NEC

SILICON TRANSISTOR
2SC5182

NPS EPITAXIAL SILICON TRANSISTOR IN MINI-MOLD PACKAGE FOR LOW-NOISE MICROWAVE AMPLIFICATION

FEATURES

- Low noise
- NF = 1.3 dB TYP. @ V_{CE} = 2 V, I_C = 3 mA, f = 2 GHz
- NF = 1.3 dB TYP. @ V_{CE} = 1 V, I_C = 3 mA, f = 2 GHz
- Mini-Mold package
  EIAJ: SC-59

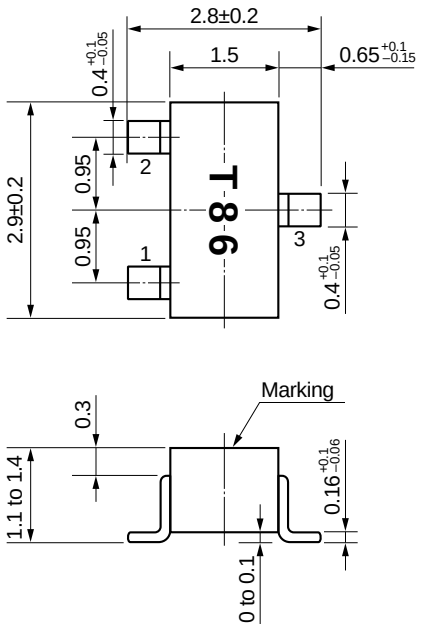
ORDERING INFORMATION

PART NUMBER	QUANTITY	ARRANGEMENT
2SC5182-T1	3 000 units/reel	Embossed tape, 8 mm wide, Pin No. 3 (Collector) facing the perforations
2SC5182-T2		Embossed tape, 8 mm wide, Pins No. 1 (Emitter) and No. 2 (Base) facing the perforations

***** Contact your NEC sales representative to order samples for evaluation (available in batches of 50).

PACKAGE DIMENSIONS

(Units: mm)



PIN CONNECTIONS

1. Emitter
2. Base
3. Collector

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C)

Collector to Base Voltage	V_{CBO}	5	V
Collector to Emitter Voltage	V_{CEO}	3	V
Emitter to Base Voltage	V_{EBO}	2	V
Collector Current	I_C	30	mA
Total Power Dissipation	P_T	90	mW
Junction Temperature	T_j	150	°C
Storage Temperature	T_{stg}	–65 to +150	°C

Caution; This transistor uses high-frequency technology. Be careful not to allow excessive current to flow through the transistor, including static electricity.

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ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS
Collector Cutoff Current	I_{CBO}			100	nA	V_{CB} = 5 V, I_E = 0
Emitter Cutoff Current	I_{EBO}			100	nA	V_{EB} = 1 V, I_C = 0
DC Current Gain	h_{FE}	70		140		V_{CE} = 2 V, I_C = 20 mA*1
Insertion Power Gain (1)	$\|S_{21e}\|^2$	7	8.5		dB	V_{CE} = 2 V, I_C = 20 mA, f = 2 GHz
Insertion Power Gain (2)	$\|S_{21e}\|^2$	6	7.5		dB	V_{CE} = 1 V, I_C = 10 mA, f = 2 GHz
Noise Figure (1)	NF		1.3	2.0	dB	V_{CE} = 2 V, I_C = 3 mA, f = 2 GHz
Noise Figure (2)	NF		1.3	2.0	dB	V_{CE} = 1 V, I_C = 3 mA, f = 2 GHz
Gain Bandwidth Product (1)	f_T	9	12		GHz	V_{CE} = 2 V, I_C = 20 mA, f = 2 GHz
Gain Bandwidth Product (2)	f_T	7	10		GHz	V_{CE} = 1 V, I_C = 10 mA, f = 2 GHz
Feedback Capacitance	C_{re}		0.4	0.8	pF	V_{CB} = 2 V, I_E = 0 mA, f = 1 MHz*2

