT143 envelope.

PINNING

PIN	DESCRIPTION
BFG33; Code: V6	
1	collector
2	base
3	emitter
4	emitter
BFG33/X; Code: V16	
1	collector
2	emitter
3	base
4	emitter



QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	–	9	V
V_{CEO}	collector-emitter voltage	open base	–	–	7	V
I_C	DC collector current		–	–	20	mA
P_{tot}	total power dissipation	up to $T_s = 110\text{ °C}$ (note 1)	–	–	140	mW
h_{FE}	DC current gain	$I_C = 15\text{ mA}$; $V_{CE} = 5\text{ V}$	50	90	–	
C_{re}	feedback capacitance	$I_C = i_c = 0$; $V_{CB} = 5\text{ V}$; $f = 1\text{ MHz}$	–	0.2	–	pF
f_T	transition frequency	$I_C = 15\text{ mA}$; $V_{CE} = 5\text{ V}$; $T_{amb} = 25\text{ °C}$; $f = 2\text{ GHz}$	–	12	–	GHz
G_{UM}	maximum unilateral power gain	$I_C = 15\text{ mA}$; $V_{CE} = 5\text{ V}$; $T_{amb} = 25\text{ °C}$; $f = 2\text{ GHz}$	–	12.5	–	dB
F	noise figure	$\Gamma_s = \Gamma_{opt}$; $I_C = 5\text{ mA}$; $V_{CE} = 5\text{ V}$; $T_{amb} = 25\text{ °C}$; $f = 2\text{ GHz}$	–	3	–	dB

Note

1. T_s is the temperature at the soldering point of the collector tab.

NPN 12 GHz wideband transistor

BFG33; BFG33/X

LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	9	V
V_{CEO}	collector-emitter voltage	open base	–	7	V
V_{EBO}	emitter-base voltage	open collector	–	2	V
I_C	DC collector current		–	20	mA
P_{tot}	total power dissipation	up to $T_s = 110\text{ °C}$ (note 1)	–	140	mW
T_{stg}	storage temperature range		–65	150	°C
T_j	junction temperature		–	150	°C

THERMAL RESISTANCE

SYMBOL	PARAMETER	THERMAL RESISTANCE
$R_{th\ j-s}$	from junction to soldering point (note 1)	290 K/W

Note

- T_s is the temperature at the soldering point of the collector tab.

CHARACTERISTICS

 $T_j = 25\text{ °C}$ unless otherwise specified.

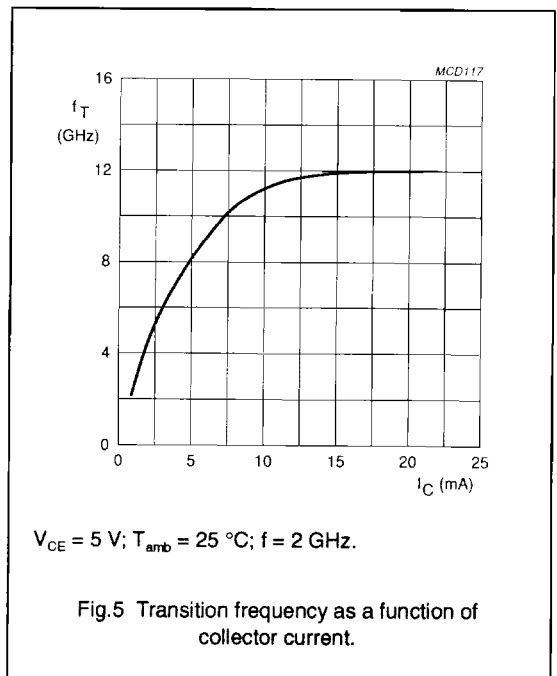
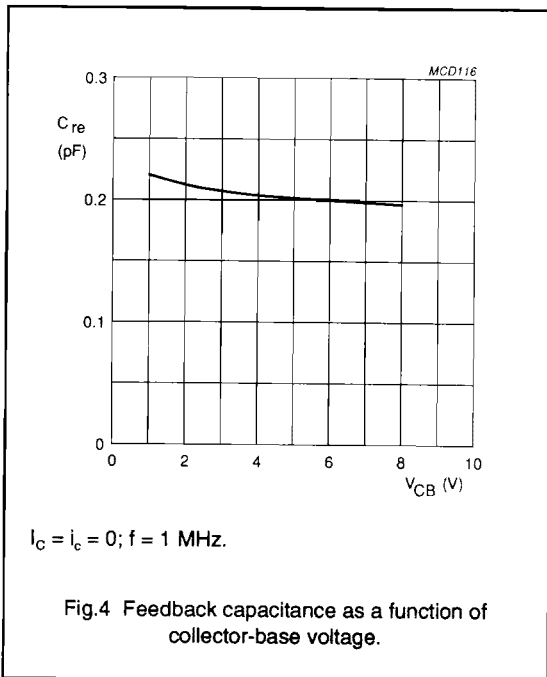
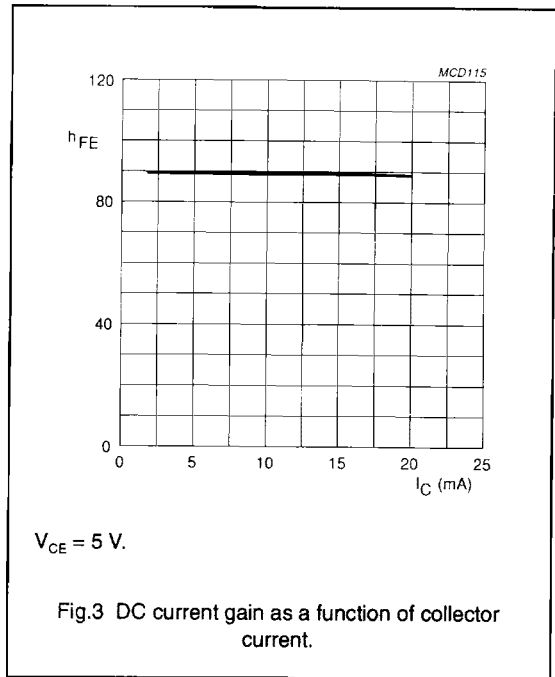
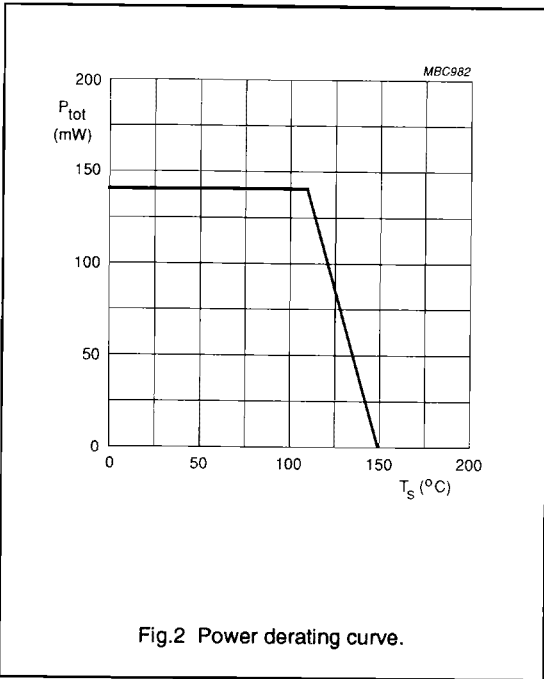
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CBO}	collector cut-off current	$I_E = 0$; $V_{CB} = 5\text{ V}$	–	–	50	nA
h_{FE}	DC current gain	$I_C = 15\text{ mA}$; $V_{CE} = 5\text{ V}$	50	90	–	
C_c	collector capacitance	$I_E = I_C = 0$; $V_{CB} = 5\text{ V}$; $f = 1\text{ MHz}$	–	0.4	–	pF
C_{re}	feedback capacitance	$I_C = I_C = 0$; $V_{CB} = 5\text{ V}$; $f = 1\text{ MHz}$	–	0.2	–	pF
f_T	transition frequency	$I_C = 15\text{ mA}$; $V_{CE} = 5\text{ V}$; $T_{amb} = 25\text{ °C}$; $f = 2\text{ GHz}$	–	12	–	GHz
G_{UM}	maximum unilateral power gain (note 1)	$I_C = 15\text{ mA}$; $V_{CE} = 5\text{ V}$; $T_{amb} = 25\text{ °C}$; $f = 2\text{ GHz}$	–	12.5	–	dB
F	noise figure	$\Gamma_s = \Gamma_{opt}$; $I_C = 5\text{ mA}$; $V_{CE} = 5\text{ V}$; $T_{amb} = 25\text{ °C}$; $f = 2\text{ GHz}$	–	3	–	dB

