SIEMENS

NPN Silicon RF Transistor — BFR 182

Preliminary Data

- For low-noise, high-gain broadband amplifiers at collector currents from 1 mA to 20 mA.
- f_T = 8 GHz
  F = 1.2 dB at 900 MHz

5:1

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

Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1]
BFR 182	RGs	Q62702-F1315	B	E	C	SOT-23

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CE0}	12	V
Collector-emitter voltage, V_{BE} = 0	V_{CES}	20	
Collector-base voltage	V_{CB0}	20	
Emitter-base voltage	V_{EB0}	2	
Collector current	I_C	35	mA
Peak collector current, $f \geq$ 10 MHz	I_{CM}	50	
Base current	I_B	4	
Peak base current, $f \geq$ 10 MHz	I_{BM}	5	
Total power dissipation, $T_S \leq$ 88 °C[3]	P_{tot}	250	mW
Junction temperature	T_j	150	°C
Ambient temperature range	T_A	– 65 … + 150	
Storage temperature range	T_{stg}	– 65 … + 150	

Thermal Resistance

Junction - ambient[2]	$R_{th\ JA}$	≤ 330	K/W
Junction - soldering point[3]	$R_{th\ JS}$	≤ 250	

1) For detailed information see chapter Package Outlines.
2) Package mounted on alumina 15 mm × 16.7 mm × 0.7 mm.
3) T_S is measured on the collector lead at the soldering point to the pcb.

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

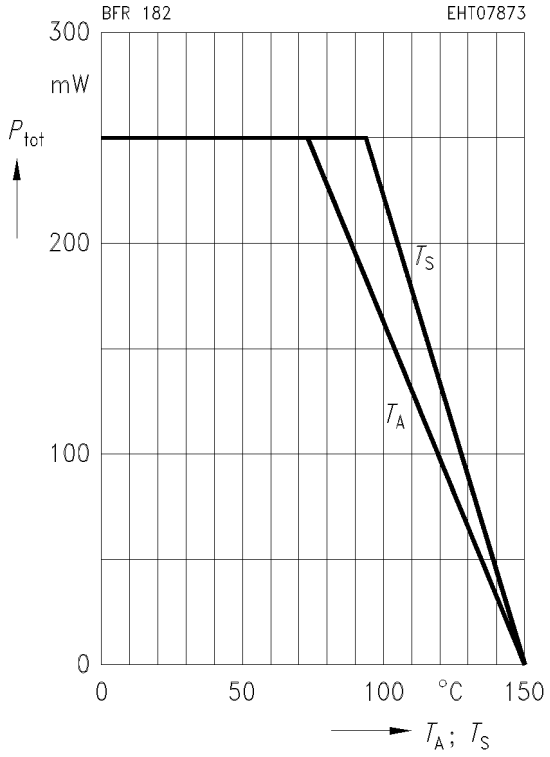
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC Characteristics					
Collector-emitter breakdown voltage I_C = 1 mA, I_B = 0	$V_{(BR)CE0}$	12	–	–	V
Collector-emitter cutoff current V_{CE} = 20 V, V_{BE} = 0	I_{CES}	–	–	100	µA
Collector-base cutoff current V_{CB} = 10 V, I_E = 0	I_{CB0}	–	–	100	nA
Emitter-base cutoff current V_{EB} = 1 V, I_C = 0	I_{EB0}	–	–	1	µA
DC current gain I_C = 5 mA, V_{CE} = 6 V I_C = 20 mA, V_{CE} = 8 V	h_{FE}	 50 –	 90 100	 250 –	–
Collector-emitter saturation voltage I_C = 15 mA, I_B = 1.5 mA	V_{CEsat}	–	0.1	0.4	V

