

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

FEATURES

- Low current consumption and high gain
 $|S_{21e}|^2 = 9 \text{ dB TYP. @ } V_{CE} = 2 \text{ V, } I_c = 7 \text{ mA, } f = 2 \text{ GHz}$
 $|S_{21e}|^2 = 8.5 \text{ dB TYP. @ } V_{CE} = 1 \text{ V, } I_c = 5 \text{ mA, } f = 2 \text{ GHz}$
- Small Mini-Mold package
 EIAJ: SC-70

ORDERING INFORMATION

PART NUMBER	QUANTITY	ARRANGEMENT
2SC5179-T1	3000 units/reel	Embossed tape, 8 mm wide, pin No. 3 (Collector) facing the perforations
2SC5179-T2		Embossed tape, 8 mm wide, pins No. 1 (Emitter) and No. 2 (Base) facing the perforations

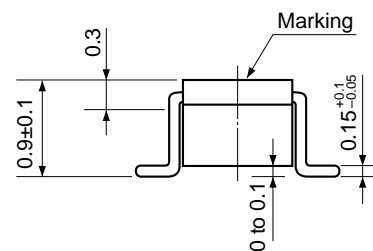
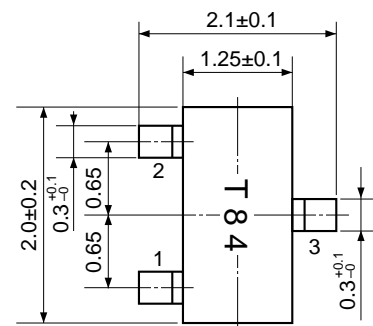
* Contact your NEC sales representatives to order samples for evaluation (available in batches of 50).

ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$)

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	10	mA
Total Power Dissipation	P_T	30	mW
Junction Temperature	T_j	150	$^\circ\text{C}$
Storage Temperature	T_{stg}	-65 to +150	$^\circ\text{C}$

PACKAGE DIMENSIONS

(Units: mm)



PIN CONNECTIONS

1. Emitter
2. Base
3. Collector

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

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 = 7 mA* ¹
Insertion Power Gain (1)	S _{21e} ²	7.5	9		dB	V _{CE} = 2 V, I _C = 7 mA, f = 2 GHz
Insertion Power Gain (2)	S _{21e} ²	7	8.5		dB	V _{CE} = 1 V, I _C = 5 mA, f = 2 GHz
Noise Figure (1)	NF		1.5	2.0	dB	V _{CE} = 2 V, I _C = 3 mA, f = 2 GHz
Noise Figure (2)	NF		1.5	2.0	dB	V _{CE} = 1 V, I _C = 3 mA, f = 2 GHz
Gain Bandwidth Product (1)	f _T	10	13		GHz	V _{CE} = 2 V, I _C = 7 mA, f = 2 GHz
Gain Bandwidth Product (2)	f _T	8.5	12		GHz	V _{CE} = 1 V, I _C = 5 mA, f = 2 GHz
Feedback Capacitance	C _{re}		0.4	0.6	pF	V _{CB} = 2 V, I _E = 0 mA, f = 1 MHz* ²