Note

- G_{UM} is the maximum unilateral power gain, assuming S_{12} is zero and $G_{UM} = 10 \log \frac{|S_{21}|^2}{(1 - |S_{11}|^2)(1 - |S_{22}|^2)}$ dB.

NPN 12 GHz wideband transistor

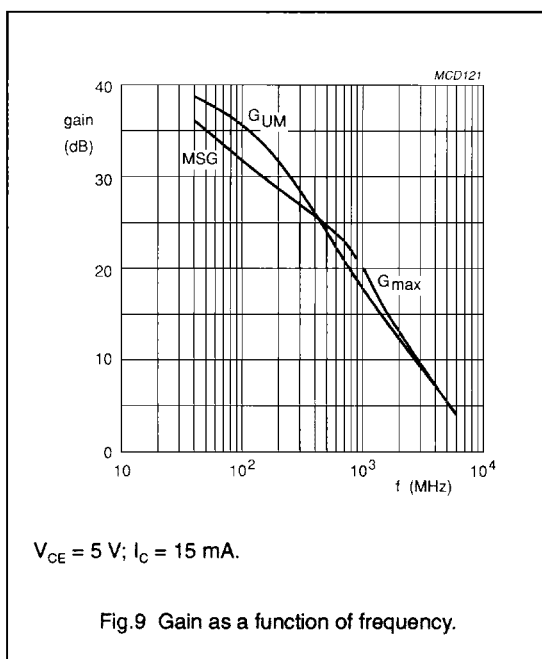
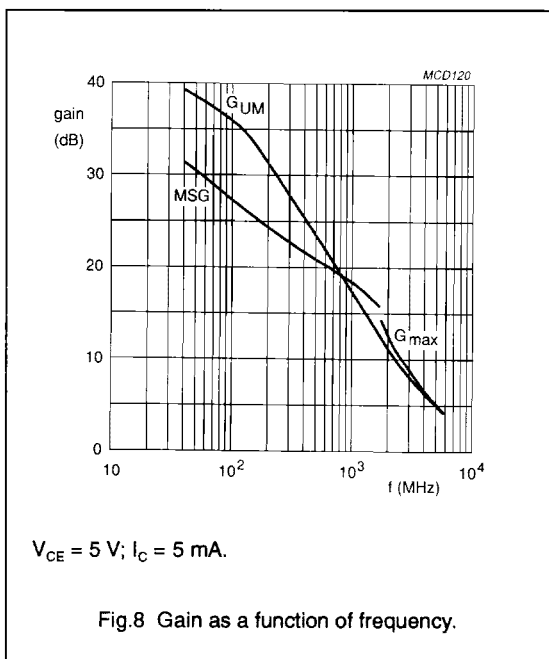
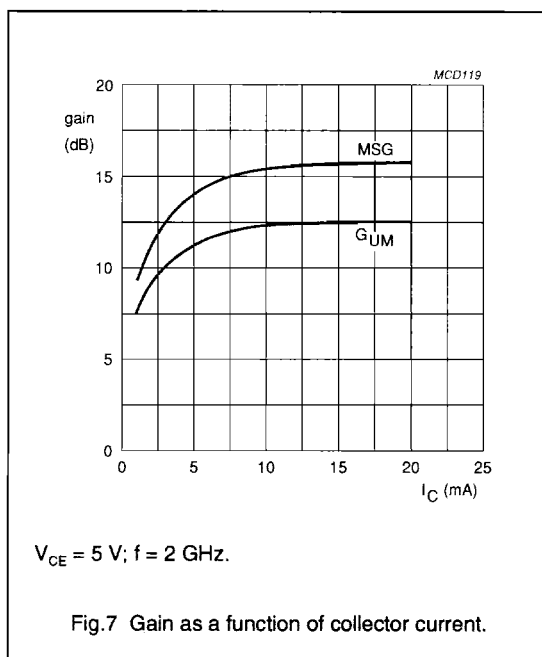
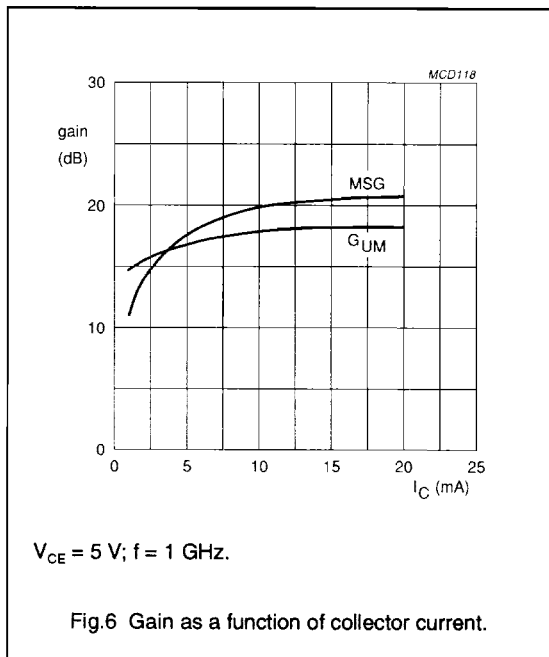
BFG33; BFG33/X



