To our customers,

Old Company Name in Catalogs and Other Documents

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Renesas Electronics website: http://www.renesas.com

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (http://www.renesas.com)

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RENESAS

SILICON TRANSISTOR
μPA813T

NPN SILICON EPITAXIAL TRANSISTOR (WITH BUILT-IN 2 × 2SC4570) SMALL MINI MOLD

μPA813T has built-in 2 transistors which were developed for UHF.

FEATURES

- High f_T
  f_T = 5.5 GHz TYP. (@V_{CE} = 5 V, I_C = 5 mA, f = 1 GHz)
- Small Collector Capacitance
  C_{ob} = 0.7 pF TYP. (@V_{CB} = 5 V, I_E = 0, f = 1 MHz)
- A Surface Mounting Package Adopted
- Built-in 2 Transistors (2 × 2SC4570)

ORDERING INFORMATION

PART NUMBER	QUANTITY	PACKING STYLE
μPA813T	Loose products (50 PCS)	Embossed tape 8 mm wide. Pin 6 (Q1 Base), Pin 5 (Q1 Emitter), Pin 4 (Q2 Emitter) face to perforation side of the tape.
μPA813T-T1	Taping products (3 KPCS/Reel)	

Remark If you require an evaluation sample, please contact an NEC Sales Representative. (Unit sample quantity is 50 pcs.)

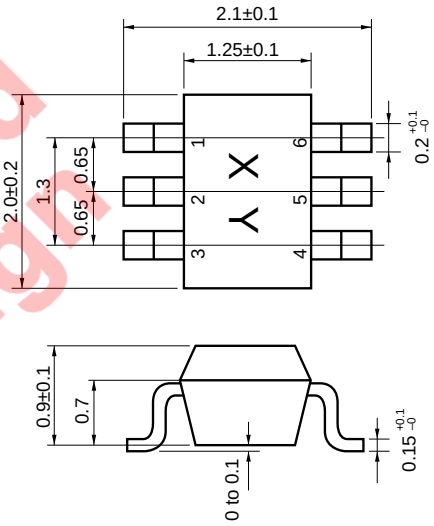
ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C)

PARAMETER	SYMBOL	RATING	UNIT
Collector to Base Voltage	V_{CBO}	20	V
Collector to Emitter Voltage	V_{CEO}	12	V
Emitter to Base Voltage	V_{EBO}	3	V
Collector Current	I_C	30	mA
Total Power Dissipation	P_T	120 in 1 element 160 in 2 elements[Note]	mW
Junction Temperature	T_j	125	°C
Storage Temperature	T_{stg}	–55 to +125	°C

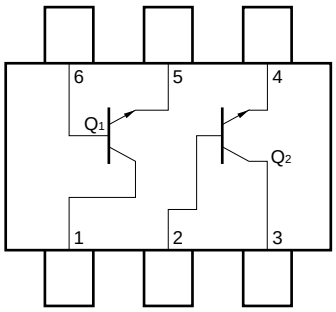
Note 90 mW must not be exceeded in 1 element.

PACKAGE DRAWINGS

(Unit: mm)



PIN CONFIGURATION (Top View)



PIN CONNECTIONS

1. Collector (Q1)
2. Base (Q2)
3. Collector (Q2)
4. Emitter (Q2)
5. Emitter (Q1)
6. Base (Q1)

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Printed in Japan

ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Collector Cutoff Current	I_{CBO}	V_{CB} = 15 V, I_E = 0			0.1	μA
Emitter Cutoff Current	I_{EBO}	V_{EB} = 1 V, I_C = 0			0.1	μA
Collector to Emitter Saturation Voltage	$V_{CE (sat)}$	h_{FE} = 10, I_C = 5 mA			0.5	V
DC Current Gain	h_{FE}	V_{CE} = 5 V, I_C = 5 mA **Note 1**	60		200	
Gain Bandwidth Product	f_T	V_{CE} = 5 V, I_C = 5 mA, f = 1 GHz		5.5		GHz
Feed-back Capacitance	C_{re}	V_{CB} = 5 V, I_E = 0, f = 1 MHz **Note 2**		0.7	0.9	pF
Insertion Power Gain	$\|S_{21e}\|^2$	V_{CE} = 5 V, I_C = 5 mA, f = 1 GHz	5			dB
h_{FE} Ratio	h_{FE1}/h_{FE2}	V_{CE} = 5 V, I_C = 5 mA A smaller value among h_{FE} of h_{FE}1 = Q1, Q2 A larger value among h_{FE} of h_{FE}2 = Q1, Q2	0.85			