***1** Measured with pulses: Pulse width ≤ 350 μs, duty cycle ≤ 2 %, pulsed.

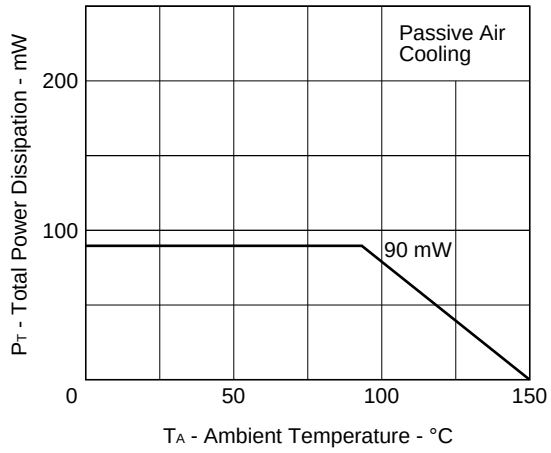
***2** Measured with a three-terminal bridge. The emitter and case terminal are connected to the guard terminal of the bridge.

h_{FE} Class

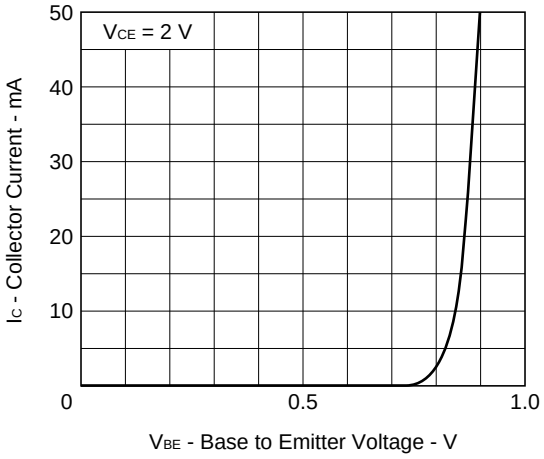
Class	FB
Marking	T86
h_{FE}	70 to 140

CHARACTERISTICS CURVES (T_A = 25 °C)

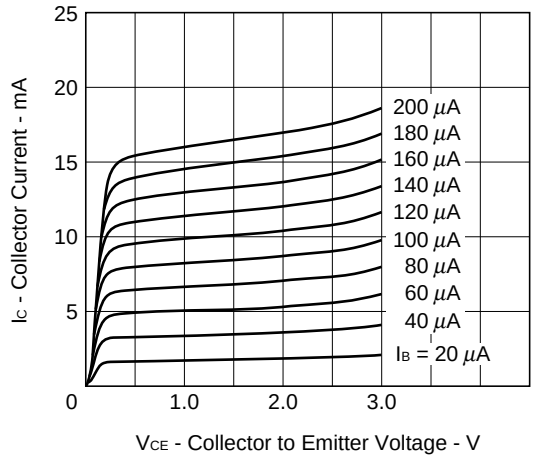
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



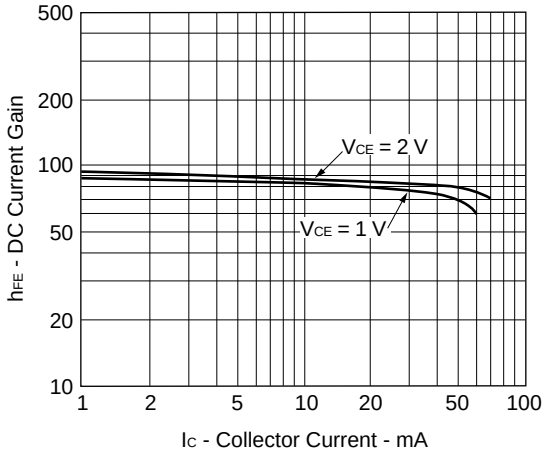
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