NPN 12 GHz wideband transistor

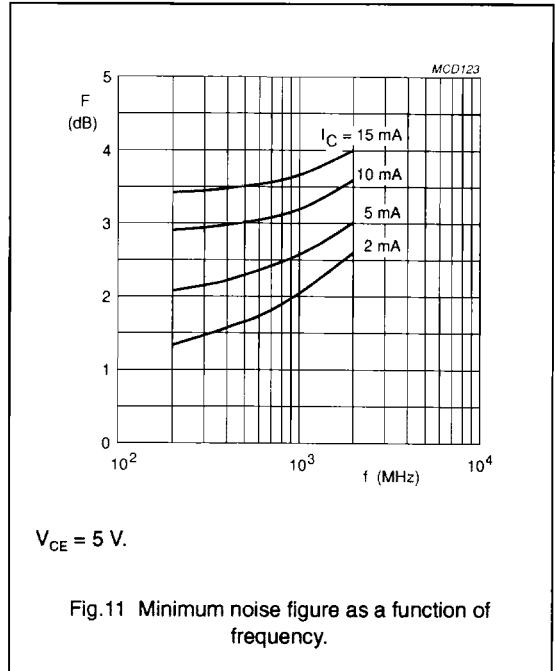
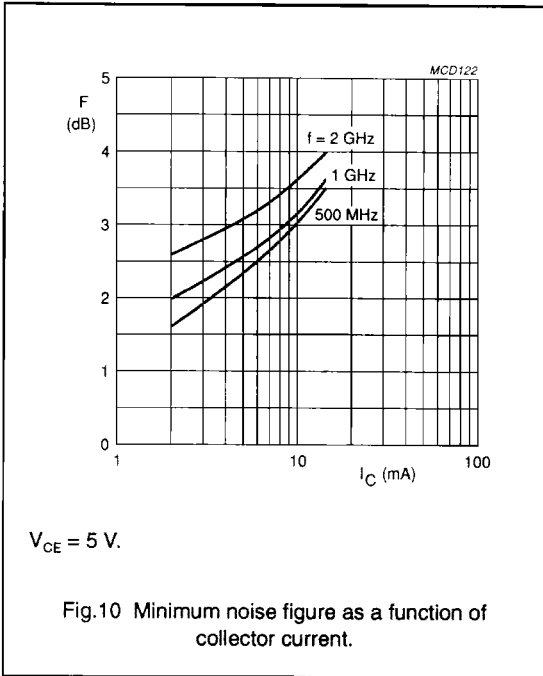
BFG33; BFG33/X

In Figs 6 to 9, G_{UM} = maximum unilateral power gain; MSG = maximum stable gain; G_{max} = maximum available gain.