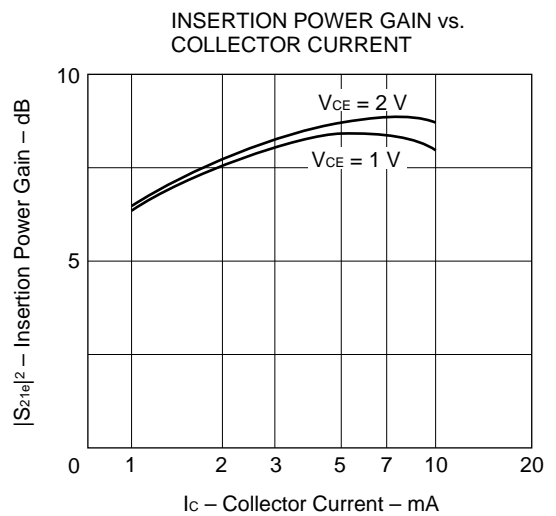
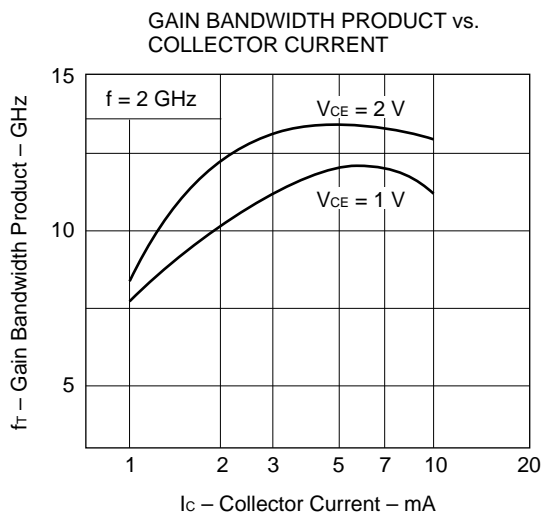
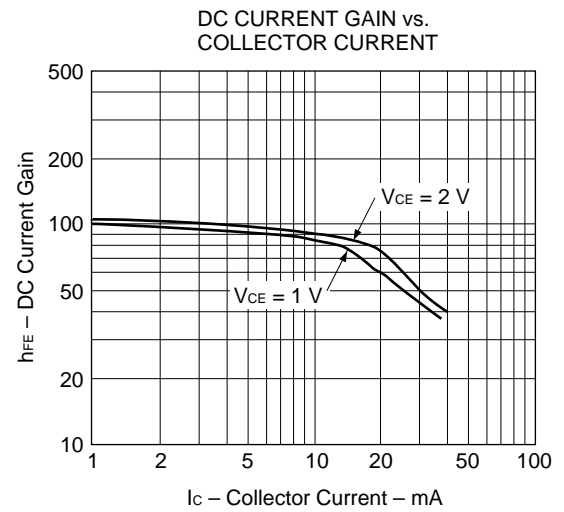
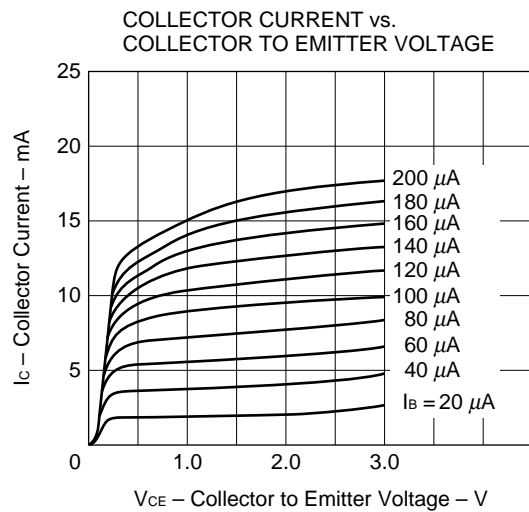
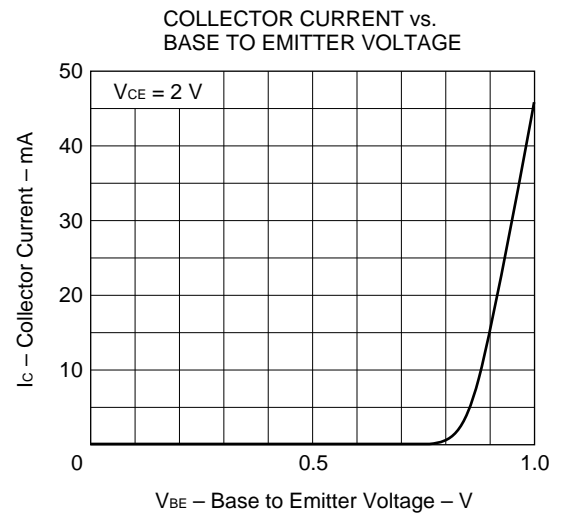
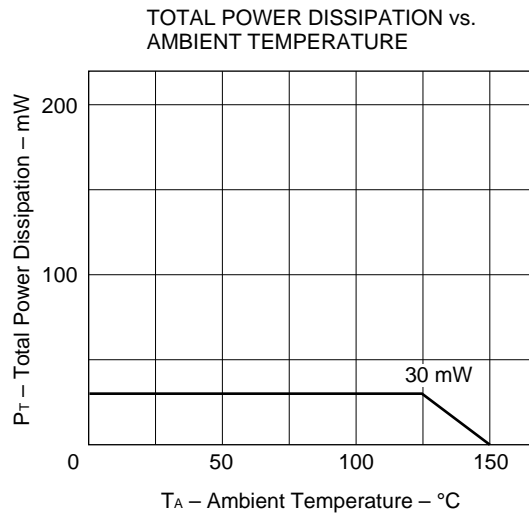
*1. Measured with pulses: Pulse width ≤ 350 μs, duty cycle ≤ 2 %, pulsed