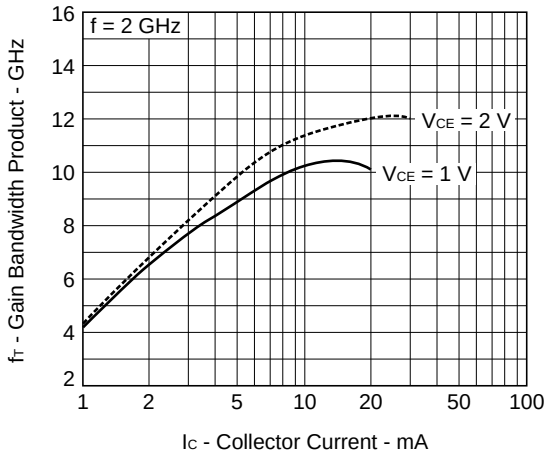
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



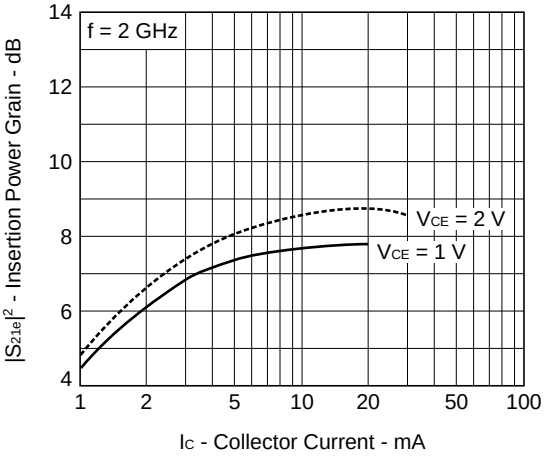
DC CURRENT GAIN vs. COLLECTOR CURRENT



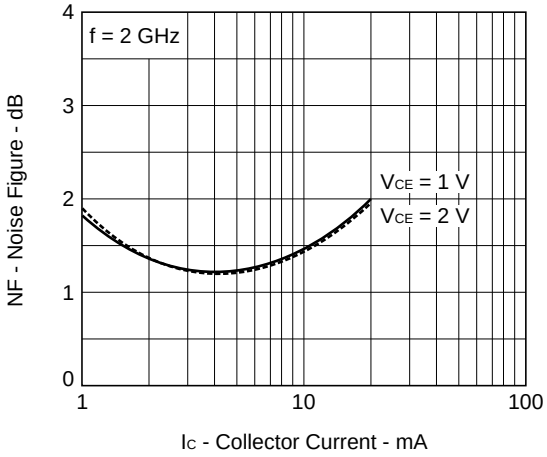
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



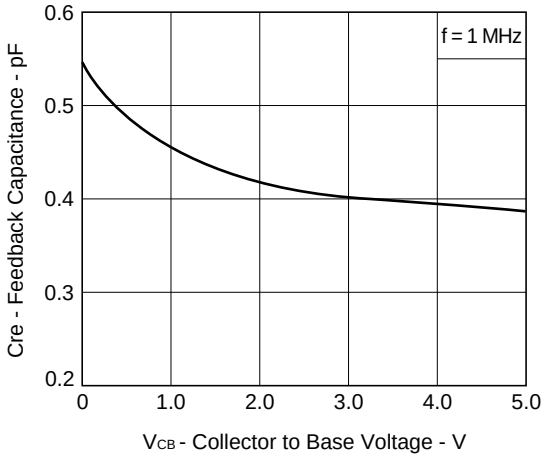
INSERTION POWER GAIN vs. COLLECTOR CURRENT