Notes 1. Pulse Measurement: Pw ≤ 350 μs, Duty cycle ≤ 2 %

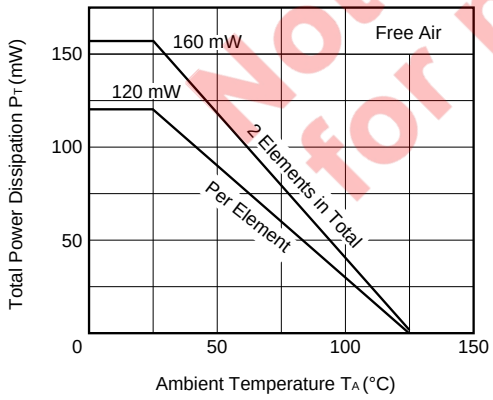
2. Measured with 3-pin bridge, emitter and case should be connected to guard pin of bridge.

h_{FE} CLASSIFICATION

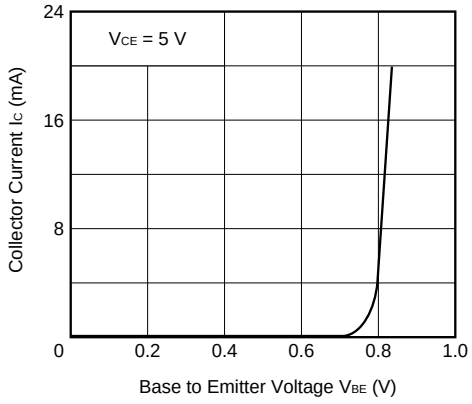
Rank	FB	GB
Marking	73T	74T
h_{FE} Value	60 to 120	100 to 200

TYPICAL CHARACTERISTICS (T_A = 25 °C)