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

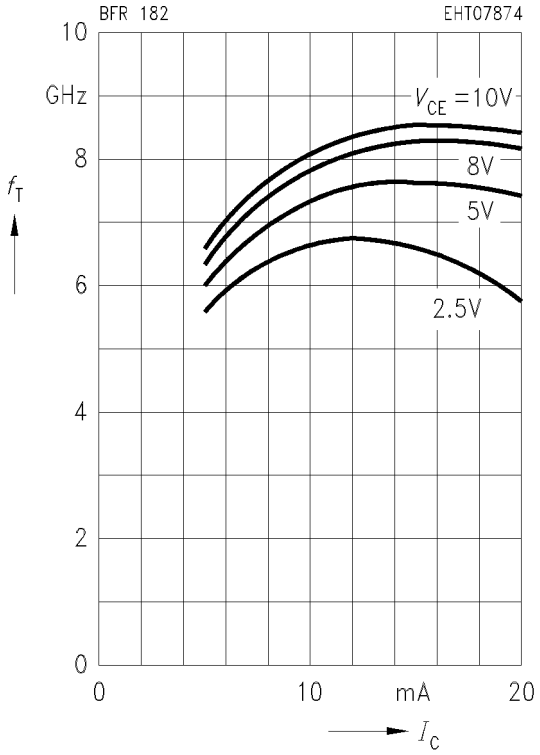
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC Characteristics					
Transition frequency	f_T				GHz
I_C = 15 mA, V_{CE} = 6 V, f = 500 MHz		–	8	–	
I_C = 20 mA, V_{CE} = 8 V, f = 500 MHz		–	8.2	–	
Collector-base capacitance V_{CB} = 10 V, V_{BE} = v_{be} = 0, f = 1 MHz	C_{cb}	–	0.32	–	pF
Collector-emitter capacitance V_{CE} = 10 V, V_{BE} = v_{be} = 0, f = 1 MHz	C_{ce}	–	0.18	–	
Input capacitance V_{EB} = 0.5 V, I_C = i_c = 0, f = 1 MHz	C_{ibo}	–	0.75	–	
Output capacitance V_{CE} = 10 V, V_{BE} = v_{be} = 0, f = 1 MHz	C_{obs}	–	0.5	–	
Noise figure	F				dB
I_C = 6 mA, V_{CE} = 5 V, f = 10 MHz, Z_S = 75 Ω		–	1.1	–	
I_C = 6 mA, V_{CE} = 5 V, f = 900 MHz		–	1.3	–	
I_C = 6 mA, V_{CE} = 5 V, f = 1.75 GHz		–	1.75	–	
Power gain	G_{ms}[1)]				
I_C = 15 mA, V_{CE} = 6 V, f = 900 MHz, Z_0 = 50 Ω		–	18	–	
I_C = 15 mA, V_{CE} = 6 V, f = 1.75 GHz, Z_0 = 50 Ω		–	12	–	
Transducer gain I_C = 15 mA, V_{CE} = 6 V, f = 900 MHz, Z_0 = 50 Ω	$\lvert S_{21e} \rvert^2$	–	14.5	–	

1) $G_{ms} = \left| \frac{S_{21e}}{S_{12e}} \right|$

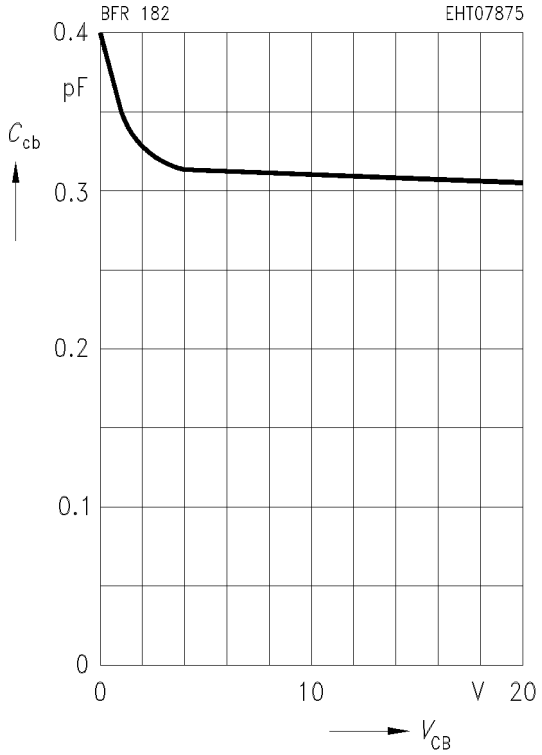
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
*Package mounted on alumina



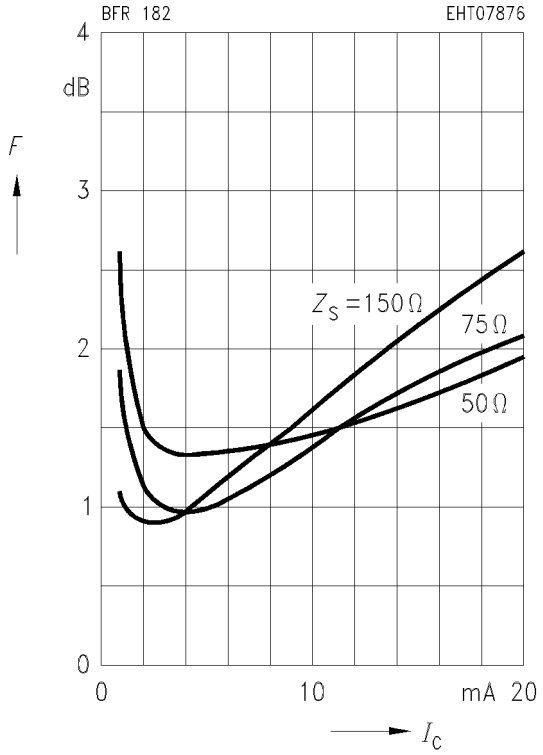
Transition frequency $f_T = f(I_C)$
f= 500 MHz



