

**NEC**

**SILICON TRANSISTOR**  
**2SC5015**

**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

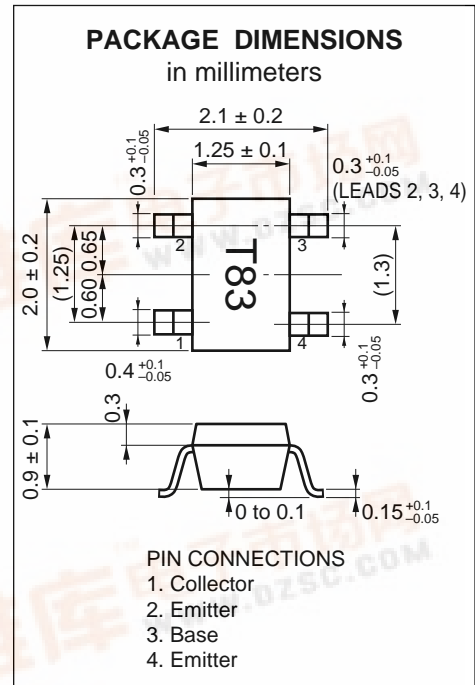
**ORDERING INFORMATION**

PART NUMBER	QUANTITY	PACKING STYLE
2SC5015-T1	3 Kpcs/Reel.	Embossed tape 8 mm wide. Pin3 (Base), Pin4 (Emitter) face to perforation side of the tape.
2SC5015-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 ( $T_A = 25 \text{ }^\circ\text{C}$ )**

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



**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> = 10 mA <sup>*1</sup>
Gain Bandwidth Product	f <sub>T</sub>		12		GHz	V <sub>CE</sub> = 3 V, I <sub>C</sub> = 10 mA
Feed-back Capacitance	C <sub>re</sub>		0.3	0.5	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> = 10 mA, f = 2.0 GHz
Noise Figure	NF		1.5	2.5	dB	V <sub>CE</sub> = 3 V, I <sub>C</sub> = 3 mA, f = 2.0 GHz