NOISE FIGURE vs.
COLLECTOR CURRENT



FEEDBACK CAPACITANCE vs.
COLLECTOR TO BASE VOLTAGE



S-PARAMETERS

V_{CE} = 1 V, I_C = 1 mA, Z_O = 50 Ω

FREQUENCY	S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
200.00	0.946	–15.2	2.671	165.4	0.063	78.9	0.987	–9.7
400.00	0.909	–30.0	2.589	151.2	0.107	71.0	0.954	–18.4
600.00	0.853	–44.5	2.488	138.3	0.156	64.3	0.901	–27.4
800.00	0.786	–59.1	2.365	125.1	0.198	53.7	0.848	–35.4
1000.00	0.720	–73.3	2.247	113.0	0.219	47.0	0.781	–42.3
1200.00	0.637	–87.7	2.104	101.9	0.246	41.9	0.726	–48.6
1400.00	0.568	–100.0	1.955	92.3	0.260	33.2	0.650	–53.8
1600.00	0.511	–112.4	1.796	82.5	0.260	32.8	0.607	–58.8
1800.00	0.464	–126.4	1.728	75.6	0.267	30.5	0.555	–63.5
2000.00	0.434	–138.9	1.613	67.8	0.249	27.0	0.526	–67.0
2200.00	0.400	–149.1	1.510	61.3	0.272	27.0	0.516	–69.4
2400.00	0.387	–163.0	1.435	54.4	0.272	27.0	0.485	–75.3
2600.00	0.352	–177.2	1.372	49.1	0.271	28.6	0.446	–78.2
2800.00	0.353	169.2	1.301	43.4	0.275	28.5	0.439	–80.7
3000.00	0.377	154.8	1.296	38.6	0.293	26.8	0.438	–85.1

V_{CE} = 1 V, I_C = 3 mA, Z_O = 50 Ω

FREQUENCY	S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
200.00	0.911	–19.5	5.004	162.9	0.062	80.7	0.966	–13.3
400.00	0.840	–37.4	4.722	146.9	0.107	69.9	0.908	–26.0
600.00	0.765	–55.0	4.355	132.6	0.149	58.6	0.815	–38.0
800.00	0.660	–72.6	3.993	119.0	0.174	46.9	0.727	–47.7
1000.00	0.565	–88.8	3.592	106.9	0.199	45.5	0.639	–56.8
1200.00	0.490	–103.1	3.248	96.3	0.210	39.9	0.564	–62.2
1400.00	0.425	–117.7	2.937	87.5	0.226	39.3	0.494	–67.8
1600.00	0.358	–131.7	2.630	79.0	0.237	36.0	0.425	–70.2
1800.00	0.316	–147.5	2.436	72.4	0.227	35.3	0.389	–77.0
2000.00	0.296	–158.4	2.226	65.8	0.244	38.6	0.352	–80.4
2200.00	0.278	–169.6	2.067	60.2	0.249	37.3	0.331	–84.2
2400.00	0.269	174.9	1.954	53.9	0.283	36.1	0.302	–83.3
2600.00	0.230	158.8	1.837	49.4	0.287	41.0	0.273	–91.3
2800.00	0.262	144.4	1.736	44.2	0.306	35.6	0.264	–92.4
3000.00	0.303	131.3	1.683	40.0	0.320	36.6	0.257	–94.5

V_{CE} = 1 V, I_C = 5 mA, Z_O = 50 Ω

FREQUENCY	S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
200.00	0.873	–22.4	6.414	160.2	0.052	80.4	0.953	–16.5
400.00	0.789	–42.7	5.841	142.2	0.106	65.7	0.879	–30.7
600.00	0.678	–61.7	5.207	127.1	0.140	58.2	0.752	–43.2
800.00	0.579	–78.6	4.608	113.9	0.164	50.8	0.652	–53.0
1000.00	0.482	–94.9	4.047	102.3	0.184	46.4	0.567	–61.2
1200.00	0.401	–111.9	3.587	92.7	0.192	47.3	0.483	–67.1
1400.00	0.350	–125.4	3.194	84.7	0.207	41.3	0.418	–71.6
1600.00	0.297	–140.0	2.853	76.7	0.222	42.6	0.365	–75.5
1800.00	0.270	–158.6	2.618	70.8	0.238	43.0	0.312	–81.2
2000.00	0.251	–170.1	2.399	65.0	0.249	42.3	0.293	–84.6
2200.00	0.235	177.1	2.203	59.2	0.252	43.5	0.274	–86.7
2400.00	0.230	167.7	2.073	53.9	0.281	41.3	0.248	–92.6
2600.00	0.201	149.7	1.965	49.4	0.298	40.2	0.221	–96.6
2800.00	0.247	138.6	1.826	44.8	0.333	38.3	0.212	–102.6
3000.00	0.277	122.9	1.770	40.0	0.337	37.3	0.223	–103.1