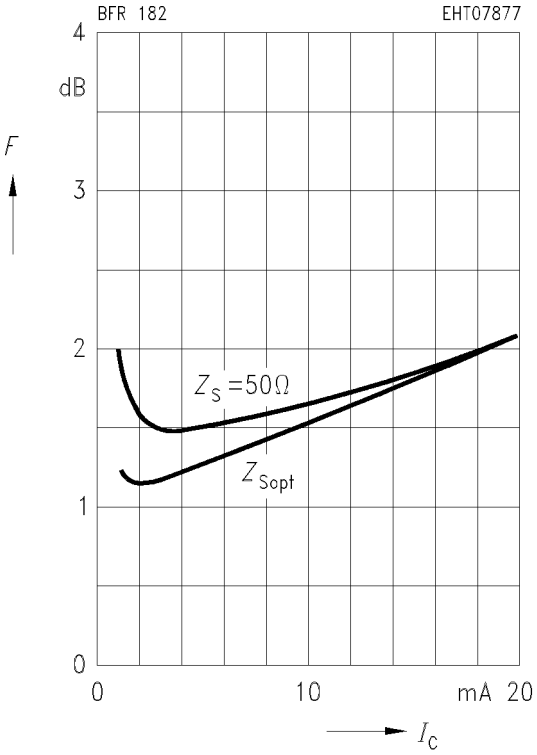
Collector-base capacitance $C_{cb} = f(V_{CB})$
V_{BE} = v_{be} = 0, f = 1 MHz



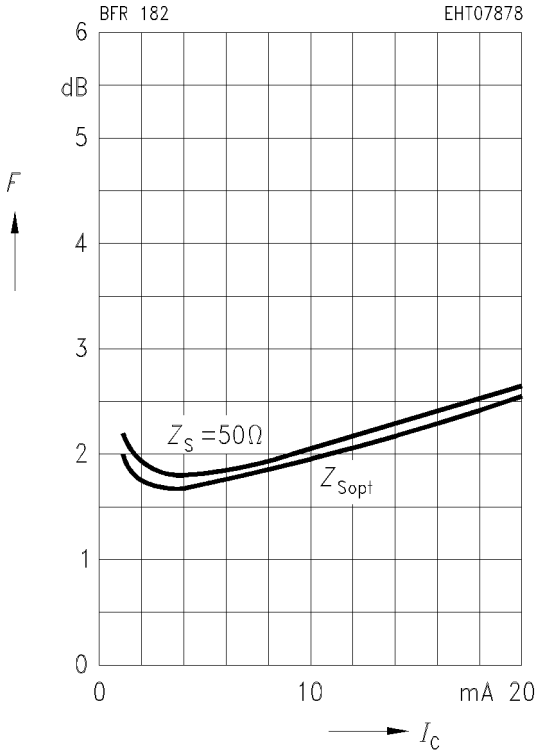
Noise figure $F = f(I_C)$
V_{CE} = 5 V, f = 10 MHz



Noise figure $F = f(I_C)$
V_{CE} = 5 V, f = 900 MHz



Noise figure $F = f(I_C)$
V_{CE} = 5 V, f = 1.75 GHz, Z_{Lopt} (G)