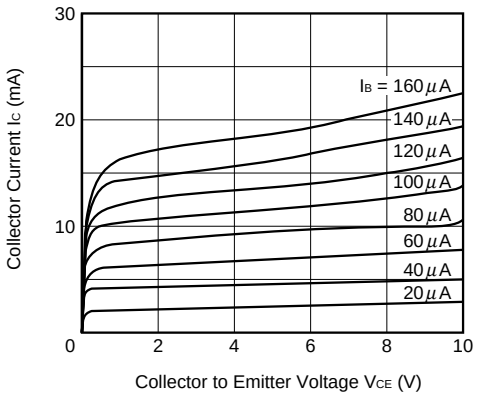
P_T - T_A Characteristics



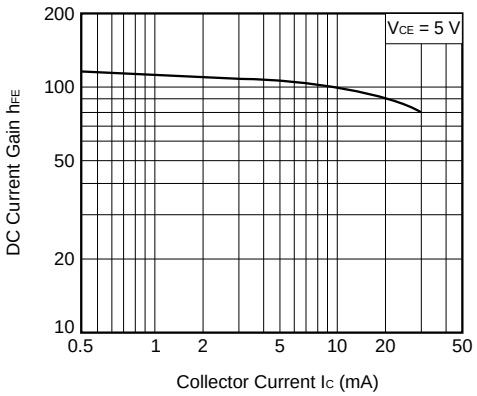
I_C - V_{BE} Characteristics



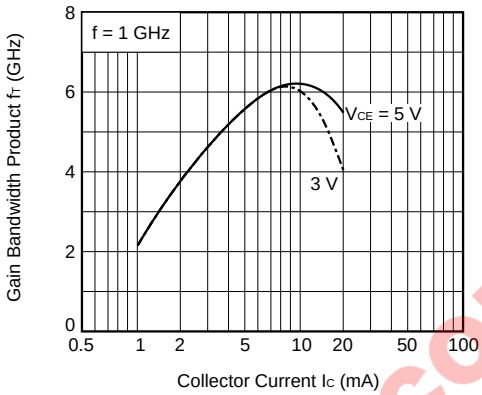
I_C - V_{CE} Characteristics



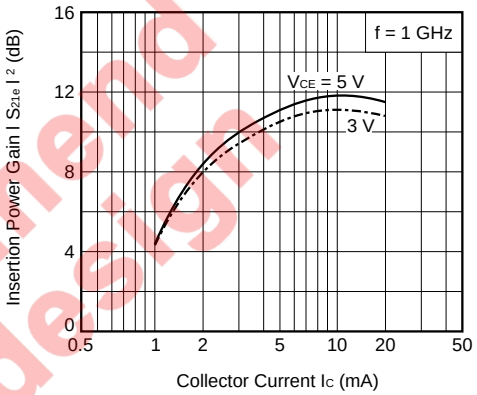
h_{FE} - I_C Characteristics



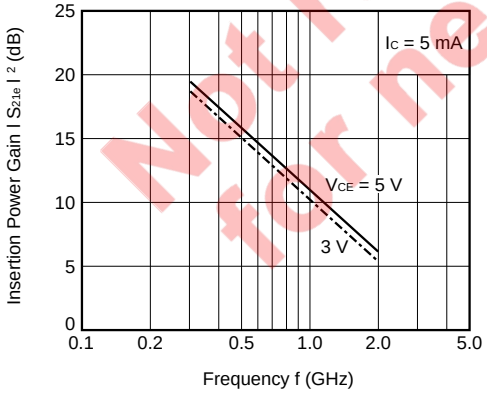
f_T - I_C Characteristics



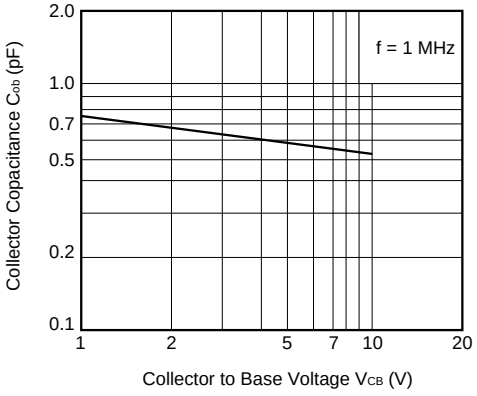
$|S_{21e}|^2$ - I_C Characteristics



$|S_{21e}|^2$ - f Characteristics



C_{ob} - V_{CB} Characteristics



S-PARAMETERS

(V_{CE} = 3 V, I_C = 1 mA)