V_{CE} = 1 V, I_C = 10 mA, Z_O = 50 Ω

FREQUENCY	S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
200.00	0.771	–30.9	9.715	150.7	0.056	70.0	0.890	–23.7
400.00	0.609	–55.7	7.822	128.9	0.095	63.2	0.724	–41.0
600.00	0.483	–75.4	6.313	113.9	0.119	54.3	0.576	–51.9
800.00	0.372	–90.8	5.206	102.0	0.144	55.8	0.485	–59.9
1000.00	0.309	–106.2	4.377	92.7	0.155	53.2	0.415	–64.6
1200.00	0.246	–122.4	3.790	84.8	0.191	52.1	0.347	–68.2
1400.00	0.206	–136.3	3.314	78.4	0.198	53.2	0.316	–71.7
1600.00	0.189	–155.4	2.942	72.0	0.219	51.8	0.272	–75.6
1800.00	0.187	–172.0	2.697	67.0	0.239	50.3	0.242	–81.9
2000.00	0.178	179.3	2.458	62.0	0.262	49.0	0.232	–86.0
2200.00	0.173	163.7	2.270	57.2	0.281	46.9	0.221	–90.3
2400.00	0.189	155.7	2.118	52.1	0.304	45.4	0.196	–96.7
2600.00	0.199	134.5	2.020	47.7	0.318	43.8	0.176	–100.4
2800.00	0.203	126.9	1.882	43.4	0.352	41.1	0.168	–108.2
3000.00	0.245	114.1	1.830	39.6	0.396	40.4	0.170	–114.7

V_{CE} = 1 V, I_C = 20 mA, Z_O = 50 Ω

FREQUENCY	S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
200.00	0.587	–45.7	13.529	138.3	0.049	69.6	0.752	–33.6
400.00	0.399	–72.3	9.303	115.5	0.081	63.4	0.529	–49.8
600.00	0.278	–92.5	6.850	102.4	0.107	63.4	0.404	–56.4
800.00	0.219	–111.6	5.397	92.4	0.130	62.5	0.323	–61.2
1000.00	0.173	–128.6	4.442	84.9	0.158	61.3	0.274	–62.9
1200.00	0.152	–149.4	3.753	78.8	0.183	61.1	0.236	–66.5
1400.00	0.152	–169.6	3.296	73.3	0.205	58.6	0.216	–69.7
1600.00	0.139	175.6	2.929	68.3	0.231	58.2	0.194	–75.2
1800.00	0.145	161.6	2.615	63.8	0.253	56.3	0.175	–80.3
2000.00	0.158	153.9	2.411	59.4	0.281	53.9	0.156	–83.1
2200.00	0.167	138.9	2.214	55.2	0.302	51.8	0.161	–86.5
2400.00	0.185	132.5	2.095	51.3	0.332	50.8	0.140	–99.9
2600.00	0.216	125.8	1.975	47.4	0.353	48.6	0.128	–105.3
2800.00	0.242	120.3	1.874	42.7	0.379	45.9	0.106	–96.1
3000.00	0.271	109.1	1.767	38.9	0.401	41.3	0.117	–112.6