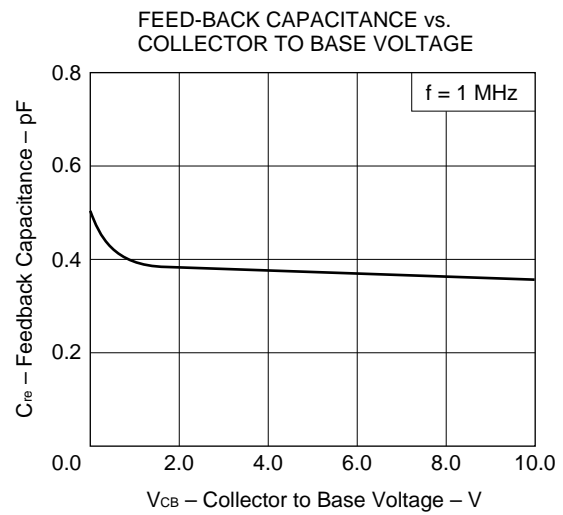
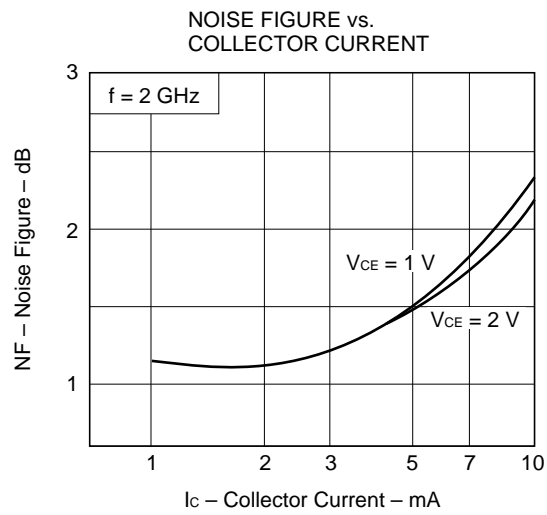
*2. Measured with a three-terminal bridge. The emitter and case terminal are connected to the guard terminal of the bridge.

h_{FE} Class

Class	FB
Marking	T84
h _{FE}	70 to 140

CHARACTERISTICS CURVES ($T_A = 25^\circ\text{C}$)





