

**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.)

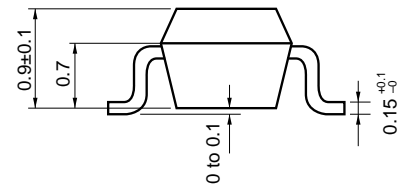
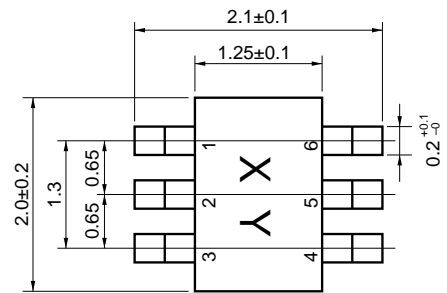
**ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25 °C)**

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 <sup>Note</sup>	mW
Junction Temperature	$T_j$	125	°C
Storage Temperature	$T_{stg}$	-55 to +125	°C

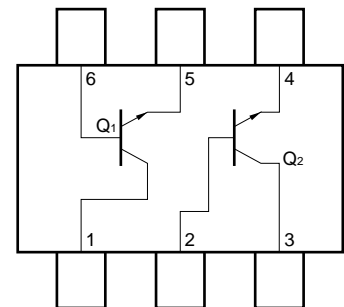
**Note** 90 mW must not be exceeded in 1 element.

**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)

The information in this document is subject to change without notice.

**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C)**

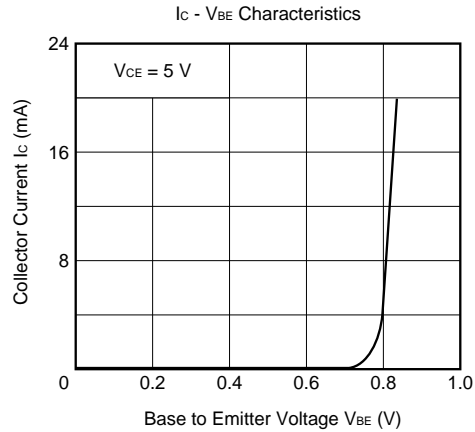
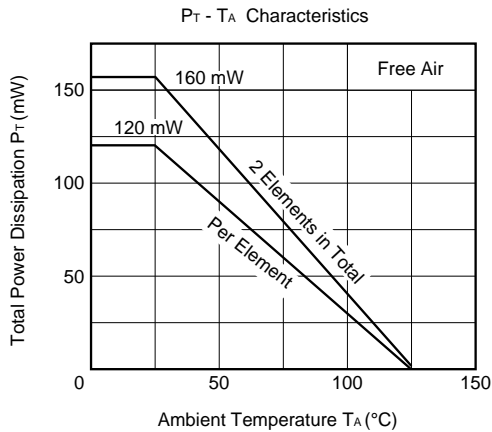
PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Collector Cutoff Current	I <sub>CBO</sub>	V <sub>CB</sub> = 15 V, I <sub>E</sub> = 0			0.1	μA
Emitter Cutoff Current	I <sub>EBO</sub>	V <sub>EB</sub> = 1 V, I <sub>C</sub> = 0			0.1	μA
Collector to Emitter Saturation Voltage	V <sub>CE(sat)</sub>	h <sub>FE</sub> = 10, I <sub>C</sub> = 5 mA			0.5	V
DC Current Gain	h <sub>FE</sub>	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 5 mA <sup>Note 1</sup>	60		200	
Gain Bandwidth Product	f <sub>T</sub>	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 5 mA, f = 1 GHz		5.5		GHz
Feed-back Capacitance	C <sub>re</sub>	V <sub>CB</sub> = 5 V, I <sub>E</sub> = 0, f = 1 MHz <sup>Note 2</sup>		0.7	0.9	pF
Insertion Power Gain	S <sub>21e</sub>   <sup>2</sup>	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 5 mA, f = 1 GHz	5			dB
h <sub>FE</sub> Ratio	h <sub>FE1</sub> /h <sub>FE2</sub>	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 5 mA A smaller value among h <sub>FE</sub> of h <sub>FE1</sub> = Q1, Q2 A larger value among h <sub>FE</sub> of h <sub>FE2</sub> = Q1, Q2	0.85			

- Notes**
1. Pulse Measurement: P<sub>w</sub> ≤ 350 μs, Duty cycle ≤ 2 %
  2. Measured with 3-pin bridge, emitter and case should be connected to guard pin of bridge.