Common Emitter S Parameters

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	**MAG**	**ANG**	**MAG**	**ANG**	**MAG**	**ANG**	**MAG**	**ANG**
I_C = 5 mA, V_{CE} = 2.5 V, Z_0 = 50 Ω								
0.10	0.803	– 21.7	12.80	160.8	0.019	78.7	0.956	– 9.9
0.20	0.708	– 40.5	11.43	143.9	0.034	70.7	0.879	– 17.5
0.30	0.604	– 56.3	9.90	131.1	0.045	65.0	0.795	– 22.2
0.40	0.510	– 69.3	8.49	120.8	0.054	62.0	0.727	– 24.8
0.50	0.434	– 80.1	7.34	112.7	0.062	60.8	0.677	– 26.2
0.60	0.375	– 89.9	6.44	106.3	0.068	60.1	0.638	– 27.0
0.70	0.332	– 97.9	5.71	101.2	0.075	60.8	0.610	– 27.6
0.80	0.295	– 106.5	5.12	96.3	0.081	60.8	0.589	– 28.0
0.90	0.264	– 115.7	4.66	92.2	0.088	61.7	0.572	– 28.4
0.95	0.251	– 120.8	4.44	90.1	0.091	61.5	0.564	– 28.6
1.00	0.238	– 124.4	4.25	88.4	0.094	61.9	0.558	– 28.8
1.20	0.208	– 142.2	3.63	81.8	0.108	62.6	0.535	– 29.7
1.40	0.181	– 159.3	3.16	75.8	0.121	63.3	0.519	– 30.6
1.60	0.168	– 175.2	2.80	70.7	0.135	63.8	0.514	– 31.6
1.70	0.168	178.2	2.66	68.4	0.142	64.2	0.512	– 32.5
1.75	0.170	173.5	2.60	67.1	0.146	64.1	0.512	– 33.0
1.80	0.170	170.5	2.54	65.8	0.150	64.2	0.511	– 33.6
2.00	0.186	158.6	2.32	61.3	0.166	64.3	0.505	– 36.2
2.50	0.235	134.4	1.93	50.9	0.206	62.9	0.470	– 41.7
3.00	0.263	117.8	1.67	41.7	0.247	61.5	0.474	– 48.2
I_C = 10 mA, V_{CE} = 2.5 V, Z_0 = 50 Ω								
0.10	0.668	– 30.6	19.05	153.1	0.017	76.1	0.912	– 13.8
0.20	0.533	– 54.1	15.41	133.0	0.030	68.5	0.786	– 21.6
0.30	0.422	– 71.8	12.30	120.0	0.039	65.8	0.687	– 24.6
0.40	0.340	– 85.5	10.01	110.6	0.047	65.5	0.623	– 25.4
0.50	0.275	– 97.2	8.38	103.7	0.054	66.1	0.582	– 25.5
0.60	0.240	– 107.6	7.17	98.4	0.062	66.6	0.554	– 25.4
0.70	0.211	– 116.4	6.27	94.2	0.069	67.6	0.536	– 25.4
0.80	0.187	– 126.5	5.57	90.1	0.077	68.1	0.523	– 25.6
0.90	0.174	– 136.6	5.02	86.6	0.085	68.6	0.513	– 25.9
0.95	0.167	– 142.7	4.77	84.9	0.089	68.6	0.508	– 26.1
1.00	0.160	– 147.2	4.55	83.4	0.093	68.6	0.504	– 26.3
1.20	0.149	– 166.0	3.85	77.9	0.108	68.9	0.488	– 27.2
1.40	0.144	175.0	3.35	72.5	0.125	68.6	0.477	– 28.2
1.60	0.143	159.7	2.95	67.9	0.141	68.2	0.476	– 29.5
1.70	0.146	155.3	2.80	65.8	0.148	68.2	0.476	– 30.5
1.75	0.154	151.7	2.73	64.6	0.153	68.0	0.476	– 31.1
1.80	0.153	149.5	2.66	63.6	0.157	67.9	0.475	– 31.8
2.00	0.174	141.9	2.44	59.4	0.175	67.2	0.469	– 34.7
2.50	0.227	124.5	2.03	49.8	0.218	64.2	0.435	– 40.3
3.00	0.259	110.8	1.75	41.2	0.261	61.7	0.439	– 47.2

Common Emitter S Parameters (continued)