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.946	–12.8	3.592	168.0	0.028	81.3	0.995	–5.8
200.00	0.922	–23.6	3.355	158.1	0.050	76.1	0.973	–10.5
300.00	0.852	–34.3	3.222	146.1	0.074	66.2	0.928	–16.1
400.00	0.829	–43.7	2.991	139.7	0.093	62.9	0.904	–19.0
500.00	0.709	–52.1	2.037	129.9	0.107	56.9	0.847	–21.9
600.00	0.752	–64.0	2.750	124.4	0.122	54.8	0.827	–24.7
700.00	0.697	–73.5	2.601	114.1	0.131	49.6	0.798	–26.3
800.00	0.624	–82.5	2.493	107.7	0.144	46.3	0.781	–29.7
900.00	0.574	–89.9	2.286	100.0	0.149	45.1	0.759	–32.1
1000.00	0.534	–97.0	2.146	93.7	0.156	41.1	0.725	–36.2
1100.00	0.509	–104.9	2.011	89.3	0.162	41.2	0.693	–38.2
1200.00	0.477	–113.0	1.937	83.7	0.166	38.8	0.651	–40.5
1300.00	0.449	–120.5	1.853	80.1	0.175	37.0	0.627	–41.4
1400.00	0.429	–127.4	1.751	74.4	0.173	35.8	0.601	–42.4
1500.00	0.418	–135.0	1.691	70.1	0.179	33.9	0.597	–43.5
1600.00	0.405	–142.8	1.619	66.6	0.178	36.1	0.583	–44.9
1700.00	0.390	–151.7	1.568	62.4	0.183	35.0	0.579	–48.0
1800.00	0.375	–157.6	1.542	59.2	0.193	36.6	0.567	–50.3
1900.00	0.364	–163.3	1.494	54.1	0.197	34.8	0.546	–53.5
2000.00	0.373	–168.7	1.461	48.9	0.206	32.7	0.532	–56.1
2100.00	0.379	–174.9	1.363	46.4	0.201	34.0	0.516	–58.7
2200.00	0.384	177.1	1.284	41.8	0.204	32.3	0.504	–61.1
2300.00	0.386	171.4	1.284	41.7	0.208	35.2	0.492	–64.3
2400.00	0.383	166.4	1.255	38.6	0.213	35.0	0.479	–67.9
2500.00	0.389	162.8	1.284	34.9	0.229	36.4	0.466	–72.3
2600.00	0.396	158.5	1.228	31.3	0.236	35.3	0.448	–75.8
2700.00	0.409	153.9	1.193	25.6	0.248	32.2	0.427	–80.0
2800.00	0.417	149.4	1.152	25.2	0.245	33.4	0.415	–83.4
2900.00	0.425	145.5	1.100	20.1	0.247	32.1	0.401	–87.1
3000.00	0.442	142.2	1.100	20.0	0.257	35.2	0.398	–92.0

(V_{CE} = 3 V, I_C = 3 mA)

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.861	–21.0	8.797	160.7	0.026	80.3	0.975	–10.6
200.00	0.785	–37.8	7.879	145.4	0.046	69.8	0.904	–18.1
300.00	0.670	–52.8	6.888	130.9	0.063	61.3	0.808	–25.1
400.00	0.600	–64.2	6.034	122.6	0.076	58.7	0.744	–27.9
500.00	0.533	–73.9	5.269	113.3	0.083	54.7	0.664	–29.7
600.00	0.485	–86.1	4.818	108.4	0.093	55.1	0.631	–31.0
700.00	0.435	–96.1	4.305	99.2	0.100	52.4	0.596	–31.3
800.00	0.382	–105.6	3.973	94.3	0.111	51.5	0.575	–33.2
900.00	0.348	–113.7	3.515	87.7	0.116	52.0	0.555	–34.6
1000.00	0.323	–121.7	3.214	82.8	0.125	50.2	0.526	–37.4
1100.00	0.305	–129.5	3.104	79.6	0.132	51.5	0.499	–38.7
1200.00	0.288	–137.9	2.907	75.2	0.138	50.4	0.468	–40.1
1300.00	0.276	–144.9	2.748	72.1	0.149	50.2	0.449	–40.3
1400.00	0.270	–151.2	2.554	67.9	0.153	49.3	0.428	–40.7
1500.00	0.272	–158.1	2.422	64.1	0.162	48.2	0.422	–41.3
1600.00	0.276	–165.3	2.299	61.8	0.168	50.2	0.412	–42.1
1700.00	0.276	–174.1	2.204	58.5	0.177	49.0	0.405	–44.6
1800.00	0.272	–179.5	2.149	55.7	0.189	49.9	0.393	–46.7
1900.00	0.272	175.4	2.068	51.4	0.198	47.8	0.374	–49.4
2000.00	0.284	171.7	2.011	46.6	0.212	45.3	0.359	–51.6
2100.00	0.296	167.0	1.860	44.9	0.211	45.8	0.345	–53.9
2200.00	0.310	160.8	1.748	40.8	0.218	43.4	0.331	–55.6
2300.00	0.320	156.5	1.730	41.0	0.227	45.6	0.317	–58.7
2400.00	0.327	152.4	1.682	38.3	0.236	44.3	0.303	–61.8
2500.00	0.335	149.8	1.712	34.9	0.254	44.7	0.287	–65.6
2600.00	0.347	146.3	1.633	31.8	0.263	42.3	0.270	–69.0
2700.00	0.360	143.0	1.591	26.4	0.278	38.1	0.253	–72.7
2800.00	0.370	139.6	1.520	26.0	0.275	38.9	0.238	–76.2
2900.00	0.384	136.7	1.453	21.4	0.278	36.8	0.223	–79.8
3000.00	0.404	134.4	1.448	21.6	0.289	39.0	0.213	–85.5