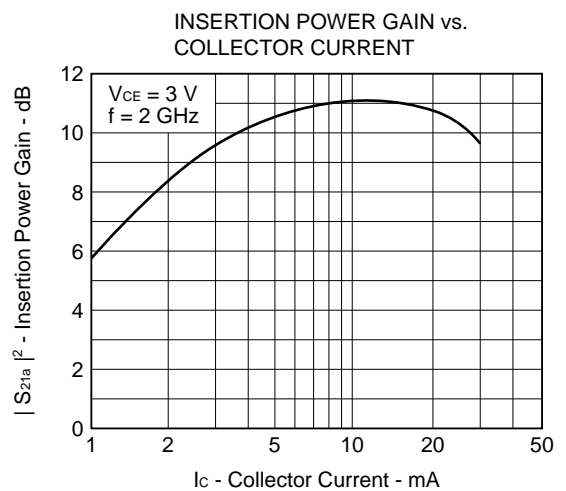
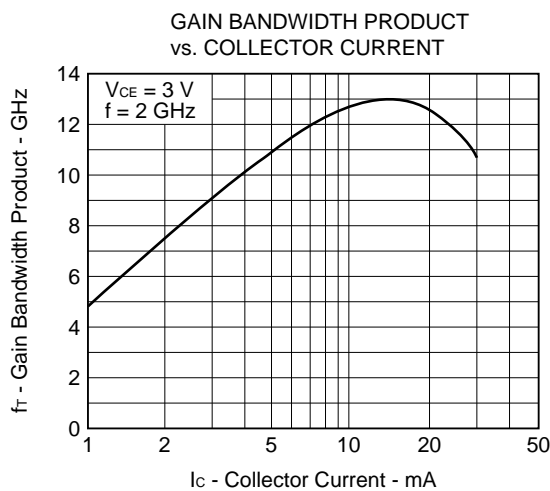
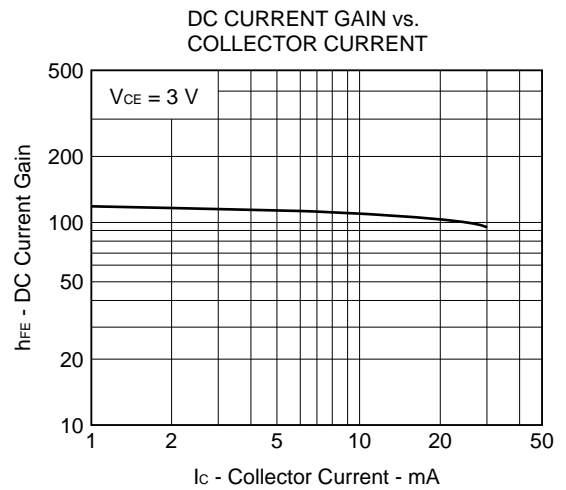
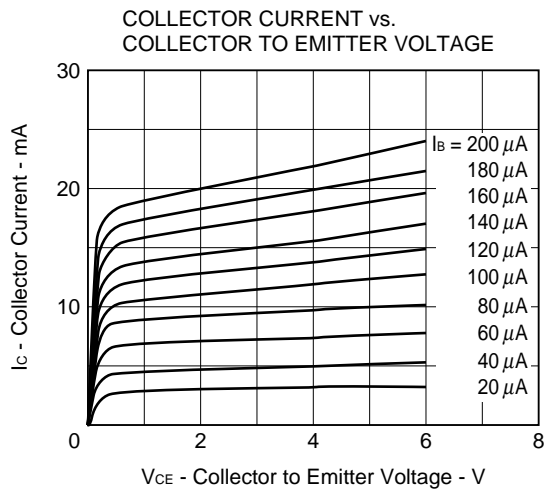
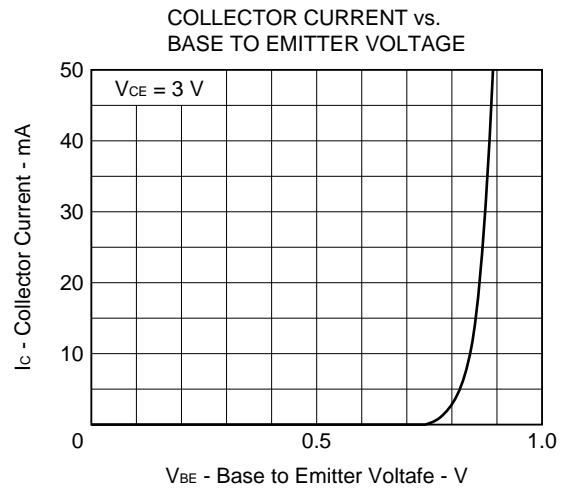
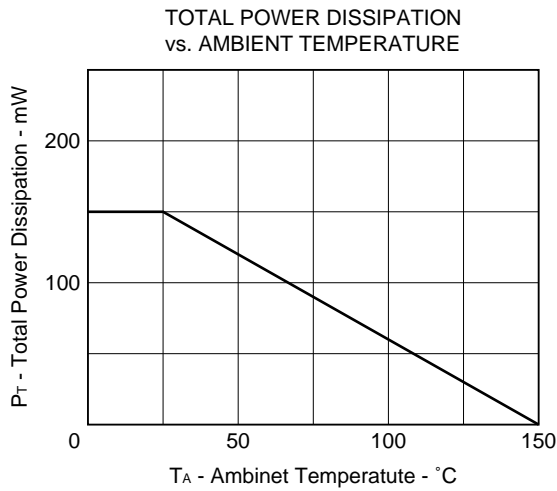
\*1 Pulse Measurement; PW ≤ 350 μs, Duty Cycle ≤ 2 % Pulsed.