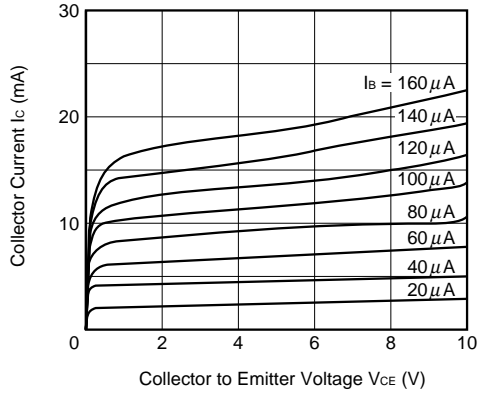
**h<sub>FE</sub> CLASSIFICATION**

Rank	FB	GB
Marking	73T	74T
h <sub>FE</sub> Value	60 to 120	100 to 200

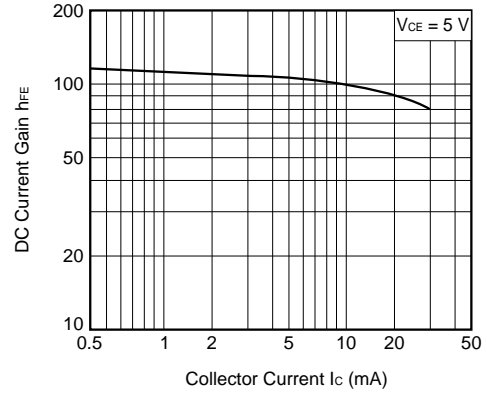
**TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C)**



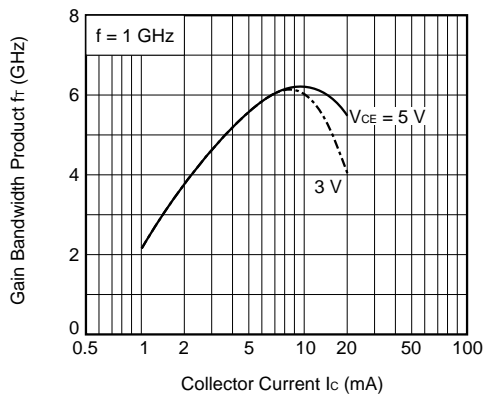
$I_c - V_{CE}$  Characteristics



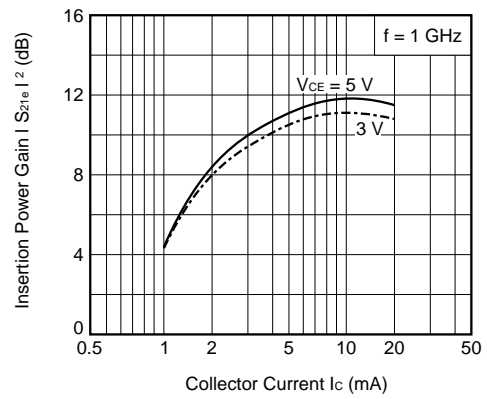
$h_{FE} - I_c$  Characteristics



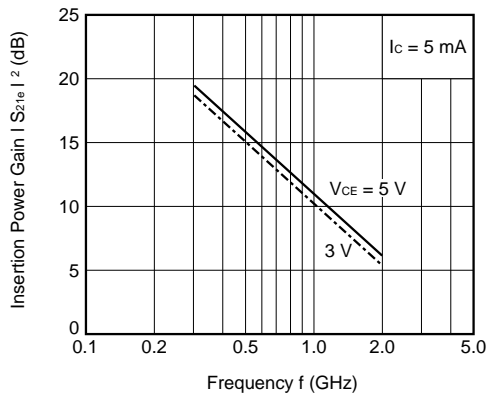
$f_T - I_c$  Characteristics



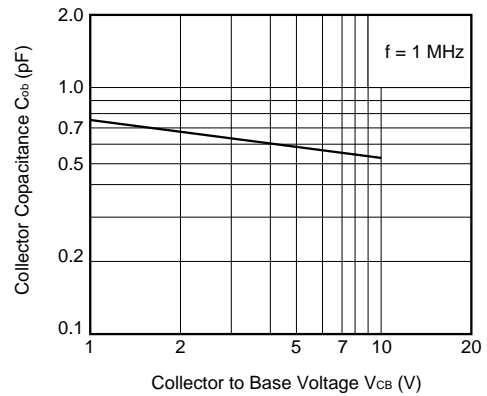
$|S_{21e}|^2 - I_c$  Characteristics



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



$C_{ob} - V_{CB}$  Characteristics



S-PARAMETERS

(V<sub>CE</sub> = 3 V, I<sub>c</sub> = 1 mA)

FREQUENCY MHz	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	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<sub>CE</sub> = 3 V, I<sub>c</sub> = 3 mA)

FREQUENCY MHz	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	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<sub>CE</sub> = 3 V, I<sub>c</sub> = 5 mA)

FREQUENCY MHz	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	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<sub>CE</sub> = 5 V, I<sub>c</sub> = 1 mA)

FREQUENCY MHz	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	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<sub>CE</sub> = 5 V, I<sub>c</sub> = 3 mA)

FREQUENCY MHz	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	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<sub>CE</sub> = 5 V, I<sub>c</sub> = 5 mA)

FREQUENCY MHz	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	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]

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