

## HIGH FREQUENCY LOW NOISE AMPLIFIER

## NPN SILICON EPITAXIAL TRANSISTOR

## 4 PINS SUPER MINI MOLD

### FEATURES

- Small Package
- High Gain Bandwidth Product ( $f_T = 12 \text{ GHz TYP.}$ )
- Low Noise, High Gain
- Low Voltage Operation

### ORDERING INFORMATION

PART NUMBER	QUANTITY	PACKING STYLE
2SC5014-T1	3 Kpcs/Reel.	Embossed tape 8 mm wide. Pin3 (Base), Pin4 (Emitter) face to perforation side of the tape.
2SC5014-T2	3 Kpcs/Reel.	Embossed tape 8 mm wide. Pin1 (Collector), Pin2 (Emitter) face to perforation side of the tape.

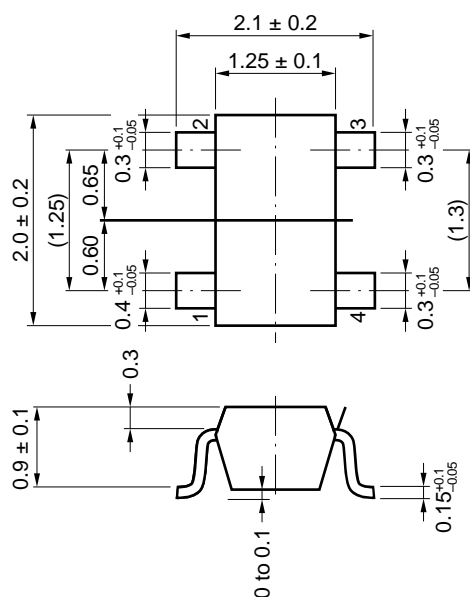
\* Please contact with responsible NEC person, if you require evaluation sample. Unit sample quantity shall be 50 pcs.  
(Part No.: 2SC5014)

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

Collector to Base Voltage	$V_{CB0}$	9	V
Collector to Emitter Voltage	$V_{CE0}$	6	V
Emitter to Base Voltage	$V_{EB0}$	2	V
Collector Current	$I_C$	10	mA
Total Power Dissipation	$P_T$	60	mW
Junction Temperature	$T_j$	150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-65 to +150	$^\circ\text{C}$

### PACKAGE DIMENSIONS

in millimeters



### PIN CONNECTIONS

1. Collector
2. Emitter
3. Base
4. Emitter

Caution; Electrostatic Sensitive Device.

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

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Collector Cutoff Current	I <sub>CB0</sub>			0.1	μA	V <sub>CB</sub> = 5 V, I <sub>E</sub> = 0
Emitter Cutoff Current	I <sub>EB0</sub>			0.1	μA	V <sub>EB</sub> = 1 V, I <sub>C</sub> = 0
DC Current Gain	h <sub>FE</sub>	75		150		V <sub>CE</sub> = 3 V, I <sub>C</sub> = 5 mA* <sup>1</sup>
Gain Bandwidth Product	f <sub>T</sub>		12		GHz	V <sub>CE</sub> = 3 V, I <sub>C</sub> = 5 mA
Feed-back Capacitance	C <sub>re</sub>		0.2	0.4	pF	V <sub>CB</sub> = 3 V, I <sub>E</sub> = 0, f = 1 MHz* <sup>2</sup>
Insertion Power Gain	S <sub>21e</sub>   <sup>2</sup>	9	11		dB	V <sub>CE</sub> = 3 V, I <sub>C</sub> = 5 mA, f = 2.0 GHz
Noise Figure	NF		2.5	4.0	dB	V <sub>CE</sub> = 3 V, I <sub>C</sub> = 3 mA, f = 2.0 GHz