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

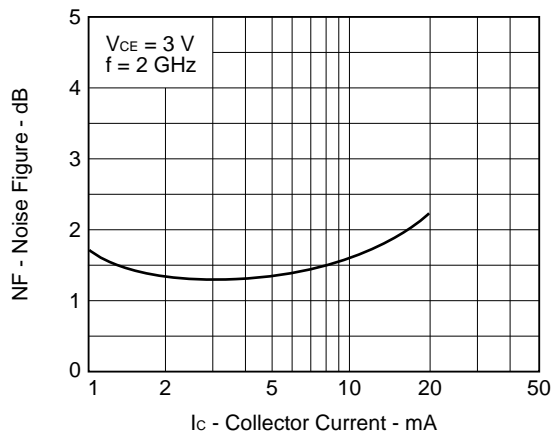
**h<sub>FE</sub> Classification**

Rank	KB
Marking	T83
h <sub>FE</sub>	75 to 150

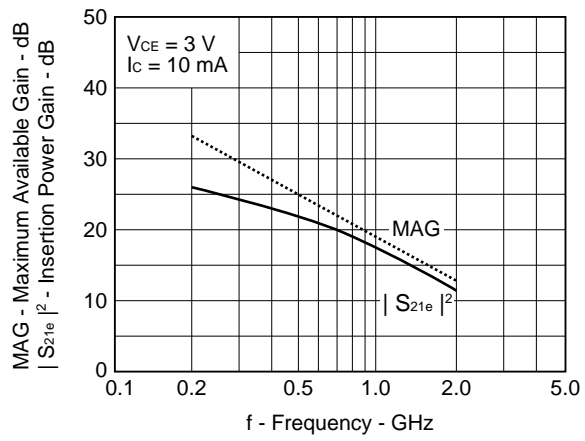
TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ )



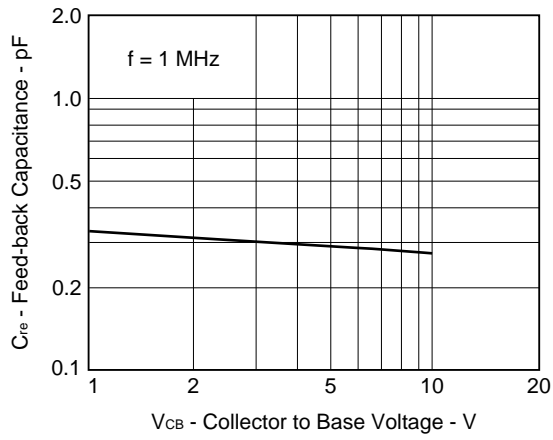
NOISE FIGURE  
vs. COLLECTOR CURRENT



MAXIMUM AVAILABLE GAIN/INSERTION POWER GAIN  
vs. FREQUENCY



FEED-BACK CAPACITANCE vs.  
COLLECTOR TO BASE VOLTAGE



**S-PARAMETER**

V<sub>CE</sub> = 3 V, I<sub>c</sub> = 10 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	.727	-22.0	22.084	159.4	.011	87.5	.934	-13.1
200.00	.640	-42.3	19.220	142.1	.029	70.7	.832	-24.3
300.00	.537	-57.8	16.333	129.2	.041	69.4	.735	-31.7
400.00	.452	-70.0	13.716	119.6	.046	60.9	.642	-35.6
500.00	.374	-82.3	11.834	111.2	.051	59.6	.562	-39.2
600.00	.332	-91.0	10.355	105.6	.060	61.7	.520	-40.7
700.00	.293	-101.5	9.190	100.2	.066	61.0	.479	-42.0
800.00	.255	-109.0	8.182	95.6	.072	61.3	.443	-44.4
900.00	.231	-119.1	7.376	91.9	.076	60.5	.413	-44.0
1000.00	.211	-128.8	6.751	87.9	.086	61.2	.394	-43.9
1100.00	.200	-136.1	6.171	84.9	.095	62.6	.376	-45.7
1200.00	.184	-143.4	5.658	81.7	.099	58.8	.363	-47.1
1300.00	.184	-154.3	5.286	79.0	.103	60.1	.342	-48.3
1400.00	.180	-162.4	4.932	76.2	.111	54.6	.332	-48.3
1500.00	.174	-171.5	4.630	73.3	.115	56.8	.310	-51.6
1600.00	.180	-178.4	4.347	70.9	.123	58.2	.303	-53.2
1700.00	.192	176.8	4.128	68.7	.131	54.1	.292	-51.8
1800.00	.193	169.1	3.914	66.0	.132	55.6	.292	-54.2
1900.00	.191	165.2	3.734	64.0	.139	51.7	.285	-55.3
2000.00	.209	161.0	3.561	61.1	.151	53.8	.281	-60.1
2100.00	.212	154.0	3.386	59.3	.154	51.9	.268	-61.0
2200.00	.219	148.1	3.242	56.7	.165	50.8	.267	-64.1
2300.00	.230	147.0	3.117	54.9	.169	49.2	.259	-63.5
2400.00	.230	141.3	2.986	53.0	.172	51.0	.240	-66.9
2500.00	.243	140.6	2.891	50.2	.186	48.5	.239	-68.9
2600.00	.254	135.8	2.790	48.6	.188	47.7	.249	-67.8
2700.00	.247	135.4	2.703	47.4	.193	47.9	.242	-73.3
2800.00	.251	132.3	2.610	44.0	.203	45.5	.237	-75.5
2900.00	.254	131.9	2.525	42.6	.207	44.0	.232	-77.9
3000.00	.269	123.9	2.435	40.5	.213	42.1	.236	-82.2