V_{CE} = 2 V, I_C = 1 mA, Z_O = 50 Ω

FREQUENCY	S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
200.00	0.940	–16.3	3.299	163.5	0.050	75.0	0.984	–9.7
400.00	0.882	–32.1	3.132	148.4	0.098	67.2	0.937	–18.5
600.00	0.805	–46.5	2.916	134.8	0.129	61.9	0.875	–26.1
800.00	0.719	–59.5	2.715	121.8	0.167	52.1	0.818	–32.6
1000.00	0.641	–74.1	2.491	110.2	0.180	50.8	0.760	–38.6
1200.00	0.563	–86.3	2.290	99.9	0.190	44.9	0.715	–43.2
1400.00	0.485	–97.4	2.107	91.3	0.217	42.3	0.656	–47.6
1600.00	0.434	–111.0	1.914	82.5	0.210	40.4	0.609	–50.8
1800.00	0.386	–123.1	1.811	75.7	0.227	36.5	0.570	–53.6
2000.00	0.374	–133.2	1.702	69.3	0.217	36.3	0.550	–58.8
2200.00	0.325	–146.4	1.586	62.7	0.229	36.3	0.540	–60.8
2400.00	0.315	–159.4	1.517	56.8	0.249	39.3	0.490	–64.8
2600.00	0.264	–172.5	1.452	51.7	0.255	37.1	0.489	–69.9
2800.00	0.276	172.9	1.377	46.2	0.269	38.3	0.458	–70.2
3000.00	0.283	154.0	1.370	42.1	0.291	41.1	0.465	–77.2

V_{CE} = 2 V, I_C = 3 mA, Z_O = 50 Ω

FREQUENCY	S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
200.00	0.846	–23.6	7.382	155.6	0.047	73.5	0.937	–16.0
400.00	0.713	–44.2	6.351	135.9	0.086	63.4	0.826	–27.4
600.00	0.583	–59.0	5.351	121.0	0.116	57.7	0.714	–36.4
800.00	0.477	–72.5	4.564	108.6	0.130	57.0	0.624	–41.1
1000.00	0.393	–84.7	3.929	98.5	0.154	56.8	0.568	–46.2
1200.00	0.313	–95.6	3.444	90.2	0.165	54.4	0.512	–49.1
1400.00	0.266	–109.6	3.054	83.4	0.188	52.0	0.468	–51.1
1600.00	0.222	–118.2	2.718	76.2	0.197	49.8	0.428	–53.9
1800.00	0.190	–133.8	2.510	71.0	0.212	46.4	0.394	–58.5
2000.00	0.178	–145.2	2.301	65.6	0.227	49.1	0.398	–60.9
2200.00	0.151	–155.8	2.143	60.6	0.253	47.6	0.375	–62.7
2400.00	0.144	–175.8	2.013	55.7	0.274	45.7	0.348	–65.1
2600.00	0.142	162.7	1.925	51.4	0.290	47.3	0.329	–68.3
2800.00	0.163	151.3	1.787	47.0	0.306	46.5	0.307	–70.7
3000.00	0.198	133.3	1.755	42.5	0.323	43.8	0.320	–77.6

V_{CE} = 2 V, I_C = 5 mA, Z_O = 50 Ω

FREQUENCY	S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
200.00	0.769	–28.9	10.062	150.0	0.045	73.3	0.893	–19.9
400.00	0.602	–49.9	8.020	128.3	0.075	63.4	0.752	–32.7
600.00	0.473	–65.4	6.390	113.8	0.098	63.8	0.620	–39.2
800.00	0.362	–76.2	5.249	102.5	0.122	58.3	0.534	–43.7
1000.00	0.292	–88.5	4.414	93.5	0.147	59.4	0.481	–48.5
1200.00	0.222	–100.1	3.817	86.3	0.159	60.4	0.431	–50.2
1400.00	0.180	–109.0	3.345	80.0	0.180	55.0	0.395	–51.7
1600.00	0.145	–121.2	2.976	73.7	0.201	57.0	0.360	–50.7
1800.00	0.119	–139.9	2.723	68.7	0.216	55.2	0.338	–58.4
2000.00	0.107	–153.0	2.488	64.2	0.249	54.0	0.329	–60.5
2200.00	0.086	–168.2	2.286	59.5	0.274	54.4	0.318	–63.0
2400.00	0.101	165.4	2.164	54.9	0.284	48.2	0.296	–68.2
2600.00	0.088	148.0	2.052	51.4	0.311	48.0	0.279	–71.7
2800.00	0.120	137.3	1.923	47.0	0.323	45.5	0.264	–71.6
3000.00	0.152	118.2	1.865	42.6	0.352	45.4	0.280	–78.0