NPN 12 GHz wideband transistor

BFG33; BFG33/X

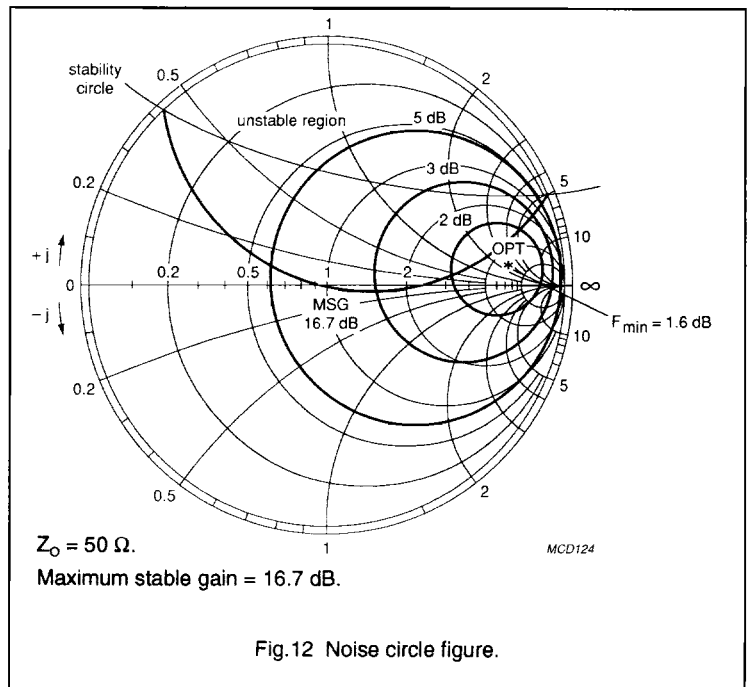


BFG33/X

f (MHz)	V _{CE} (V)	I _C (mA)
500	5	2

Noise Parameters

F _{min} (dB)	Gamma (opt)		R _n /50
	(mag)	(ang)	
1.6	0.774	6.2	1.254



NPN 12 GHz wideband transistor

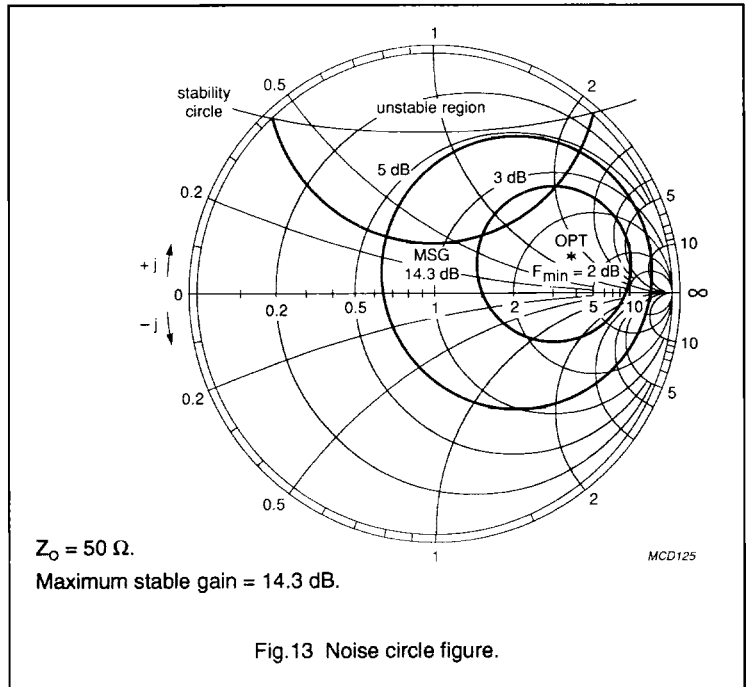
BFG33; BFG33/X

BFG33/X

f (MHz)	V _{CE} (V)	I _C (mA)
1000	5	2

Noise Parameters

F _{min} (dB)	Gamma (opt)		R _n /50
	(mag)	(ang)	
2	0.627	13.6	1.458

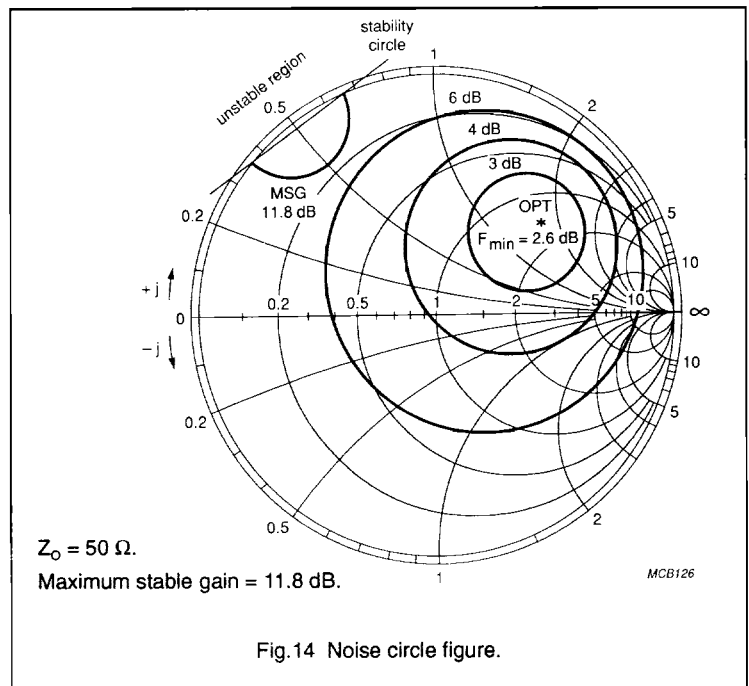


BFG33/X

f (MHz)	V _{CE} (V)	I _C (mA)
2000	5	2

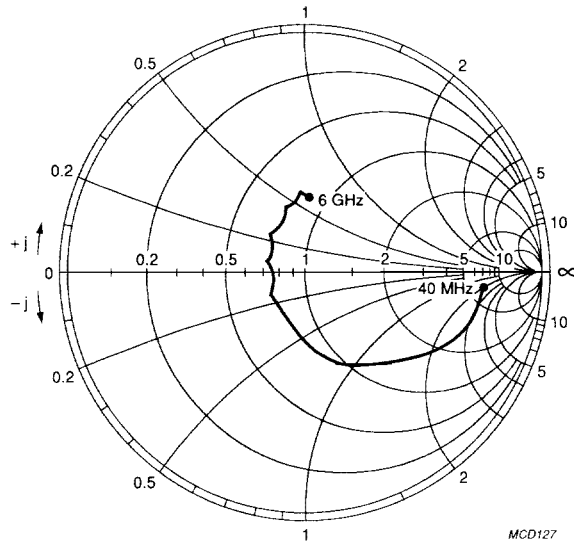
Noise Parameters

F _{min} (dB)	Gamma (opt)		R _n /50
	(mag)	(ang)	
2.6	0.58	40.2	1.064



NPN 12 GHz wideband transistor

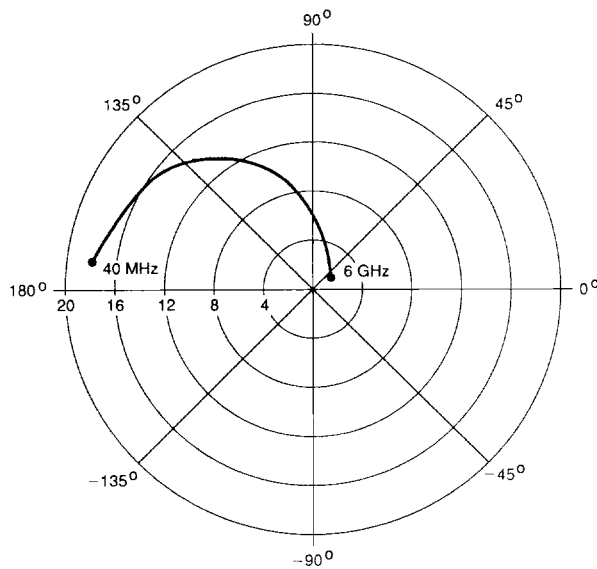
BFG33; BFG33/X



$V_{CE} = 5\text{ V}; I_C = 15\text{ mA}$.

MCD127

Fig.15 Common emitter input reflection coefficient (S_{11}).