V<sub>CE</sub> = 3 V, I<sub>c</sub> = 5 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	.854	-15.0	13.962	166.0	.014	83.0	.966	-9.2
200.00	.795	-29.7	13.063	152.7	.033	76.1	.917	-17.9
300.00	.724	-41.9	11.975	141.5	.046	71.1	.856	-25.0
400.00	.648	-53.1	10.690	132.1	.054	65.0	.785	-30.0
500.00	.569	-63.9	9.702	123.1	.063	62.7	.711	-34.8
600.00	.516	-72.9	8.789	116.6	.070	58.8	.656	-38.4
700.00	.457	-81.9	8.009	110.2	.078	55.8	.611	-40.8
800.00	.411	-88.9	7.240	104.7	.085	54.3	.562	-44.1
900.00	.374	-96.5	6.634	100.2	.094	55.3	.525	-45.7
1000.00	.331	-105.0	6.145	95.6	.095	52.9	.500	-46.6
1100.00	.310	-111.5	5.664	91.9	.102	53.3	.468	-48.0
1200.00	.277	-118.1	5.207	88.1	.108	50.6	.453	-50.0
1300.00	.260	-126.8	4.898	84.8	.112	51.5	.425	-51.2
1400.00	.249	-134.2	4.595	81.6	.119	52.3	.411	-52.6
1500.00	.232	-143.5	4.329	78.3	.121	50.2	.386	-54.8
1600.00	.232	-150.4	4.085	75.4	.133	48.7	.378	-55.2
1700.00	.234	-158.5	3.892	72.7	.134	46.4	.360	-57.5
1800.00	.216	-164.6	3.678	69.8	.140	47.9	.359	-58.6
1900.00	.211	-171.3	3.514	67.6	.145	45.5	.343	-60.4
2000.00	.230	-176.6	3.368	64.5	.151	46.0	.336	-63.1
2100.00	.224	174.1	3.207	62.2	.161	46.4	.319	-64.7
2200.00	.227	168.9	3.064	59.2	.166	45.9	.317	-66.7
2300.00	.229	165.3	2.942	57.3	.168	44.3	.314	-67.4
2400.00	.230	158.8	2.838	55.3	.174	44.3	.291	-68.4
2500.00	.253	156.1	2.742	52.5	.181	42.8	.290	-71.4
2600.00	.250	150.1	2.656	50.7	.184	44.0	.289	-69.8
2700.00	.248	149.2	2.558	49.0	.189	43.8	.281	-74.2
2800.00	.254	145.7	2.484	45.9	.195	40.9	.283	-77.3
2900.00	.262	143.7	2.405	44.2	.203	39.8	.276	-77.7
3000.00	.264	135.7	2.317	41.7	.208	39.4	.294	-83.9

**S-PARAMETER**

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

FREQUENCY

f (MHz)