V_{CE} = 2 V, I_C = 10 mA, Z_O = 50 Ω

FREQUENCY	S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
200.00	0.649	–35.6	13.772	141.3	0.047	70.2	0.826	–25.0
400.00	0.449	–57.4	9.813	118.7	0.067	62.7	0.627	–37.6
600.00	0.322	–69.2	7.343	105.6	0.093	71.8	0.504	–41.9
800.00	0.235	–78.6	5.842	95.8	0.113	64.8	0.427	–45.4
1000.00	0.173	–89.4	4.820	88.2	0.130	63.1	0.386	–46.7
1200.00	0.137	–102.3	4.118	82.0	0.154	65.1	0.355	–48.7
1400.00	0.101	–116.1	3.592	76.8	0.179	60.2	0.324	–49.8
1600.00	0.079	–120.2	3.170	71.1	0.200	59.5	0.308	–54.2
1800.00	0.055	–153.2	2.898	66.9	0.230	56.2	0.282	–56.1
2000.00	0.072	–173.2	2.634	62.5	0.253	57.3	0.280	–56.6
2200.00	0.052	154.2	2.418	58.1	0.260	56.1	0.261	–60.8
2400.00	0.061	151.5	2.291	54.1	0.307	52.6	0.244	–64.5
2600.00	0.071	123.5	2.169	50.4	0.307	48.0	0.230	–71.5
2800.00	0.105	118.9	2.019	46.3	0.332	47.9	0.233	–74.8
3000.00	0.145	103.4	1.965	41.9	0.351	43.6	0.232	–78.0

V_{CE} = 2 V, I_C = 20 mA, Z_O = 50 Ω

FREQUENCY	S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
200.00	0.563	–40.1	15.719	137.3	0.039	70.2	0.772	–29.0
400.00	0.375	–59.9	10.612	115.1	0.066	71.6	0.555	–40.3
600.00	0.253	–71.3	7.768	102.7	0.091	68.9	0.447	–43.8
800.00	0.183	–82.8	6.125	93.3	0.116	67.9	0.377	–46.1
1000.00	0.127	–89.7	5.011	86.5	0.136	66.3	0.336	–46.6
1200.00	0.085	–102.5	4.243	80.7	0.163	66.3	0.313	–47.5
1400.00	0.065	–122.5	3.708	75.7	0.181	63.7	0.291	–50.5
1600.00	0.057	–142.5	3.300	71.0	0.206	62.8	0.271	–51.5
1800.00	0.044	–176.9	2.941	66.7	0.232	60.6	0.251	–53.1
2000.00	0.046	153.8	2.721	62.7	0.255	58.8	0.233	–56.1
2200.00	0.064	132.0	2.493	58.4	0.271	56.7	0.229	–60.9
2400.00	0.076	124.4	2.353	54.6	0.301	55.2	0.212	–70.0
2600.00	0.121	116.4	2.216	51.0	0.319	53.4	0.196	–72.9
2800.00	0.141	109.4	2.096	46.4	0.345	50.4	0.186	–66.7
3000.00	0.170	95.5	1.964	42.5	0.360	45.8	0.190	–78.5

[MEMO]

[MEMO]