S-PARAMETER

 $V_{CE} = 1\text{ V}$, $I_C = 1\text{ mA}$, $Z_O = 50\ \Omega$

FREQUENCY		S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	
100.0000	0.982	−3.7	1.968	174.3	0.020	83.4	0.994	−4.0	
200.0000	0.983	−7.5	1.939	167.5	0.038	82.6	0.992	−8.1	
300.0000	0.973	−10.6	1.930	161.8	0.058	79.2	0.980	−11.5	
400.0000	0.955	−14.9	2.014	156.4	0.075	75.4	0.959	−15.5	
500.0000	0.946	−17.9	1.934	150.9	0.091	72.8	0.949	−18.8	
600.0000	0.918	−22.1	1.988	146.3	0.107	69.9	0.923	−22.1	
700.0000	0.900	−25.8	1.951	141.7	0.122	66.8	0.901	−25.6	
800.0000	0.873	−29.1	1.931	137.1	0.136	64.2	0.875	−28.4	
900.0000	0.845	−33.3	1.996	133.2	0.148	61.7	0.851	−31.2	
1000.0000	0.827	−35.8	1.900	129.5	0.158	59.8	0.832	−34.1	
1100.0000	0.799	−40.3	1.963	125.6	0.170	57.6	0.806	−36.4	
1200.0000	0.776	−43.4	1.944	121.7	0.179	55.7	0.781	−38.8	
1300.0000	0.753	−46.8	1.909	118.0	0.189	54.3	0.761	−41.1	
1400.0000	0.718	−50.7	1.936	114.1	0.196	52.7	0.736	−43.1	
1500.0000	0.695	−53.4	1.870	110.7	0.205	50.9	0.719	−45.4	
1600.0000	0.663	−57.1	1.878	107.2	0.211	49.7	0.698	−47.0	
1700.0000	0.634	−60.0	1.849	104.0	0.215	48.5	0.677	−48.9	
1800.0000	0.609	−62.8	1.810	100.6	0.222	47.3	0.658	−50.3	
1900.0000	0.581	−65.7	1.786	97.9	0.227	46.4	0.642	−51.9	
2000.0000	0.554	−69.0	1.773	94.7	0.231	45.8	0.622	−53.4	

 $V_{CE} = 1\text{ V}$, $I_C = 3\text{ mA}$, $Z_O = 50\ \Omega$

FREQUENCY		S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	
100.0000	0.932	−6.3	5.517	168.9	0.019	83.2	0.975	−7.0	
200.0000	0.914	−12.8	5.308	160.7	0.037	79.3	0.951	−13.6	
300.0000	0.881	−18.1	5.147	152.7	0.054	74.7	0.913	−19.1	
400.0000	0.833	−25.4	5.209	145.3	0.067	70.9	0.857	−24.5	
500.0000	0.797	−29.6	4.893	139.4	0.080	67.7	0.819	−28.7	
600.0000	0.737	−35.8	4.844	133.4	0.092	65.8	0.765	−32.1	
700.0000	0.687	−41.6	4.709	127.6	0.101	63.4	0.720	−35.6	
800.0000	0.636	−46.0	4.495	122.5	0.111	62.2	0.680	−37.8	
900.0000	0.583	−51.0	4.406	117.5	0.118	61.4	0.645	−40.0	
1000.0000	0.541	−54.6	4.184	113.4	0.127	60.5	0.616	−41.8	
1100.0000	0.495	−59.2	4.048	108.6	0.135	59.5	0.587	−43.4	
1200.0000	0.452	−61.8	3.894	104.4	0.143	59.0	0.561	−44.6	
1300.0000	0.420	−65.0	3.693	101.0	0.150	58.2	0.538	−46.0	
1400.0000	0.381	−67.5	3.545	97.1	0.158	58.2	0.517	−47.1	
1500.0000	0.354	−70.0	3.369	94.2	0.165	57.4	0.502	−48.3	
1600.0000	0.325	−71.8	3.227	91.2	0.173	57.5	0.483	−48.9	
1700.0000	0.299	−73.7	3.089	88.6	0.180	57.2	0.469	−49.9	
1800.0000	0.276	−75.3	2.965	85.9	0.187	56.9	0.457	−50.5	
1900.0000	0.254	−77.3	2.842	83.7	0.194	56.8	0.446	−51.3	
2000.0000	0.234	−79.0	2.744	81.2	0.201	56.7	0.434	−52.2	