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	.908	-11.7	9.519	169.3	.020	77.7	.984	-7.3
200.00	.872	-22.9	9.147	158.9	.036	74.3	.951	-13.7
300.00	.825	-33.1	8.721	149.4	.050	68.7	.920	-19.7
400.00	.767	-42.7	8.085	141.0	.061	66.4	.866	-24.9
500.00	.701	-52.2	7.623	132.2	.073	61.0	.813	-30.0
600.00	.656	-61.0	7.104	125.7	.082	57.4	.764	-33.9
700.00	.598	-69.4	6.670	119.0	.088	54.9	.721	-37.3
800.00	.551	-76.2	6.145	113.1	.097	52.4	.671	-41.2
900.00	.494	-84.0	5.719	108.0	.101	51.7	.631	-42.9
1000.00	.458	-90.7	5.371	102.9	.111	49.3	.602	-45.0
1100.00	.422	-97.4	5.005	98.6	.117	47.6	.570	-47.0
1200.00	.388	-104.1	4.642	94.3	.118	46.3	.538	-49.4
1300.00	.356	-110.7	4.396	90.5	.124	45.3	.512	-51.3
1400.00	.341	-117.6	4.148	86.8	.129	42.6	.491	-52.7
1500.00	.318	-124.9	3.933	83.0	.135	44.0	.463	-55.2
1600.00	.305	-132.3	3.713	79.8	.140	43.7	.445	-56.4
1700.00	.291	-140.3	3.563	77.0	.141	42.0	.430	-57.1
1800.00	.282	-145.0	3.382	73.6	.149	42.2	.424	-59.1
1900.00	.269	-151.9	3.234	71.2	.149	41.8	.413	-60.7
2000.00	.277	-160.1	3.108	67.7	.155	41.4	.401	-64.2
2100.00	.262	-167.5	2.956	65.1	.162	40.4	.386	-65.3
2200.00	.255	-172.8	2.838	61.9	.169	38.9	.377	-66.8
2300.00	.260	-177.4	2.722	60.0	.169	38.1	.373	-68.2
2400.00	.249	175.5	2.635	57.5	.173	37.9	.352	-68.1
2500.00	.266	171.8	2.553	54.5	.182	38.2	.351	-71.9
2600.00	.263	164.2	2.459	52.0	.183	36.7	.347	-70.9
2700.00	.270	164.0	2.383	50.6	.192	36.7	.341	-75.1
2800.00	.272	159.9	2.323	47.5	.195	36.4	.337	-79.8
2900.00	.278	155.5	2.241	45.6	.193	34.5	.316	-78.4
3000.00	.272	150.5	2.147	42.7	.200	35.0	.324	-82.3

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

FREQUENCY

f (MHz)

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	.973	-6.3	3.521	173.9	.015	82.1	.991	-3.5
200.00	.959	-13.5	3.484	167.3	.033	83.0	.985	-7.6
300.00	.947	-19.7	3.458	161.2	.055	79.6	.981	-11.3
400.00	.922	-26.2	3.360	155.2	.065	72.2	.962	-14.8
500.00	.898	-32.8	3.348	148.3	.084	69.4	.946	-18.9
600.00	.878	-39.1	3.287	143.3	.100	63.5	.925	-22.5
700.00	.848	-45.9	3.248	137.3	.109	60.2	.909	-25.5
800.00	.822	-51.7	3.136	131.4	.126	56.6	.875	-29.5
900.00	.772	-58.0	3.040	126.1	.134	55.0	.847	-32.4
1000.00	.752	-64.0	2.980	120.9	.150	50.0	.830	-34.6
1100.00	.708	-70.1	2.879	116.1	.158	46.1	.801	-38.1
1200.00	.676	-76.4	2.749	110.5	.163	43.5	.776	-40.7
1300.00	.644	-82.4	2.690	106.0	.172	44.1	.745	-43.5
1400.00	.617	-88.2	2.588	101.4	.176	38.2	.724	-46.8
1500.00	.579	-94.1	2.514	96.8	.181	36.3	.696	-49.2
1600.00	.559	-100.2	2.407	92.4	.186	33.2	.680	-50.2
1700.00	.536	-106.6	2.369	89.1	.188	31.7	.651	-52.6
1800.00	.509	-111.4	2.278	84.9	.191	30.5	.642	-54.9
1900.00	.490	-117.1	2.201	81.5	.192	28.4	.624	-57.0
2000.00	.478	-124.8	2.151	77.0	.195	27.2	.611	-59.7
2100.00	.442	-129.6	2.071	73.5	.198	25.4	.593	-62.2
2200.00	.423	-136.7	2.001	69.4	.201	25.8	.575	-63.7
2300.00	.429	-140.8	1.938	67.1	.203	23.5	.565	-65.5
2400.00	.401	-145.8	1.873	63.8	.202	21.3	.536	-66.3
2500.00	.406	-152.3	1.839	60.3	.204	20.3	.540	-69.0
2600.00	.388	-158.3	1.776	57.3	.201	20.6	.528	-68.7
2700.00	.400	-161.7	1.733	55.3	.204	20.6	.521	-72.7
2800.00	.385	-166.9	1.688	51.3	.203	19.0	.512	-75.5
2900.00	.389	-171.6	1.644	49.3	.201	17.8	.498	-75.6
3000.00	.368	-177.7	1.590	46.0	.209	17.2	.495	-80.4

[MEMO]

**[MEMO]**

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