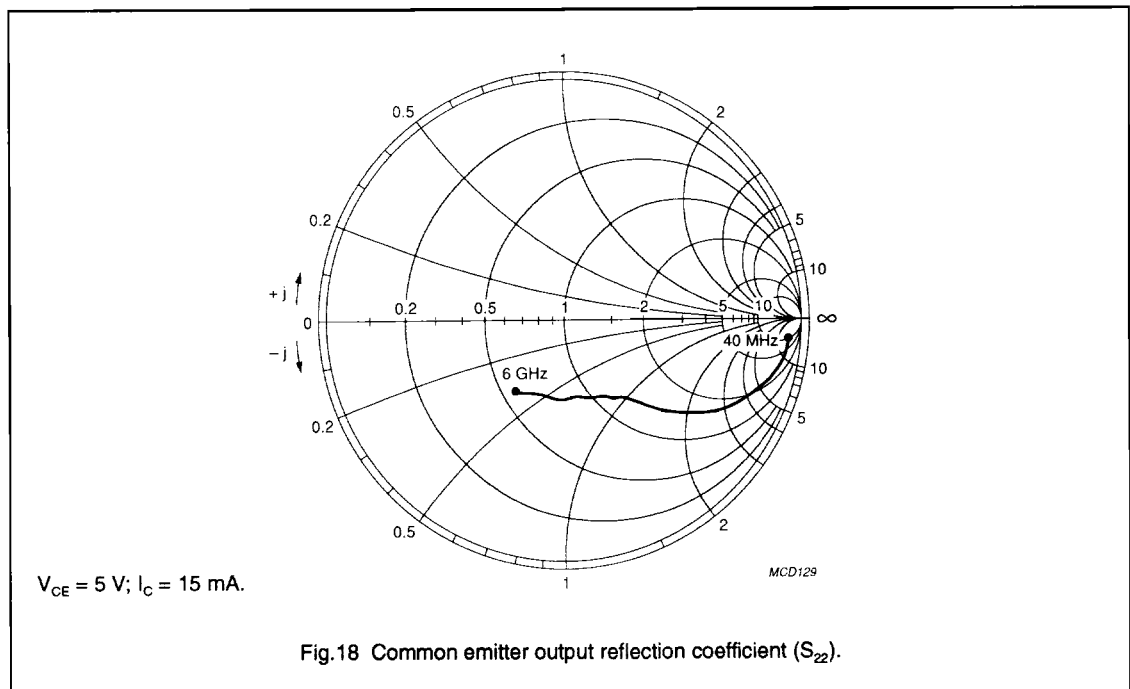
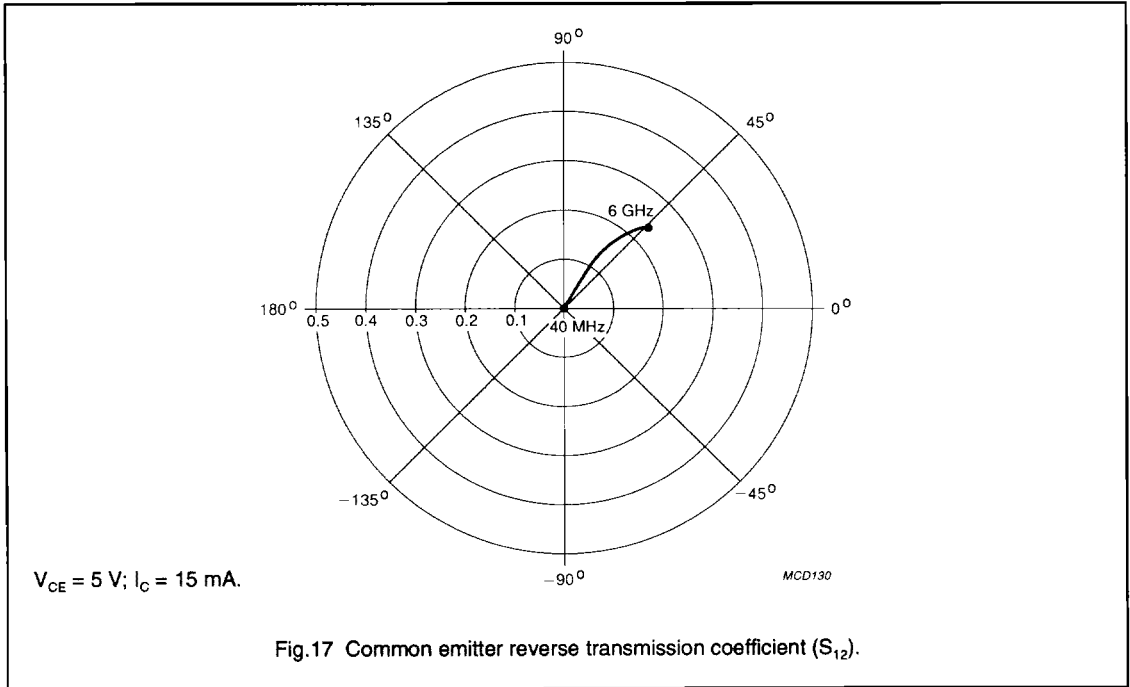
$V_{CE} = 5\text{ V}; I_C = 15\text{ mA}$.

MCD128

Fig.16 Common emitter forward transmission coefficient (S_{21}).