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	**MAG**	**ANG**	**MAG**	**ANG**	**MAG**	**ANG**	**MAG**	**ANG**
I_C = 15 mA, V_{CE} = 2.5 V, Z_0 = 50 Ω								
0.10	0.573	– 38.1	22.08	148.0	0.016	74.8	0.873	– 16.0
0.20	0.430	– 65.2	16.70	126.8	0.027	68.3	0.727	– 22.9
0.30	0.332	– 84.5	12.79	114.4	0.036	67.1	0.632	– 24.4
0.40	0.265	– 99.8	10.19	105.8	0.044	67.9	0.576	– 24.3
0.50	0.222	– 113.8	8.42	99.5	0.052	68.9	0.544	– 23.8
0.60	0.197	– 125.3	7.16	94.8	0.060	69.4	0.523	– 23.6
0.70	0.178	– 135.2	6.22	90.9	0.068	70.6	0.510	– 23.6
0.80	0.166	– 145.7	5.50	87.1	0.076	71.0	0.501	– 23.8
0.90	0.160	– 157.2	4.94	83.9	0.084	71.3	0.493	– 24.2
0.95	0.160	– 162.3	4.70	82.3	0.088	71.1	0.489	– 24.4
1.00	0.157	– 166.1	4.48	80.9	0.092	71.3	0.486	– 24.7
1.20	0.159	177.3	3.79	75.6	0.109	71.0	0.474	– 25.8
1.40	0.160	161.0	3.29	70.5	0.126	70.6	0.465	– 27.0
1.60	0.165	149.3	2.89	66.1	0.143	69.8	0.465	– 28.6
1.70	0.168	145.1	2.74	64.1	0.151	69.6	0.465	– 29.7
1.75	0.177	142.4	2.68	62.9	0.155	69.4	0.465	– 30.3
1.80	0.177	140.9	2.61	61.8	0.160	69.2	0.465	– 31.1
2.00	0.198	134.8	2.39	57.8	0.178	68.4	0.459	– 34.1
2.50	0.250	121.3	1.98	48.3	0.222	65.0	0.425	– 40.1
3.00	0.281	109.1	1.71	39.7	0.266	62.0	0.430	– 47.3
I_C = 20 mA, V_{CE} = 2.5 V, Z_0 = 50 Ω								
0.10	0.500	– 46.9	23.00	143.8	0.016	72.0	0.832	– 17.4
0.20	0.368	– 78.9	16.49	122.3	0.026	67.7	0.679	– 23.1
0.30	0.290	– 101.1	12.28	110.4	0.035	67.6	0.592	– 23.5
0.40	0.245	– 119.0	9.66	102.4	0.043	68.8	0.546	– 22.8
0.50	0.215	– 134.1	7.93	96.5	0.051	70.2	0.521	– 22.2
0.60	0.203	– 145.4	6.71	92.0	0.059	70.9	0.504	– 22.0
0.70	0.195	– 154.8	5.81	88.3	0.067	71.9	0.495	– 22.2
0.80	0.190	– 164.3	5.13	84.7	0.075	72.1	0.488	– 22.5
0.90	0.194	– 173.3	4.61	81.6	0.084	72.7	0.482	– 23.0
0.95	0.196	– 177.5	4.37	80.0	0.088	72.5	0.479	– 23.3
1.00	0.192	178.9	4.17	78.7	0.092	72.6	0.476	– 23.7
1.20	0.201	166.8	3.52	73.5	0.109	72.2	0.467	– 25.1
1.40	0.211	153.7	3.06	68.4	0.127	71.6	0.459	– 26.5
1.60	0.215	144.3	2.69	63.9	0.144	70.8	0.459	– 28.3
1.70	0.217	140.6	2.55	62.0	0.152	70.6	0.459	– 29.5
1.75	0.225	138.7	2.49	60.8	0.157	70.3	0.460	– 30.3
1.80	0.224	137.0	2.42	59.7	0.162	70.1	0.459	– 31.0
2.00	0.247	131.7	2.22	55.6	0.180	69.1	0.454	– 34.2
2.50	0.296	119.4	1.84	46.1	0.226	65.6	0.421	– 40.8
3.00	0.327	107.9	1.59	37.5	0.271	62.5	0.424	– 48.5

Common Emitter S Parameters (continued)

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	**MAG**	**ANG**	**MAG**	**ANG**	**MAG**	**ANG**	**MAG**	**ANG**
I_C = 5 mA, V_{CE} = 5 V, Z_0 = 50 Ω								
0.10	0.820	– 20.3	12.73	161.6	0.018	79.6	0.959	– 9.5
0.20	0.728	– 38.1	11.45	145.2	0.033	71.4	0.886	– 16.9
0.30	0.625	– 53.0	10.00	132.5	0.044	65.8	0.807	– 21.6
0.40	0.531	– 65.0	8.62	122.2	0.054	62.9	0.739	– 24.3
0.50	0.450	– 75.7	7.49	114.1	0.061	61.6	0.689	– 25.8
0.60	0.390	– 84.3	6.59	107.7	0.068	60.8	0.649	– 26.7
0.70	0.343	– 91.9	5.85	102.6	0.074	61.3	0.621	– 27.3
0.80	0.302	– 100.2	5.27	97.6	0.081	61.3	0.599	– 27.8
0.90	0.269	– 108.8	4.79	93.5	0.087	61.9	0.582	– 28.2
0.95	0.254	– 112.9	4.57	91.4	0.090	61.9	0.574	– 28.4
1.00	0.239	– 116.0	4.37	89.6	0.094	62.1	0.567	– 28.6
1.20	0.202	– 132.6	3.74	83.1	0.107	62.7	0.543	– 29.4
1.40	0.167	– 150.7	3.26	77.0	0.120	63.3	0.526	– 30.2
1.60	0.148	– 166.1	2.89	71.9	0.133	63.7	0.521	– 31.2
1.70	0.146	– 174.7	2.74	69.7	0.141	64.2	0.519	– 32.0
1.75	0.148	– 179.4	2.68	68.4	0.144	64.2	0.518	– 32.6
1.80	0.147	177.9	2.62	67.1	0.148	64.3	0.518	– 33.1
2.00	0.161	163.0	2.40	62.6	0.164	64.3	0.511	– 35.6
2.50	0.206	136.2	1.99	52.3	0.203	62.8	0.476	– 40.8
3.00	0.238	118.7	1.72	43.2	0.244	61.6	0.480	– 47.0
I_C = 10 mA, V_{CE} = 5 V, Z_0 = 50 Ω								
0.10	0.705	– 27.7	19.05	154.4	0.017	77.0	0.920	– 13.1
0.20	0.571	– 49.3	15.66	134.8	0.029	69.7	0.801	– 21.0
0.30	0.454	– 65.0	12.65	121.8	0.039	66.5	0.703	– 24.2
0.40	0.364	– 77.0	10.36	112.4	0.046	65.9	0.638	– 25.3
0.50	0.296	– 87.3	8.70	105.3	0.054	66.3	0.595	– 25.5
0.60	0.250	– 96.0	7.48	100.0	0.062	66.7	0.565	– 25.5
0.70	0.217	– 103.7	6.54	95.7	0.069	67.5	0.546	– 25.5
0.80	0.188	– 112.0	5.82	91.5	0.077	67.9	0.532	– 25.7
0.90	0.167	– 122.6	5.24	88.1	0.084	68.5	0.520	– 25.9
0.95	0.157	– 127.4	4.99	86.3	0.088	68.5	0.515	– 26.1
1.00	0.146	– 131.0	4.76	84.8	0.092	68.7	0.510	– 26.2
1.20	0.126	– 152.1	4.04	79.3	0.108	68.6	0.495	– 27.0
1.40	0.112	– 174.2	3.51	73.9	0.124	68.5	0.483	– 28.0
1.60	0.108	168.0	3.09	69.4	0.139	68.0	0.481	– 29.2
1.70	0.109	161.2	2.93	67.5	0.147	68.0	0.480	– 30.1
1.75	0.114	157.6	2.86	66.3	0.152	67.6	0.480	– 30.7
1.80	0.113	154.0	2.79	65.1	0.156	67.6	0.480	– 31.3
2.00	0.138	143.5	2.55	61.1	0.173	67.0	0.474	– 34.1
2.50	0.189	125.2	2.12	51.4	0.215	64.0	0.439	– 39.4
3.00	0.219	110.1	1.83	42.9	0.257	61.4	0.443	– 45.9