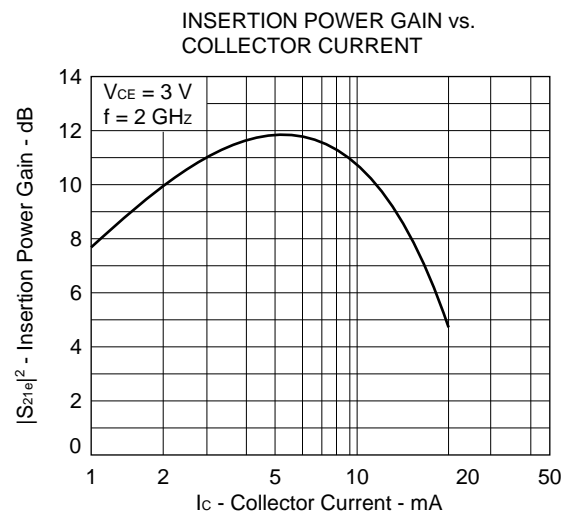
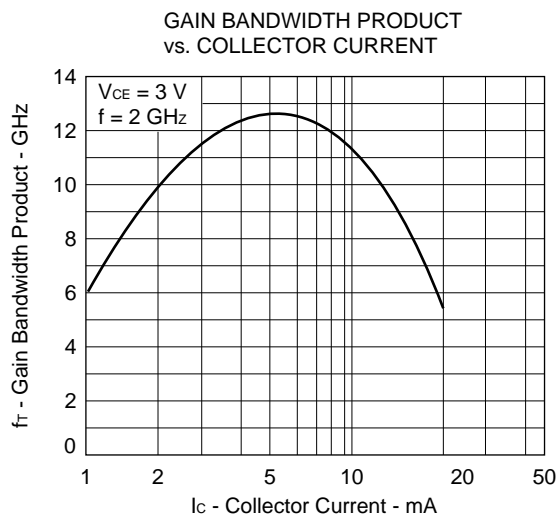
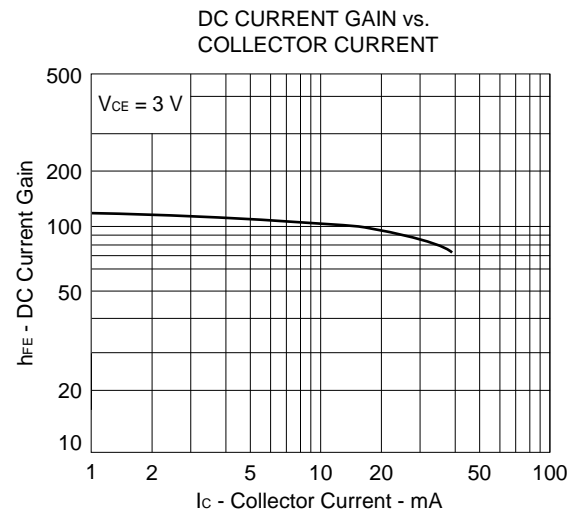
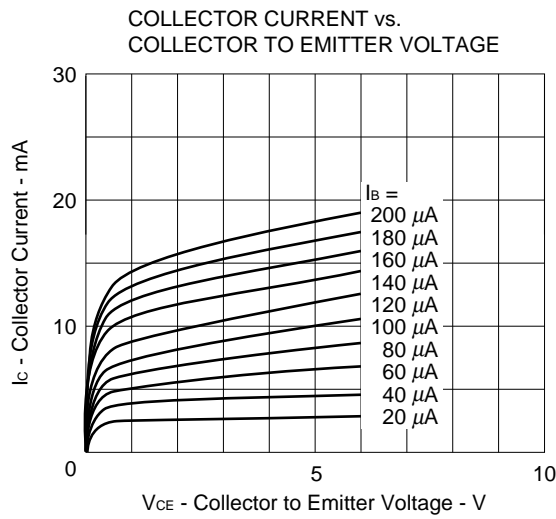
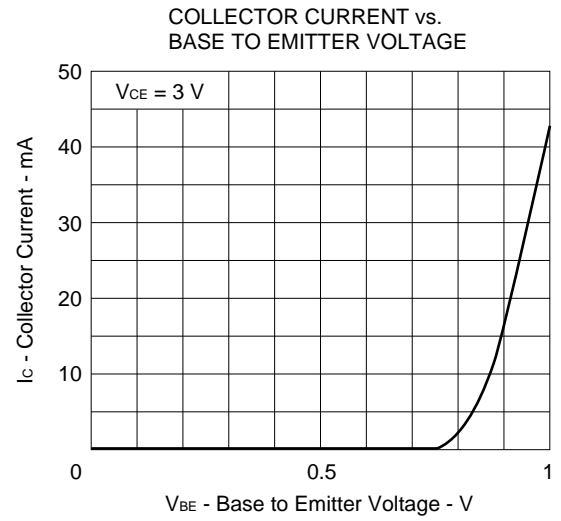
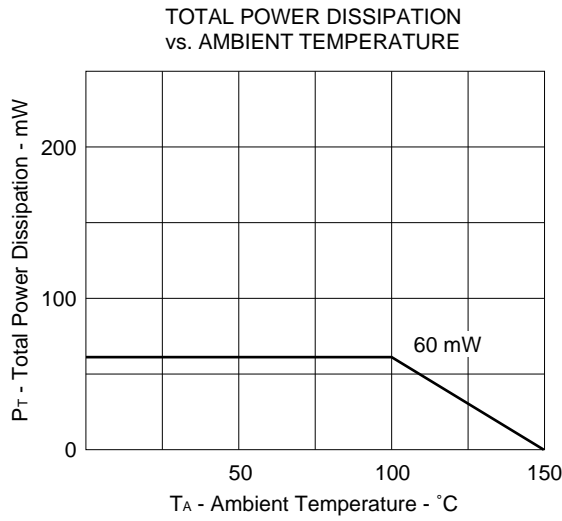
\*1 Pulse Measurement; PW ≤ 350 μs, Duty Cycle ≤ 2 % Pulsed.