S-PARAMETERS

(V_{CE} = 3 V, I_C = 5 mA)

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.791	–26.8	12.479	155.7	0.023	73.8	0.954	–13.7
200.00	0.679	–47.2	10.575	137.3	0.043	66.1	0.843	–22.4
300.00	0.550	–63.8	8.756	122.5	0.055	60.0	0.725	–28.9
400.00	0.471	–75.6	7.345	114.2	0.066	58.3	0.651	–30.5
500.00	0.407	–85.6	6.229	105.8	0.074	57.1	0.575	–31.1
600.00	0.367	–97.3	5.556	101.6	0.083	58.9	0.546	–31.3
700.00	0.327	–107.6	4.890	93.4	0.091	57.1	0.516	–30.9
800.00	0.290	–117.1	4.472	89.2	0.101	56.9	0.499	–32.1
900.00	0.268	–125.5	3.922	83.4	0.109	57.3	0.484	–33.2
1000.00	0.255	–133.8	3.574	78.8	0.118	55.8	0.459	–35.6
1100.00	0.243	–142.1	3.440	76.1	0.127	56.6	0.437	–36.6
1200.00	0.234	–150.4	3.200	72.1	0.135	55.5	0.411	–37.8
1300.00	0.228	–156.8	3.016	69.2	0.145	55.2	0.392	–37.8
1400.00	0.227	–162.7	2.793	65.5	0.151	54.4	0.376	–38.0
1500.00	0.235	–168.8	2.638	62.0	0.161	53.1	0.371	–38.5
1600.00	0.244	–175.3	2.496	60.0	0.169	54.7	0.362	–39.2
1700.00	0.249	176.5	2.389	57.1	0.179	53.2	0.355	–41.5
1800.00	0.249	171.6	2.329	54.5	0.192	53.6	0.343	–43.6
1900.00	0.252	167.1	2.235	50.3	0.202	51.1	0.325	–46.4
2000.00	0.266	164.2	2.173	45.7	0.215	48.3	0.311	–48.3
2100.00	0.279	160.3	2.005	44.1	0.216	48.9	0.297	–50.7
2200.00	0.295	154.8	1.884	40.1	0.224	46.3	0.282	–52.1
2300.00	0.307	151.2	1.857	40.5	0.233	48.1	0.268	–54.9
2400.00	0.316	147.8	1.806	38.1	0.243	46.7	0.254	–57.7
2500.00	0.326	145.5	1.834	34.8	0.262	46.6	0.237	–61.3
2600.00	0.338	142.2	1.749	31.9	0.271	43.9	0.220	–64.6
2700.00	0.350	139.4	1.703	26.5	0.286	39.8	0.203	–68.3
2800.00	0.362	136.4	1.627	26.3	0.283	40.2	0.187	–71.6
2900.00	0.376	134.0	1.556	21.8	0.286	37.9	0.173	–74.9
3000.00	0.398	132.1	1.546	22.1	0.297	40.0	0.161	–81.4

(V_{CE} = 5 V, I_C = 1 mA)