Common Emitter S Parameters (continued)

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	**MAG**	**ANG**	**MAG**	**ANG**	**MAG**	**ANG**	**MAG**	**ANG**
I_C = 15 mA, V_{CE} = 5 V, Z_0 = 50 Ω								
0.10	0.629	– 33.0	22.43	150.1	0.016	75.7	0.889	– 15.1
0.20	0.481	– 56.4	17.40	129.3	0.027	69.4	0.750	– 22.4
0.30	0.369	– 72.7	13.53	116.7	0.036	67.8	0.652	– 24.5
0.40	0.288	– 84.9	10.86	107.9	0.044	68.0	0.593	– 24.6
0.50	0.230	– 96.4	9.01	101.5	0.052	69.1	0.558	– 24.3
0.60	0.195	– 105.2	7.68	96.7	0.060	69.5	0.534	– 24.0
0.70	0.170	– 113.3	6.68	92.7	0.068	70.5	0.520	– 24.0
0.80	0.144	– 122.6	5.92	89.0	0.076	70.8	0.509	– 24.2
0.90	0.135	– 134.7	5.32	85.8	0.084	71.1	0.500	– 24.4
0.95	0.129	– 140.8	5.06	84.1	0.088	71.0	0.496	– 24.6
1.00	0.120	– 143.8	4.82	82.8	0.092	71.1	0.492	– 24.8
1.20	0.110	– 166.4	4.08	77.6	0.108	70.7	0.479	– 25.8
1.40	0.106	171.5	3.54	72.5	0.125	70.2	0.469	– 26.8
1.60	0.106	155.0	3.12	68.2	0.142	69.4	0.469	– 28.2
1.70	0.111	148.9	2.95	66.3	0.150	69.2	0.468	– 29.2
1.75	0.120	145.9	2.88	65.1	0.154	68.9	0.469	– 29.8
1.80	0.120	141.8	2.81	64.0	0.158	68.8	0.468	– 30.5
2.00	0.140	135.9	2.57	60.2	0.176	68.0	0.462	– 33.4
2.50	0.192	120.6	2.13	50.8	0.220	64.5	0.428	– 38.8
3.00	0.227	107.7	1.84	42.4	0.262	61.6	0.432	– 45.6
I_C = 20 mA, V_{CE} = 5 V, Z_0 = 50 Ω								
0.10	0.576	– 37.1	24.28	146.9	0.016	75.5	0.864	– 16.3
0.20	0.422	– 62.6	18.06	125.7	0.026	69.4	0.715	– 22.8
0.30	0.318	– 79.7	13.73	113.5	0.035	68.8	0.622	– 23.9
0.40	0.248	– 93.3	10.89	105.2	0.043	69.5	0.570	– 23.6
0.50	0.198	– 105.3	8.98	99.2	0.050	70.8	0.539	– 23.0
0.60	0.171	– 116.0	7.62	94.6	0.059	71.1	0.520	– 22.7
0.70	0.149	– 124.9	6.61	90.9	0.067	72.0	0.508	– 22.7
0.80	0.132	– 136.3	5.85	87.3	0.075	72.2	0.499	– 23.0
0.90	0.126	– 148.4	5.25	84.2	0.083	72.6	0.492	– 23.3
0.95	0.123	– 155.2	4.99	82.7	0.088	72.3	0.489	– 23.5
1.00	0.117	– 158.7	4.76	81.3	0.092	72.4	0.485	– 23.8
1.20	0.118	– 178.2	4.02	76.3	0.109	71.8	0.474	– 24.8
1.40	0.121	161.8	3.49	71.4	0.126	71.2	0.465	– 26.1
1.60	0.124	147.2	3.07	67.1	0.142	70.2	0.466	– 27.6
1.70	0.128	143.2	2.91	65.2	0.151	70.0	0.466	– 28.6
1.75	0.133	140.3	2.84	64.1	0.155	69.7	0.466	– 29.3
1.80	0.134	138.0	2.77	63.0	0.159	69.5	0.466	– 30.0
2.00	0.157	132.9	2.53	59.1	0.177	68.6	0.460	– 33.0
2.50	0.211	119.1	2.10	50.0	0.221	65.0	0.425	– 38.6
3.00	0.243	106.7	1.81	41.5	0.264	61.9	0.429	– 45.6