$V_{CE} = 1 \text{ V}$, $I_C = 5 \text{ mA}$, $Z_o = 50 \Omega$

FREQUENCY		S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	
100.0000	0.867	−9.9	8.234	165.2	0.018	83.2	0.957	−9.0	
200.0000	0.834	−19.0	7.897	155.1	0.035	77.1	0.911	−17.3	
300.0000	0.782	−25.7	7.518	145.9	0.050	72.5	0.847	−23.7	
400.0000	0.713	−34.0	7.443	137.5	0.062	69.7	0.776	−28.9	
500.0000	0.655	−39.7	6.901	130.7	0.073	66.9	0.723	−32.6	
600.0000	0.576	−46.5	6.572	123.6	0.083	66.2	0.664	−35.4	
700.0000	0.514	−52.3	6.182	117.3	0.092	64.6	0.618	−37.9	
800.0000	0.458	−56.2	5.737	112.1	0.100	64.0	0.579	−39.3	
900.0000	0.410	−59.9	5.382	107.5	0.109	63.2	0.547	−40.8	
1000.0000	0.369	−62.7	5.014	103.5	0.116	63.5	0.522	−41.8	
1100.0000	0.335	−65.8	4.692	99.8	0.125	62.8	0.499	−42.8	
1200.0000	0.303	−67.2	4.411	96.3	0.134	63.2	0.479	−43.5	
1300.0000	0.276	−69.6	4.134	93.3	0.141	62.4	0.459	−44.4	
1400.0000	0.251	−71.0	3.902	90.4	0.149	62.7	0.444	−45.1	
1500.0000	0.229	−72.5	3.681	87.9	0.159	62.1	0.431	−45.9	
1600.0000	0.210	−73.7	3.493	85.3	0.167	62.0	0.420	−46.2	
1700.0000	0.191	−74.4	3.326	83.0	0.174	61.6	0.409	−46.8	
1800.0000	0.174	−75.1	3.175	80.8	0.182	61.3	0.399	−47.5	
1900.0000	0.159	−76.8	3.035	78.7	0.190	61.0	0.392	−48.0	
2000.0000	0.144	−78.3	2.915	76.7	0.198	60.7	0.384	−48.7	

$V_{CE} = 1 \text{ V}$, $I_C = 7 \text{ mA}$, $Z_o = 50 \Omega$

FREQUENCY		S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	
100.0000	0.793	−15.0	10.022	161.8	0.018	80.9	0.938	−10.4	
200.0000	0.737	−27.5	9.509	149.4	0.034	76.0	0.875	−19.6	
300.0000	0.661	−36.5	8.774	139.2	0.047	71.5	0.796	−26.1	
400.0000	0.574	−44.7	8.493	130.0	0.058	68.7	0.716	−31.0	
500.0000	0.517	−50.7	7.755	122.7	0.069	67.4	0.660	−33.9	
600.0000	0.446	−56.1	7.177	116.0	0.077	66.5	0.601	−36.0	
700.0000	0.395	−60.3	6.636	110.4	0.086	65.8	0.559	−37.8	
800.0000	0.348	−63.2	6.072	105.9	0.095	65.9	0.524	−38.7	
900.0000	0.311	−66.1	5.617	102.0	0.104	65.7	0.497	−39.7	
1000.0000	0.278	−68.0	5.189	98.4	0.112	66.0	0.476	−40.1	
1100.0000	0.251	−70.3	4.824	95.1	0.121	65.3	0.457	−40.9	
1200.0000	0.227	−71.3	4.499	92.0	0.129	65.4	0.442	−41.1	
1300.0000	0.204	−73.4	4.203	89.4	0.138	65.3	0.426	−42.0	
1400.0000	0.185	−74.0	3.963	86.7	0.146	64.8	0.413	−42.7	
1500.0000	0.167	−75.7	3.722	84.3	0.155	64.6	0.404	−43.1	
1600.0000	0.151	−76.3	3.525	82.1	0.163	64.5	0.395	−43.7	
1700.0000	0.135	−77.1	3.345	80.1	0.172	64.0	0.385	−44.0	
1800.0000	0.122	−77.5	3.191	77.8	0.180	63.6	0.377	−44.6	
1900.0000	0.108	−78.9	3.042	76.0	0.190	63.2	0.371	−45.2	
2000.0000	0.097	−81.0	2.913	74.1	0.197	62.9	0.365	−46.1	