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.950	–12.3	3.566	168.4	0.023	83.0	0.998	–5.3
200.00	0.926	–22.6	3.336	158.9	0.046	74.7	0.977	–9.4
300.00	0.856	–32.8	3.213	147.0	0.066	67.5	0.935	–14.6
400.00	0.836	–41.9	2.991	141.0	0.083	63.6	0.915	–17.2
500.00	0.796	–50.1	2.847	131.3	0.095	58.3	0.858	–19.7
600.00	0.761	–61.5	2.765	126.0	0.109	56.3	0.847	–22.4
700.00	0.704	–70.8	2.617	115.8	0.120	51.6	0.821	–23.7
800.00	0.631	–79.5	2.512	109.4	0.131	48.2	0.808	–27.0
900.00	0.579	–86.6	2.309	101.9	0.135	46.6	0.788	–29.2
1000.00	0.539	–93.3	2.165	95.6	0.142	43.3	0.756	–33.2
1100.00	0.513	–101.1	2.034	91.3	0.148	43.5	0.726	–35.0
1200.00	0.480	–108.9	1.959	85.9	0.151	41.2	0.685	–37.2
1300.00	0.450	–116.5	1.874	82.4	0.160	39.5	0.663	–37.9
1400.00	0.428	–123.2	1.779	76.6	0.158	38.3	0.637	–38.7
1500.00	0.414	–130.8	1.717	72.4	0.163	36.5	0.638	–39.9
1600.00	0.398	–138.5	1.644	68.8	0.164	39.2	0.625	–41.0
1700.00	0.380	–147.4	1.592	64.6	0.168	38.2	0.624	–44.1
1800.00	0.366	–153.2	1.563	61.5	0.177	39.7	0.613	–46.0
1900.00	0.352	–159.1	1.518	56.4	0.182	38.2	0.593	–49.2
2000.00	0.361	–164.7	1.481	51.5	0.190	36.0	0.579	–51.7
2100.00	0.366	–171.1	1.386	48.9	0.186	37.6	0.565	–54.0
2200.00	0.369	–179.4	1.308	44.4	0.190	36.1	0.552	–56.2
2300.00	0.369	174.8	1.309	44.3	0.194	39.1	0.541	–59.1
2400.00	0.366	169.6	1.277	41.2	0.199	38.9	0.530	–62.3
2500.00	0.371	165.9	1.307	37.3	0.215	40.4	0.517	–66.2
2600.00	0.379	161.3	1.253	33.9	0.221	39.2	0.500	–69.4
2700.00	0.391	156.4	1.215	28.1	0.234	36.0	0.479	–73.1
2800.00	0.400	151.8	1.174	27.8	0.232	37.6	0.469	–76.2
2900.00	0.407	147.8	1.121	22.7	0.234	36.5	0.454	–79.3
3000.00	0.423	144.5	1.129	22.6	0.245	39.8	0.453	–83.8

S-PARAMETERS

(V_{CE} = 5 V, I_C = 3 mA)

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.866	–19.9	8.751	161.3	0.022	80.8	0.979	–9.5
200.00	0.793	–36.0	7.872	146.5	0.041	69.9	0.916	–16.0
300.00	0.679	–50.1	6.917	132.2	0.057	62.2	0.829	–22.5
400.00	0.611	–60.9	6.089	124.1	0.068	59.5	0.772	–24.8
500.00	0.543	–70.2	5.334	114.8	0.076	56.4	0.696	–26.3
600.00	0.493	–81.8	4.895	109.9	0.085	56.7	0.669	–27.5
700.00	0.441	–91.5	4.381	100.8	0.092	54.5	0.637	–27.7
800.00	0.385	–100.5	4.046	95.8	0.102	53.5	0.620	–29.6
900.00	0.346	–108.2	3.591	89.2	0.106	53.8	0.601	–30.9
1000.00	0.319	–115.6	3.283	84.2	0.114	52.3	0.574	–33.8
1100.00	0.299	–123.2	3.174	81.1	0.121	53.5	0.549	–34.9
1200.00	0.280	–131.4	2.974	76.8	0.127	52.4	0.517	–36.2
1300.00	0.266	–138.4	2.608	73.8	0.137	52.3	0.499	–36.3
1400.00	0.256	–144.9	2.616	69.5	0.141	51.6	0.479	–36.5
1500.00	0.256	–152.4	2.484	66.0	0.150	50.8	0.477	–37.1
1600.00	0.257	–160.0	2.356	63.5	0.156	52.5	0.468	–37.8
1700.00	0.255	–168.7	2.262	60.3	0.165	51.4	0.464	–40.4
1800.00	0.250	–174.6	2.203	57.6	0.176	52.3	0.454	–42.3
1900.00	0.250	–179.8	2.118	53.2	0.184	50.4	0.435	–45.0
2000.00	0.262	176.1	2.060	48.6	0.197	47.9	0.421	–47.1
2100.00	0.272	170.7	1.910	46.8	0.196	48.6	0.407	–49.1
2200.00	0.284	164.3	1.797	42.7	0.204	46.8	0.394	–50.6
2300.00	0.294	159.8	1.778	43.0	0.212	48.9	0.381	–53.1
2400.00	0.300	155.6	1.733	40.3	0.222	47.7	0.369	–56.0
2500.00	0.309	152.8	1.762	37.0	0.239	48.1	0.353	–59.2
2600.00	0.320	149.3	1.684	33.8	0.247	45.6	0.338	–62.1
2700.00	0.333	145.8	1.636	28.5	0.262	41.5	0.319	–65.3
2800.00	0.345	142.1	1.567	28.1	0.261	42.3	0.306	–68.1
2900.00	0.356	139.2	1.497	23.6	0.263	40.3	0.293	–70.8
3000.00	0.375	136.8	1.492	23.8	0.274	42.7	0.281	–75.5