NPN 12 GHz wideband transistor

BFG33; BFG33/X



NPN 12 GHz wideband transistor

BFG33; BFG33/X

Table 1 Common emitter scattering parameters, $V_{CE} = 2.5$ V, $I_C = 2$ mA

f (MHz)	S_{11}		S_{21}		S_{12}		S_{22}		G_{UM} (dB)
	MAG. (RAT)	ANG. (DEG)	MAG. (RAT)	ANG. (DEG)	MAG. (RAT)	ANG. (DEG)	MAG. (RAT)	ANG. (DEG)	
40	0.957	-2.4	3.176	176.6	0.006	87.1	0.994	-2.1	40.0
100	0.956	-5.9	3.049	171.6	0.014	84.1	0.990	-5.3	37.5
200	0.939	-11.6	3.027	163.0	0.028	78.9	0.974	-10.4	31.8
300	0.917	-17.2	2.985	155.3	0.041	74.3	0.950	-15.1	27.6
400	0.890	-23.0	2.988	149.2	0.053	70.1	0.928	-19.3	24.9
500	0.863	-28.2	2.878	143.6	0.064	66.1	0.905	-23.5	22.5
600	0.831	-33.6	2.855	138.4	0.073	63.0	0.875	-27.1	20.5
700	0.799	-38.6	2.795	133.7	0.081	60.3	0.848	-30.0	18.9
800	0.759	-44.1	2.814	128.9	0.088	58.0	0.820	-32.5	17.6
900	0.717	-48.4	2.716	123.2	0.095	56.0	0.800	-34.5	16.2
1000	0.686	-53.6	2.638	120.6	0.100	53.7	0.777	-37.1	15.2
1200	0.613	-63.6	2.510	113.4	0.110	50.3	0.734	-41.4	13.4
1400	0.534	-74.3	2.506	105.0	0.120	48.5	0.697	-44.4	12.3
1600	0.479	-83.0	2.382	98.4	0.127	46.8	0.676	-47.3	11.3
1800	0.429	-90.6	2.248	94.3	0.133	46.2	0.653	-50.0	10.3
2000	0.364	-98.1	2.127	88.8	0.138	45.1	0.630	-51.9	9.4
2200	0.309	-107.6	2.017	83.9	0.144	43.8	0.605	-54.4	8.5
2400	0.273	-119.4	1.920	78.0	0.149	42.5	0.581	-57.9	7.8
2600	0.253	-129.9	1.820	74.3	0.155	41.8	0.572	-62.3	7.2
2800	0.228	-137.4	1.789	69.7	0.163	40.8	0.578	-65.6	7.0
3000	0.202	-146.9	1.698	65.8	0.167	40.7	0.573	-67.5	6.5
3250	0.183	-163.1	1.609	61.8	0.173	40.6	0.555	-69.9	5.9
3500	0.186	-176.7	1.514	57.8	0.178	39.7	0.532	-74.3	5.2
3750	0.183	174.3	1.479	53.5	0.184	38.6	0.527	-79.8	5.0
4000	0.177	162.9	1.374	49.9	0.192	38.3	0.534	-83.5	4.4
4250	0.184	148.4	1.338	47.3	0.197	37.3	0.539	-86.7	4.2
4500	0.208	140.9	1.263	42.6	0.202	36.7	0.526	-90.0	3.6
4750	0.213	137.2	1.226	39.7	0.206	35.7	0.521	-95.3	3.3
5000	0.206	129.2	1.188	36.9	0.212	34.0	0.532	-100.8	3.1
5250	0.219	118.0	1.155	33.9	0.214	33.5	0.547	-105.1	3.0
5500	0.250	112.5	1.067	31.2	0.222	32.9	0.547	-108.4	2.4
5750	0.261	110.6	1.056	28.3	0.222	33.0	0.545	-112.6	2.3
6000	0.254	105.9	1.016	24.2	0.229	31.4	0.555	-118.0	2.0

NPN 12 GHz wideband transistor

BFG33; BFG33/X

Table 2 Common emitter scattering parameters, $V_{CE} = 2.5$ V, $I_C = 5$ mA

f (MHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		G _{UM} (dB)
	MAG. (RAT)	ANG. (DEG)	MAG. (RAT)	ANG. (DEG)	MAG. (RAT)	ANG. (DEG)	MAG. (RAT)	ANG. (DEG)	
40	0.893	-3.6	7.425	174.8	0.005	86.4	0.983	-3.4	39.2
100	0.888	-8.8	7.078	167.7	0.013	81.6	0.972	-8.6	36.3
200	0.850	-17.2	6.935	156.8	0.025	74.6	0.927	-16.6	30.9
300	0.802	-25.4	6.711	147.7	0.036	69.2	0.870	-22.9	27.2
400	0.748	-33.8	6.544	140.1	0.045	64.8	0.818	-28.1	24.7
500	0.698	-41.2	6.205	133.7	0.052	61.3	0.768	-32.8	22.6
600	0.638	-49.3	6.078	127.8	0.058	59.2	0.719	-36.2	21.1
700	0.579	-56.8	5.897	122.1	0.064	57.7	0.681	-38.7	19.9
800	0.517	-64.3	5.712	116.6	0.068	56.7	0.647	-40.6	18.8
900	0.466	-70.1	5.375	111.8	0.073	55.8	0.621	-42.0	17.8
1000	0.422	-76.8	5.097	107.9	0.077	55.1	0.597	-43.7	16.9
1200	0.340	-90.0	4.614	100.5	0.085	54.2	0.555	-46.5	15.4
1400	0.280	-104.0	4.256	93.9	0.093	53.9	0.526	-48.9	14.3
1600	0.249	-113.5	3.830	88.7	0.101	53.8	0.510	-51.2	13.2
1800	0.215	-122.3	3.488	85.0	0.108	54.0	0.496	-53.0	12.3
2000	0.178	-132.9	3.178	80.8	0.115	53.7	0.480	-54.2	11.3
2200	0.155	-149.7	2.940	77.2	0.122	53.0	0.459	-56.3	10.5
2400	0.157	-165.2	2.726	72.9	0.129	52.3	0.439	-59.8	9.8
2600	0.164	-175.2	2.532	70.0	0.137	51.9	0.433	-64.3	9.1
2800	0.159	177.4	2.416	66.7	0.144	51.0	0.439	-67.7	8.7
3000	0.155	166.7	2.261	63.5	0.151	50.7	0.441	-69.6	8.1
3250	0.167	152.1	2.113	60.2	0.159	50.4	0.428	-71.7	7.5
3500	0.187	144.5	1.973	56.8	0.166	49.4	0.409	-76.2	6.9
3750	0.192	138.9	1.895	53.2	0.174	48.4	0.405	-82.3	6.5
4000	0.196	129.6	1.762	50.0	0.183	47.7	0.415	-86.6	5.9
4250	0.219	120.4	1.700	47.7	0.189	46.6	0.420	-89.4	5.7
4500	0.244	117.6	1.602	43.7	0.196	45.8	0.409	-92.9	5.2
4750	0.247	115.6	1.544	41.2	0.202	45.0	0.403	-98.6	4.8
5000	0.242	108.7	1.486	38.5	0.209	43.2	0.414	-104.5	4.5
5250	0.262	100.3	1.440	35.6	0.213	42.6	0.430	-108.7	4.4
5500	0.293	97.4	1.340	33.3	0.222	41.1	0.434	-111.9	3.8
5750	0.301	96.7	1.310	30.6	0.224	41.4	0.434	-116.3	3.7
6000	0.292	92.7	1.255	26.9	0.232	39.4	0.446	-121.8	3.3