Common Emitter S Parameters (continued)

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	**MAG**	**ANG**	**MAG**	**ANG**	**MAG**	**ANG**	**MAG**	**ANG**
I_C = 5 mA, V_{CE} = 8 V, Z_0 = 50 Ω								
0.10	0.839	– 19.4	12.60	162.1	0.018	79.8	0.960	– 9.2
0.20	0.749	– 36.2	11.39	146.0	0.033	71.7	0.891	– 16.5
0.30	0.647	– 50.6	10.02	133.5	0.044	66.3	0.813	– 21.3
0.40	0.553	– 62.2	8.68	123.3	0.054	63.4	0.747	– 24.1
0.50	0.470	– 71.8	7.56	115.1	0.061	61.7	0.696	– 25.7
0.60	0.406	– 80.4	6.67	108.7	0.068	61.0	0.656	– 26.7
0.70	0.357	– 87.6	5.93	103.5	0.075	61.3	0.627	– 27.3
0.80	0.313	– 95.0	5.35	98.5	0.081	61.3	0.604	– 27.9
0.90	0.278	– 103.1	4.86	94.3	0.087	61.9	0.586	– 28.2
0.95	0.260	– 107.3	4.65	92.3	0.091	61.7	0.578	– 28.5
1.00	0.246	– 109.8	4.44	90.5	0.094	62.0	0.570	– 28.7
1.20	0.202	– 125.5	3.80	84.0	0.107	62.6	0.546	– 29.5
1.40	0.161	– 142.2	3.32	77.9	0.120	63.2	0.528	– 30.2
1.60	0.139	– 158.4	2.94	72.7	0.134	63.5	0.523	– 31.2
1.70	0.135	– 166.6	2.79	70.6	0.141	63.9	0.520	– 31.9
1.75	0.134	– 172.3	2.73	69.2	0.144	63.8	0.520	– 32.5
1.80	0.135	– 175.5	2.67	67.9	0.148	64.0	0.519	– 33.0
2.00	0.146	168.9	2.45	63.4	0.164	63.9	0.512	– 35.4
2.50	0.187	138.3	2.03	53.1	0.202	62.4	0.476	– 40.5
3.00	0.220	119.9	1.76	44.1	0.242	61.3	0.480	– 46.5
I_C = 10 mA, V_{CE} = 8 V, Z_0 = 50 Ω								
0.10	0.741	– 26.1	18.86	155.3	0.017	77.5	0.922	– 12.7
0.20	0.606	– 46.3	15.67	135.9	0.030	70.2	0.808	– 20.6
0.30	0.484	– 61.4	12.76	123.0	0.039	66.6	0.711	– 24.1
0.40	0.389	– 72.5	10.50	113.4	0.047	65.9	0.645	– 25.3
0.50	0.316	– 81.4	8.85	106.3	0.054	66.2	0.601	– 25.6
0.60	0.266	– 89.3	7.61	100.9	0.062	66.2	0.570	– 25.7
0.70	0.229	– 95.7	6.66	96.6	0.070	67.4	0.550	– 25.7
0.80	0.197	– 102.9	5.93	92.4	0.077	67.6	0.535	– 25.9
0.90	0.170	– 111.9	5.35	88.9	0.085	68.1	0.523	– 26.1
0.95	0.158	– 116.5	5.09	87.1	0.089	68.1	0.518	– 26.3
1.00	0.147	– 120.0	4.86	85.7	0.093	68.3	0.512	– 26.4
1.20	0.119	– 139.2	4.13	80.1	0.108	68.2	0.496	– 27.2
1.40	0.097	– 160.4	3.58	74.8	0.124	68.1	0.483	– 28.0
1.60	0.086	177.4	3.16	70.3	0.140	67.5	0.481	– 29.1
1.70	0.088	169.8	2.99	68.3	0.148	67.5	0.481	– 30.0
1.75	0.093	164.3	2.93	67.1	0.151	67.3	0.481	– 30.6
1.80	0.092	160.1	2.85	66.0	0.156	67.2	0.480	– 31.3
2.00	0.111	148.1	2.61	62.0	0.173	66.5	0.473	– 33.9
2.50	0.165	125.0	2.17	52.4	0.215	63.6	0.438	– 39.0
3.00	0.195	110.6	1.87	44.0	0.256	61.1	0.442	– 45.4