(V_{CE} = 5 V, I_C = 5 mA)

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.800	–25.2	12.402	156.5	0.021	74.6	0.960	–12.2
200.00	0.693	–44.6	10.586	138.5	0.037	68.7	0.861	–19.8
300.00	0.563	–60.2	8.837	123.8	0.051	61.5	0.753	–25.7
400.00	0.482	–71.3	7.446	115.6	0.060	59.4	0.687	–26.9
500.00	0.417	–80.5	6.349	107.2	0.067	58.7	0.616	–27.3
600.00	0.373	–91.8	5.672	103.0	0.076	60.5	0.590	–27.6
700.00	0.330	–101.5	5.006	94.8	0.084	58.4	0.564	–27.2
800.00	0.288	–110.6	4.575	90.5	0.094	58.0	0.550	–28.4
900.00	0.262	–118.6	4.014	84.7	0.099	58.5	0.536	–29.5
1000.00	0.245	–126.5	3.647	80.2	0.109	57.4	0.513	–31.9
1100.00	0.231	–134.6	3.522	77.5	0.117	58.3	0.491	–32.8
1200.00	0.219	–142.9	3.278	73.6	0.123	57.5	0.465	–34.0
1300.00	0.211	–149.9	3.085	70.8	0.134	57.5	0.448	–33.9
1400.00	0.208	–156.0	2.864	67.0	0.139	56.8	0.433	–34.1
1500.00	0.212	–163.0	2.706	63.6	0.150	55.2	0.430	–34.5
1600.00	0.219	–169.9	2.564	61.6	0.157	57.0	0.423	–35.2
1700.00	0.224	–178.3	2.457	58.7	0.167	55.5	0.419	–37.7
1800.00	0.223	176.1	2.392	56.1	0.179	56.0	0.409	–39.6
1900.00	0.225	171.5	2.295	52.1	0.188	53.6	0.391	–42.3
2000.00	0.238	168.1	2.228	47.6	0.201	51.0	0.376	–44.2
2100.00	0.250	163.7	2.061	46.0	0.201	51.6	0.363	–46.3
2200.00	0.266	158.0	1.939	42.1	0.209	49.1	0.349	–47.5
2300.00	0.277	154.2	1.911	42.4	0.219	51.2	0.335	–49.9
2400.00	0.206	150.4	1.864	40.1	0.228	49.7	0.323	–52.4
2500.00	0.296	148.1	1.891	36.9	0.247	49.7	0.309	–55.4
2600.00	0.309	145.0	1.807	33.8	0.256	47.0	0.293	–58.2
2700.00	0.322	142.0	1.757	28.4	0.270	42.9	0.276	–61.1
2800.00	0.333	138.8	1.679	28.3	0.268	43.5	0.261	–63.8
2900.00	0.345	136.4	1.605	23.8	0.270	41.4	0.247	–66.2
3000.00	0.366	134.3	1.595	24.1	0.282	43.5	0.234	–71.1

[MEMO]