NPN 12 GHz wideband transistor

BFG33; BFG33/X

Table 4 Noise data

f (MHz)	F _{min} (dB)	Γ _{opt}		R _n
		(RAT)	(DEG)	
500	2.3	0.644	5.3	1.170
1000	2.5	0.560	13.3	1.350
2000	3.0	0.519	39.1	0.994

Table 5 Common emitter scattering parameters, V_{CE} = 5 V, I_C = 10 mA

f (MHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		G _{UM} (dB)
	MAG. (RAT)	ANG. (DEG)	MAG. (RAT)	ANG. (DEG)	MAG. (RAT)	ANG. (DEG)	MAG. (RAT)	ANG. (DEG)	
40	0.828	-4.8	13.346	173.1	0.005	83.9	0.964	-4.6	39.0
100	0.813	-11.9	12.673	164.5	0.012	79.3	0.941	-11.5	36.1
200	0.752	-23.5	12.218	151.5	0.022	72.0	0.867	-21.3	31.4
300	0.677	-34.7	11.599	141.1	0.031	67.2	0.784	-28.4	28.1
400	0.596	-45.6	10.955	132.1	0.037	63.8	0.714	-33.6	25.8
500	0.524	-55.2	10.150	124.8	0.043	61.8	0.654	-37.7	23.9
600	0.449	-65.1	9.558	118.1	0.048	61.1	0.605	-40.4	22.6
700	0.387	-73.0	8.832	112.4	0.053	60.5	0.568	-42.2	21.3
800	0.338	-79.6	8.108	107.6	0.057	60.4	0.539	-43.5	20.2
900	0.297	-85.3	7.408	103.7	0.062	60.3	0.516	-44.5	19.1
1000	0.264	-91.3	6.812	100.3	0.066	60.3	0.496	-45.5	18.2
1200	0.211	-104.4	5.875	94.6	0.074	60.2	0.463	-47.5	16.6
1400	0.184	-118.2	5.207	89.7	0.083	60.0	0.441	-49.7	15.4
1600	0.168	-127.5	4.620	85.5	0.092	59.9	0.430	-52.0	14.3
1800	0.146	-135.9	4.151	82.4	0.100	59.9	0.422	-53.4	13.3
2000	0.121	-149.0	3.756	78.9	0.108	59.4	0.410	-54.5	12.4
2200	0.115	-169.8	3.454	75.8	0.116	58.7	0.391	-56.4	11.5
2400	0.130	175.8	3.192	72.2	0.123	57.8	0.373	-60.1	10.8
2600	0.143	168.9	2.955	69.7	0.131	57.1	0.368	-64.9	10.1
2800	0.143	162.9	2.801	66.9	0.139	56.1	0.374	-68.7	9.7
3000	0.144	153.0	2.617	64.0	0.146	55.5	0.378	-70.6	9.1
3250	0.162	140.6	2.439	61.0	0.155	54.8	0.367	-72.5	8.5
3500	0.185	135.3	2.277	58.0	0.163	53.7	0.348	-77.1	7.9
3750	0.191	131.0	2.176	54.6	0.170	52.6	0.345	-83.8	7.5
4000	0.197	122.2	2.028	51.6	0.179	51.7	0.356	-88.5	6.9
4250	0.222	114.3	1.951	49.4	0.186	50.5	0.361	-91.1	6.6
4500	0.248	112.5	1.839	45.8	0.193	49.7	0.350	-94.6	6.1
4750	0.250	111.0	1.767	43.3	0.200	48.9	0.344	-100.8	5.8
5000	0.246	104.2	1.700	40.8	0.206	47.1	0.355	-107.1	5.5

NPN 12 GHz wideband transistor

BFG33; BFG33/X

Table 3 Common emitter scattering parameters, $V_{CE} = 5\text{ V}$, $I_C = 5\text{ mA}$

f (MHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		G _{UM} (dB)
	MAG. (RAT)	ANG. (DEG)	MAG. (RAT)	ANG. (DEG)	MAG. (RAT)	ANG. (DEG)	MAG. (RAT)	ANG. (DEG)	
40	0.908	-3.3	7.375	174.9	0.005	84.9	0.982	-3.3	39.3
100	0.901	-8.2	7.042	168.1	0.013	82.0	0.970	-8.2	36.5
200	0.867	-16.1	6.911	157.5	0.025	75.3	0.929	-15.8	31.5
300	0.822	-23.8	6.706	148.6	0.035	70.2	0.876	-22.0	27.7
400	0.770	-31.6	6.547	141.1	0.044	66.1	0.827	-27.1	25.2
500	0.721	-38.5	6.219	134.8	0.052	62.6	0.780	-31.7	23.1
600	0.663	-45.8	6.093	128.9	0.058	60.6	0.732	-35.2	21.5
700	0.605	-52.6	5.906	123.3	0.063	59.1	0.694	-37.7	20.3
800	0.544	-59.2	5.735	117.8	0.068	58.0	0.661	-39.6	19.2
900	0.493	-64.3	5.405	113.0	0.073	57.1	0.636	-41.1	18.1
1000	0.448	-70.1	5.129	109.3	0.077	56.3	0.611	-42.8	17.2
1200	0.363	-81.3	4.658	101.9	0.085	55.3	0.570	-45.8	15.7
1400	0.298	-93.1	4.314	95.3	0.094	54.8	0.540	-48.1	14.6
1600	0.262	-101.2	3.894	90.1	0.102	54.5	0.523	-50.5	13.5
1800	0.225	-108.2	3.551	86.5	0.109	54.6	0.509	-52.3	12.5
2000	0.183	-115.7	3.239	82.4	0.117	54.1	0.492	-53.7	11.6
2200	0.149	-129.9	3.000	78.7	0.124	53.3	0.470	-55.7	10.7
2400	0.141	-146.4	2.787	74.3	0.131	52.4	0.450	-59.2	10.0
2600	0.143	-158.0	2.592	71.5	0.139	51.9	0.443	-63.7	9.3
2800	0.135	-165.6	2.478	68.2	0.147	50.9	0.449	-67.1	8.9
3000	0.126	-177.1	2.320	65.1	0.153	50.5	0.450	-69.0	8.4
3250	0.131	164.3	2.170	61.8	0.161	50.0	0.436	-71.0	7.7
3500	0.151	154.2	2.028	58.4	0.168	48.9	0.416	-75.5	7.1
3750	0.156	147.9	1.953	54.8	0.176	47.7	0.412	-81.4	6.7
4000	0.158	136.8	1.818	51.6	0.185	47.0	0.420	-85.7	6.1
4250	0.178	125.7	1.753	49.3	0.191	45.9	0.425	-88.5	5.9
4500	0.205	122.2	1.654	45.3	0.198	45.0	0.414	-91.8	5.4
4750	0.209	120.5	1.596	42.7	0.204	44.1	0.407	-97.4	5.0
5000	0.205	113.1	1.539	40.1	0.210	42.3	0.417	-103.4	4.8
5250	0.224	103.6	1.490	37.2	0.214	41.6	0.433	-107.6	4.6
5500	0.256	100.3	1.387	34.8	0.223	40.3	0.436	-110.7	4.0
5750	0.266	100.0	1.359	32.1	0.224	40.3	0.435	-115.0	3.9
6000	0.258	96.0	1.304	28.5	0.232	38.4	0.446	-120.6	3.6