Common Emitter S Parameters (continued)

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	**MAG**	**ANG**	**MAG**	**ANG**	**MAG**	**ANG**	**MAG**	**ANG**
I_C = 15 mA, V_{CE} = 8 V, Z_0 = 50 Ω								
0.10	0.679	– 30.6	22.35	151.0	0.016	76.3	0.893	– 14.7
0.20	0.524	– 52.4	17.54	130.5	0.028	69.6	0.758	– 22.1
0.30	0.402	– 67.3	13.75	117.8	0.037	67.6	0.660	– 24.5
0.40	0.317	– 78.0	11.07	109.0	0.045	68.0	0.599	– 24.7
0.50	0.252	– 87.6	9.21	102.5	0.052	68.6	0.563	– 24.5
0.60	0.210	– 95.4	7.86	97.6	0.060	69.0	0.538	– 24.3
0.70	0.180	– 101.4	6.84	93.6	0.068	70.0	0.522	– 24.2
0.80	0.152	– 110.0	6.07	89.8	0.076	70.3	0.511	– 24.4
0.90	0.134	– 120.4	5.46	86.6	0.084	70.7	0.501	– 24.6
0.95	0.124	– 126.5	5.19	84.9	0.088	70.4	0.497	– 24.8
1.00	0.113	– 128.9	4.95	83.6	0.093	70.5	0.493	– 25.0
1.20	0.095	– 150.8	4.19	78.4	0.109	70.2	0.479	– 25.8
1.40	0.083	– 178.2	3.64	73.4	0.125	69.7	0.469	– 26.8
1.60	0.082	161.0	3.20	69.0	0.142	68.9	0.469	– 28.1
1.70	0.083	154.8	3.03	67.2	0.150	68.8	0.468	– 29.1
1.75	0.089	150.4	2.96	66.0	0.154	68.5	0.468	– 29.7
1.80	0.089	146.4	2.89	64.9	0.158	68.2	0.468	– 30.4
2.00	0.110	138.9	2.64	61.1	0.176	67.4	0.462	– 33.2
2.50	0.166	120.4	2.20	51.8	0.219	64.0	0.427	– 38.4
3.00	0.199	107.7	1.89	43.5	0.260	61.1	0.430	– 44.9
I_C = 20 mA, V_{CE} = 8 V, Z_0 = 50 Ω								
0.10	0.634	– 34.2	24.40	147.9	0.016	75.1	0.870	– 15.9
0.20	0.470	– 57.4	18.39	126.9	0.026	69.5	0.724	– 22.6
0.30	0.353	– 72.3	14.08	114.6	0.035	68.4	0.629	– 24.0
0.40	0.272	– 83.7	11.19	106.2	0.043	69.2	0.575	– 23.8
0.50	0.215	– 93.0	9.25	100.1	0.051	70.2	0.544	– 23.3
0.60	0.178	– 101.3	7.86	95.5	0.059	70.6	0.523	– 23.0
0.70	0.151	– 109.2	6.83	91.8	0.067	71.7	0.510	– 23.0
0.80	0.131	– 118.5	6.04	88.2	0.076	71.7	0.501	– 23.2
0.90	0.114	– 129.2	5.43	85.1	0.084	72.0	0.493	– 23.5
0.95	0.109	– 136.6	5.16	83.5	0.088	71.7	0.490	– 23.7
1.00	0.101	– 141.0	4.92	82.2	0.092	71.8	0.486	– 23.9
1.20	0.092	– 163.6	4.16	77.2	0.109	71.4	0.474	– 24.9
1.40	0.085	170.5	3.60	72.3	0.126	70.7	0.465	– 26.0
1.60	0.090	151.8	3.17	68.1	0.143	69.6	0.465	– 27.4
1.70	0.090	146.0	3.01	66.3	0.151	69.5	0.465	– 28.5
1.75	0.098	142.3	2.94	65.1	0.155	69.2	0.465	– 29.1
1.80	0.099	140.6	2.86	64.1	0.159	68.9	0.465	– 29.8
2.00	0.122	133.8	2.62	60.2	0.177	68.0	0.459	– 32.7
2.50	0.176	118.7	2.17	51.1	0.220	64.4	0.424	– 38.1
3.00	0.209	106.3	1.87	42.8	0.262	61.4	0.428	– 44.8