$V_{CE} = 2 \text{ V}$, $I_C = 1 \text{ mA}$, $Z_o = 50 \Omega$

FREQUENCY		S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	
100.0000	0.982	−3.3	2.003	173.6	0.018	84.7	0.996	−3.6	
200.0000	0.985	−6.8	1.935	168.2	0.036	83.0	0.993	−7.4	
300.0000	0.977	−9.8	1.940	162.7	0.052	80.2	0.983	−10.5	
400.0000	0.960	−13.9	2.017	157.1	0.069	76.3	0.964	−14.4	
500.0000	0.952	−16.7	1.946	152.1	0.085	73.9	0.955	−17.4	
600.0000	0.925	−20.7	1.993	147.7	0.099	71.0	0.932	−20.4	
700.0000	0.908	−24.1	1.957	143.2	0.113	68.0	0.913	−23.8	
800.0000	0.884	−27.3	1.942	138.8	0.126	65.9	0.888	−26.5	
900.0000	0.859	−31.1	2.004	135.0	0.137	63.8	0.865	−29.2	
1000.0000	0.840	−33.5	1.911	131.4	0.147	61.6	0.847	−32.0	
1100.0000	0.815	−37.8	1.973	127.7	0.159	59.3	0.822	−34.1	
1200.0000	0.795	−40.5	1.951	124.0	0.168	57.8	0.803	−36.4	
1300.0000	0.772	−44.0	1.928	120.4	0.177	56.1	0.782	−38.4	
1400.0000	0.741	−47.4	1.956	116.7	0.184	54.6	0.758	−40.4	
1500.0000	0.716	−50.2	1.889	113.2	0.193	53.0	0.743	−42.6	
1600.0000	0.689	−53.5	1.896	109.8	0.198	51.6	0.719	−44.1	
1700.0000	0.659	−56.4	1.873	106.7	0.204	50.5	0.699	−45.9	
1800.0000	0.635	−59.0	1.835	103.4	0.210	49.6	0.681	−47.4	
1900.0000	0.606	−61.6	1.815	100.7	0.215	48.8	0.666	−48.8	
2000.0000	0.581	−64.7	1.801	97.6	0.220	48.0	0.647	−50.4	

 $V_{CE} = 2 \text{ V}$, $I_C = 3 \text{ mA}$, $Z_o = 50 \Omega$

FREQUENCY		S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	
100.0000	0.933	-5.7	5.575	170.0	0.017	84.9	0.979	-6.3	
200.0000	0.922	-11.6	5.330	161.5	0.033	79.6	0.959	-12.5	
300.0000	0.893	-16.6	5.178	154.0	0.049	75.2	0.924	-17.5	
400.0000	0.851	-23.1	5.267	146.8	0.062	72.2	0.874	-22.6	
500.0000	0.815	-27.0	4.943	141.1	0.074	69.1	0.838	-26.4	
600.0000	0.759	-32.9	4.915	135.2	0.086	67.6	0.787	-29.6	
700.0000	0.713	-38.0	4.769	129.6	0.095	65.0	0.745	-33.0	
800.0000	0.664	-42.0	4.578	124.5	0.104	63.8	0.706	-35.0	
900.0000	0.612	-46.6	4.507	119.7	0.112	63.0	0.673	-37.0	
1000.0000	0.572	-49.9	4.285	115.6	0.120	61.9	0.645	-38.9	
1100.0000	0.525	-54.0	4.163	111.0	0.128	61.1	0.617	-40.3	
1200.0000	0.485	-56.5	4.009	106.8	0.136	60.8	0.593	-41.4	
1300.0000	0.452	-59.2	3.814	103.4	0.143	60.2	0.569	-43.0	
1400.0000	0.413	-61.5	3.672	99.6	0.150	59.9	0.548	-43.9	
1500.0000	0.385	-63.5	3.499	96.7	0.157	59.5	0.532	-44.9	
1600.0000	0.356	-64.9	3.349	93.6	0.164	59.1	0.517	-45.6	
1700.0000	0.330	-66.4	3.213	90.9	0.172	58.7	0.501	-46.4	
1800.0000	0.307	-67.7	3.079	88.2	0.178	58.6	0.488	-47.2	
1900.0000	0.286	-69.2	2.959	85.9	0.185	58.4	0.478	-47.8	
2000.0000	0.265	-70.4	2.863	83.5	1.193	58.2	0.464	-48.6	