\*2 Measured with 3 terminals bridge, Emitter and Case should be grounded.

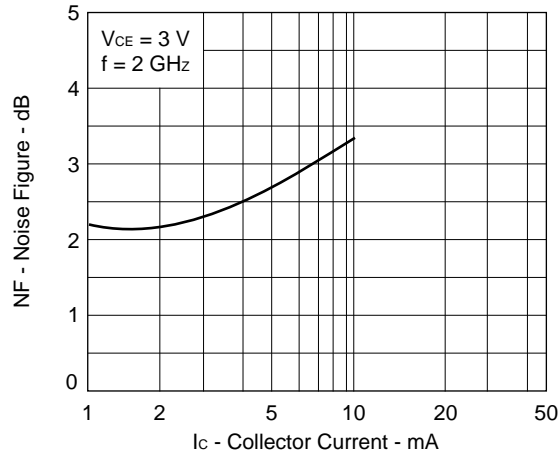
**h<sub>FE</sub> Classification**

Rank	KB
Marking	T82
h <sub>FE</sub>	75 to 150

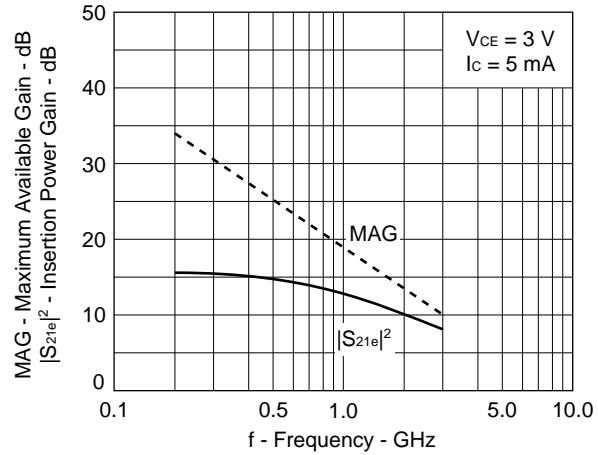
TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ )



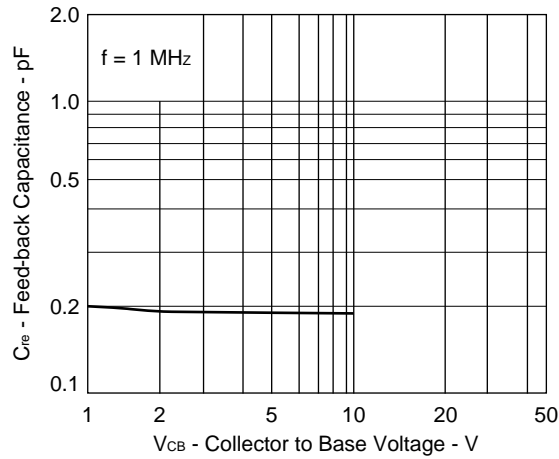
NOISE FIGURE vs.  
COLLECTOR CURRENT



INSERTION POWER GAIN/MAXIMUM  
AVAILABLE GAIN vs. FREQUENCY



FEED BACK CAPACITANCE vs.  
COLLECTOR TO BASE VOLTAGE



**S-PARAMETER** $V_{CE} = 3\text{ V}$ ,  $I_C = 5\text{ mA}$ 

FREQUENCY f (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	.823	-8.8	11.035	169.7	.009	88.8	.985	-5.7
200.00	.793	-18.1	10.640	159.5	.020	84.1	.957	-11.0
300.00	.749	-26.0	10.141	150.5	.033	72.2	.930	-15.8
400.00	.695	-33.0	9.390	142.2	.042	73.5	.885	-20.1
500.00	.635	-39.4	8.859	134.0	.049	68.9	.842	-23.8
600.00	.590	-45.4	8.274	127.8	.055	63.7	.795	-26.8
700.00	.539	-51.0	7.737	121.6	.059	64.9	.761	-29.5
800.00	.498	-55.5	7.130	116.0	.069	60.0	.720	-32.3
900.00	.448	-59.6	6.637	111.1	.073	60.3	.685	-33.3
1000.00	.410	-63.7	6.241	106.5	.078	58.1	.666	-34.7
1100.00	.374	-67.3	5.816	102.6	.079	56.9	.638	-36.7
1200.00	.340	-70.7	5.403	98.4	.084	58.3	.619	-38.1
1300.00	.306	-74.1	5.119	95.1	.094	57.5	.591	-39.6
1400.00	.285	-77.1	4.838	91.6	.094	56.5	.577	-40.9
1500.00	.249	-80.7	4.587	88.1	.102	55.4	.556	-42.0
1600.00	.230	-82.9	4.351	85.2	.110	54.0	.544	-43.2
1700.00	.211	-90.3	4.155	82.8	.110	54.5	.520	-44.4
1800.00	.189	-93.1	3.961	79.7	.116	52.7	.520	-46.1
1900.00	.180	-93.5	3.780	77.3	.123	51.6	.508	-47.4
2000.00	.160	-101.3	3.645	74.1	.124	50.4	.505	-49.4
2100.00	.132	-103.4	3.473	71.8	.126	51.8	.485	-50.7
2200.00	.116	-113.9	3.340	68.6	.139	50.2	.477	-51.6
2300.00	.112	-115.1	3.199	67.1	.140	50.2	.481	-52.4
2400.00	.091	-121.2	3.095	64.8	.148	48.0	.452	-53.5
2500.00	.082	-127.8	2.992	62.1	.148	50.0	.451	-55.5
2600.00	.078	-138.4	2.896	59.8	.157	45.7	.451	-55.1
2700.00	.070	-147.3	2.779	58.7	.166	45.5	.452	-58.6
2800.00	.076	-149.6	2.719	55.5	.163	44.2	.446	-61.7
2900.00	.065	-158.2	2.614	54.0	.164	45.8	.431	-61.1
3000.00	.072	-165.5	2.532	51.4	.173	42.6	.432	-64.4