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f (MHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		G _{UM} (dB)
	MAG. (RAT)	ANG. (DEG)	MAG. (RAT)	ANG. (DEG)	MAG. (RAT)	ANG. (DEG)	MAG. (RAT)	ANG. (DEG)	
5250	0.267	96.2	1.644	38.0	0.211	46.5	0.371	-111.2	5.3
5500	0.299	93.8	1.537	35.8	0.221	44.8	0.376	-114.3	4.8
5750	0.306	93.5	1.498	33.3	0.223	45.0	0.376	-118.7	4.6
6000	0.296	89.6	1.434	29.8	0.232	42.9	0.389	-124.4	4.2

Table 6 Noise data

f (MHz)	F _{min} (dB)	Γ _{opt}		R _n
		(RAT)	(DEG)	
500	3.1	0.528	5.3	1.18
1000	3.1	0.477	12.7	1.33
2000	3.6	0.418	39.1	0.98

Table 7 Common emitter scattering parameters, V_{CE} = 5 V, I_C = 15 mA

f (MHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		G _{UM} (dB)
	MAG. (RAT)	ANG. (DEG)	MAG. (RAT)	ANG. (DEG)	MAG. (RAT)	ANG. (DEG)	MAG. (RAT)	ANG. (DEG)	
40	0.760	-6.2	18.053	171.9	0.005	81.2	0.948	-5.3	38.9
100	0.740	-15.2	17.102	162.0	0.011	77.5	0.916	-13.4	36.0
200	0.657	-30.0	16.185	147.4	0.021	70.4	0.821	-24.2	31.5
300	0.563	-44.3	14.989	135.7	0.028	66.2	0.724	-31.4	28.4
400	0.472	-57.3	13.618	126.0	0.034	63.7	0.647	-36.3	26.1
500	0.400	-68.0	12.164	118.5	0.039	62.6	0.587	-39.7	24.3
600	0.340	-77.8	10.943	112.4	0.044	62.4	0.541	-41.8	22.8
700	0.294	-85.4	9.810	107.5	0.048	62.4	0.509	-43.3	21.5
800	0.258	-91.9	8.829	103.4	0.053	62.6	0.483	-44.3	20.4
900	0.228	-98.1	7.983	100.0	0.057	62.8	0.464	-44.9	19.3
1000	0.203	-104.8	7.279	97.1	0.062	62.9	0.447	-45.7	18.4
1200	0.170	-120.1	6.203	92.0	0.070	63.0	0.419	-47.4	16.8
1400	0.157	-134.6	5.444	87.6	0.079	62.7	0.401	-49.7	15.6
1600	0.149	-144.1	4.812	83.8	0.088	62.5	0.394	-51.9	14.5
1800	0.133	-153.6	4.313	80.8	0.097	62.3	0.389	-53.4	13.5
2000	0.119	-168.7	3.900	77.6	0.105	61.8	0.378	-54.4	12.6
2200	0.125	172.8	3.580	74.7	0.112	61.0	0.360	-56.3	11.8
2400	0.146	162.2	3.305	71.3	0.120	60.1	0.344	-60.2	11.0
2600	0.161	157.6	3.056	68.9	0.128	59.3	0.339	-65.2	10.3
2800	0.163	152.5	2.894	66.2	0.136	58.2	0.346	-69.2	9.9
3000	0.166	144.3	2.703	63.5	0.143	57.7	0.350	-71.1	9.3
3250	0.187	134.2	2.517	60.5	0.152	56.9	0.340	-72.9	8.7

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f (MHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		G _{UM} (dB)
	MAG. (RAT)	ANG. (DEG)	MAG. (RAT)	ANG. (DEG)	MAG. (RAT)	ANG. (DEG)	MAG. (RAT)	ANG. (DEG)	
3500	0.210	130.0	2.348	57.6	0.160	55.8	0.322	-77.7	8.1
3750	0.215	126.2	2.239	54.3	0.168	54.8	0.320	-84.7	7.7
4000	0.222	118.1	2.086	51.4	0.176	53.8	0.332	-89.6	7.1
4250	0.248	111.1	2.006	49.1	0.184	52.6	0.337	-92.2	6.8
4500	0.273	109.5	1.889	45.7	0.191	51.8	0.327	-95.8	6.4
4750	0.274	107.9	1.813	43.3	0.198	51.0	0.321	-102.3	6.0
5000	0.270	101.3	1.742	40.7	0.204	49.2	0.333	-108.7	5.7
5250	0.292	93.7	1.684	37.9	0.210	48.7	0.350	-112.8	5.5
5500	0.323	91.4	1.576	35.9	0.220	46.8	0.356	-115.9	5.0
5750	0.329	91.2	1.533	33.4	0.222	47.2	0.356	-120.4	4.8
6000	0.318	87.2	1.466	30.0	0.231	45.0	0.369	-126.1	4.4

Table 8 Noise data

f (MHz)	F _{min} (dB)	Γ _{opt}		R _n
		(RAT)	(DEG)	
500	3.6	0.463	5.5	1.180
1000	3.6	0.420	13.2	1.34
2000	4.0	0.350	39.2	0.984