$V_{CE} = 2\text{ V}$, $I_C = 5\text{ mA}$, $Z_o = 50\ \Omega$

FREQUENCY		S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	
100.0000	0.885	−8.3	8.518	167.7	0.017	82.5	0.964	−8.1	
200.0000	0.859	−15.7	8.125	157.0	0.032	78.3	0.926	−15.6	
300.0000	0.811	−22.2	7.721	148.0	0.046	73.6	0.868	−21.4	
400.0000	0.742	−30.3	7.619	139.7	0.057	71.7	0.801	−26.5	
500.0000	0.689	−35.3	7.082	132.9	0.068	68.6	0.752	−30.0	
600.0000	0.612	−41.5	6.779	125.8	0.077	67.5	0.696	−32.3	
700.0000	0.550	−46.7	6.401	119.7	0.086	66.1	0.650	−34.9	
800.0000	0.495	−50.2	5.962	114.6	0.094	65.7	0.612	−36.2	
900.0000	0.446	−53.7	5.613	109.9	0.102	65.0	0.581	−37.6	
1000.0000	0.406	−55.9	5.244	105.8	0.111	64.6	0.557	−38.5	
1100.0000	0.369	−58.4	4.918	101.9	0.118	64.6	0.534	−39.7	
1200.0000	0.337	−59.5	4.631	98.5	0.127	64.6	0.515	−40.2	
1300.0000	0.310	−61.3	4.346	95.5	0.134	64.1	0.495	−41.0	
1400.0000	0.285	−61.9	4.103	92.6	0.142	64.0	0.481	−41.6	
1500.0000	0.263	−63.2	3.875	90.0	0.150	63.7	0.467	−42.3	
1600.0000	0.244	−63.4	3.680	87.4	0.157	63.4	0.456	−42.6	
1700.0000	0.225	−63.7	3.502	85.1	0.165	63.3	0.446	−43.3	
1800.0000	0.210	−63.8	3.338	83.0	0.172	62.7	0.435	−43.7	
1900.0000	0.193	−64.7	3.193	80.9	0.181	62.5	0.427	−44.2	
2000.0000	0.178	−64.8	3.064	78.9	0.188	62.3	0.419	−45.0	

$V_{CE} = 2\text{ V}$, $I_C = 7\text{ mA}$, $Z_o = 50\ \Omega$

FREQUENCY		S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	
100.0000	0.836	−10.5	11.040	165.5	0.016	82.0	0.952	−9.4	
200.0000	0.794	−19.7	10.358	153.3	0.031	77.4	0.897	−17.6	
300.0000	0.731	−27.4	9.657	143.3	0.043	73.3	0.825	−23.4	
400.0000	0.645	−36.2	9.225	133.7	0.053	71.2	0.751	−28.2	
500.0000	0.579	−41.6	8.418	126.3	0.063	69.1	0.696	−31.0	
600.0000	0.500	−47.0	7.759	119.3	0.073	68.1	0.640	−32.9	
700.0000	0.440	−51.4	7.124	113.3	0.081	67.5	0.598	−34.6	
800.0000	0.393	−54.0	6.499	108.6	0.089	67.2	0.564	−35.3	
900.0000	0.352	−56.3	6.003	104.4	0.097	67.0	0.537	−36.4	
1000.0000	0.319	−57.7	5.536	100.8	0.105	67.1	0.517	−36.8	
1100.0000	0.290	−59.5	5.135	97.3	0.114	67.0	0.496	−37.7	
1200.0000	0.265	−59.6	4.801	94.4	0.122	67.0	0.482	−37.8	
1300.0000	0.242	−61.1	4.484	91.6	0.130	66.5	0.465	−38.6	
1400.0000	0.223	−61.2	4.221	89.0	0.138	66.8	0.456	−39.0	
1500.0000	0.204	−62.1	3.974	86.5	0.147	66.1	0.443	−39.7	
1600.0000	0.189	−61.7	3.760	84.3	0.154	65.7	0.435	−40.1	
1700.0000	0.175	−61.5	3.565	82.3	0.163	65.4	0.426	−40.5	
1800.0000	0.162	−60.6	3.393	80.2	0.171	65.1	0.418	−41.0	
1900.0000	0.148	−60.8	3.248	78.3	0.179	64.7	0.411	−41.4	
2000.0000	0.137	−60.9	3.106	76.6	0.187	64.5	0.406	−42.1	

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Anti-radioactive design is not implemented in this product.