 $V_{CE} = 3\text{ V}$ ,  $I_C = 3\text{ mA}$ 

FREQUENCY f (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	.884	-6.6	8.068	172.0	.011	93.9	.992	-4.4
200.00	.860	-14.2	7.892	163.8	.024	80.0	.977	-9.0
300.00	.834	-20.5	7.693	156.3	.032	80.2	.958	-13.3
400.00	.796	-26.7	7.283	149.2	.042	76.9	.925	-17.0
500.00	.748	-32.8	7.076	141.6	.052	67.6	.895	-21.1
600.00	.717	-38.2	6.761	136.1	.058	67.4	.862	-24.5
700.00	.669	-43.8	6.499	129.9	.070	63.3	.836	-26.7
800.00	.628	-48.0	6.091	124.2	.073	59.3	.793	-30.8
900.00	.578	52.7	5.764	119.2	.083	60.1	.762	-32.5
1000.00	.536	-56.1	5.505	114.4	.092	56.6	.743	-35.1
1100.00	.500	-61.3	5.203	110.3	.097	56.4	.712	-36.7
1200.00	.468	-64.2	4.885	105.5	.100	55.4	.691	-38.3
1300.00	.431	-68.0	4.675	101.9	.100	54.5	.657	-40.0
1400.00	.399	-72.0	4.449	98.1	.108	53.8	.645	-42.5
1500.00	.366	-75.4	4.243	94.4	.113	51.2	.615	-44.0
1600.00	.338	-78.3	4.047	91.0	.116	51.6	.599	-45.4
1700.00	.318	-82.5	3.904	88.5	.122	50.7	.578	-46.7
1800.00	.285	-86.3	3.719	84.9	.120	48.6	.572	-48.2
1900.00	.267	-87.6	3.566	82.3	.133	47.7	.556	-49.2
2000.00	.247	-94.1	3.456	79.0	.137	44.6	.552	-52.5
2100.00	.217	-96.8	3.295	76.4	.142	48.1	.531	-53.6
2200.00	.203	-100.7	3.179	73.0	.142	44.9	.525	-54.4
2300.00	.190	-105.0	3.068	71.1	.146	44.0	.518	-54.8
2400.00	.167	-105.7	2.958	68.5	.147	42.7	.492	-56.1
2500.00	.160	-112.6	2.883	65.9	.159	42.0	.492	-58.4
2600.00	.140	-120.1	2.772	63.4	.162	43.1	.481	-58.7
2700.00	.134	-123.6	2.690	61.9	.161	43.7	.470	-61.6
2800.00	.130	-125.1	2.621	58.8	.169	38.4	.472	-64.0
2900.00	.128	-133.0	2.523	57.0	.173	41.4	.468	-64.0
3000.00	.108	-132.3	2.453	54.2	.175	39.1	.461	-67.8

**S-PARAMETER** $V_{CE} = 3\text{ V}$ ,  $I_C = 1\text{ mA}$ 

FREQUENCY f (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	.958	-4.1	3.306	175.2	.012	90.6	.993	-2.6
200.00	.949	-8.4	3.287	170.0	.026	83.1	.990	-5.6
300.00	.940	-12.0	3.275	165.4	.039	83.7	.993	-8.3
400.00	.925	-16.2	3.205	160.8	.046	78.7	.976	-11.2
500.00	.908	-20.4	3.226	155.1	.055	74.7	.971	-14.3
600.00	.900	-24.1	3.182	151.3	.069	74.6	.960	-16.9
700.00	.879	-28.2	3.185	146.4	.079	68.4	.951	-19.4
800.00	.860	-31.9	3.100	141.5	.090	65.7	.930	-23.1
900.00	.822	-36.0	3.045	137.0	.100	65.1	.907	-25.2
1000.00	.811	-39.4	3.015	132.6	.110	61.9	.904	-27.4
1100.00	.782	-43.3	2.944	128.6	.115	57.3	.879	-30.1
1200.00	.749	-47.4	2.859	123.5	.127	57.3	.865	-32.8
1300.00	.722	-50.7	2.822	119.8	.130	54.9	.838	-35.0
1400.00	.694	-54.3	2.750	115.7	.141	50.6	.827	-38.1
1500.00	.663	-58.1	2.700	111.3	.145	50.5	.802	-39.6
1600.00	.641	-61.5	2.600	107.3	.155	47.1	.788	-41.8
1700.00	.616	-65.3	2.595	104.6	.158	45.3	.763	-44.3
1800.00	.580	-68.5	2.521	100.4	.163	42.4	.755	-46.3
1900.00	.562	-72.3	2.450	97.2	.165	40.2	.728	-48.5
2000.00	.531	-76.8	2.424	93.1	.172	39.6	.721	-51.1
2100.00	.498	-77.9	2.340	90.0	.180	38.4	.706	-53.3
2200.00	.470	-81.7	2.291	85.9	.185	35.7	.695	-55.0
2300.00	.453	-84.7	2.232	83.5	.181	33.9	.673	-56.5
2400.00	.419	-86.6	2.158	80.1	.188	32.4	.654	-57.9
2500.00	.404	-92.0	2.134	77.2	.191	32.8	.652	-60.2
2600.00	.372	-95.0	2.063	73.8	.192	31.7	.632	-60.0
2700.00	.366	-97.8	2.016	72.4	.190	31.6	.612	-63.1
2800.00	.355	-101.0	1.990	68.6	.189	29.4	.620	-66.5
2900.00	.340	-104.6	1.920	66.2	.196	28.2	.611	-66.7
3000.00	.316	-107.2	1.907	62.9	.204	26.9	.599	-70.0

[MEMO]

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