NEC

SILICON TRANSISTOR
2SC5015

HIGH FREQUENCY LOW NOISE AMPLIFIER
NPN SILICON EPITAXIAL TRANSISTOR
4 PINS SUPER MINI MOLD

FEATURES

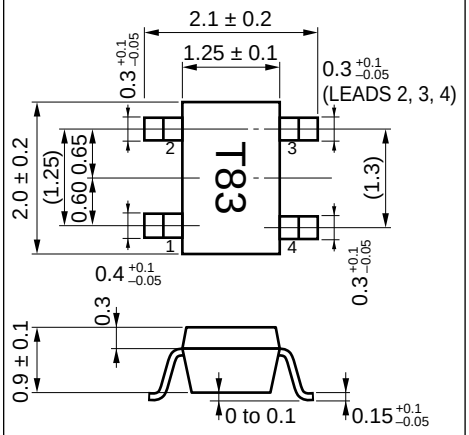
- Small Package
- High Gain Bandwidth Product (f_T = 12 GHz TYP.)
- Low Noise, High Gain
- Low Voltage Operation

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)

PACKAGE DIMENSIONS
in millimeters



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

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C)

Collector to Base Voltage	V_{CBO}	9	V
Collector to Emitter Voltage	V_{CEO}	6	V
Emitter to Base Voltage	V_{EBO}	2	V
Collector Current	I_C	30	mA
Total Power Dissipation	P_T	150	mW
Junction Temperature	T_j	150	°C
Storage Temperature	T_{stg}	–65 to + 150	°C

Caution: Electrostatic Sensitive Device

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ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Collector Cutoff Current	I_{CBO}			0.1	μA	V_{CB} = 5 V, I_E = 0
Emitter Cutoff Current	I_{EBO}			0.1	μA	V_{EB} = 1 V, I_C = 0
DC Current Gain	h_{FE}	75		150		V_{CE} = 3 V, I_C = 10 mA***1**
Gain Bandwidth Product	f_T		12		GHz	V_{CE} = 3 V, I_C = 10 mA
Feed-back Capacitance	C_{re}		0.3	0.5	pF	V_{CB} = 3 V, I_E = 0, f = 1 MHz***2**
Insertion Power Gain	$\|S_{21e}\|^2$	9	11		dB	V_{CE} = 3 V, I_C = 10 mA, f = 2.0 GHz
Noise Figure	NF		1.5	2.5	dB	V_{CE} = 3 V, I_C = 3 mA, f = 2.0 GHz

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

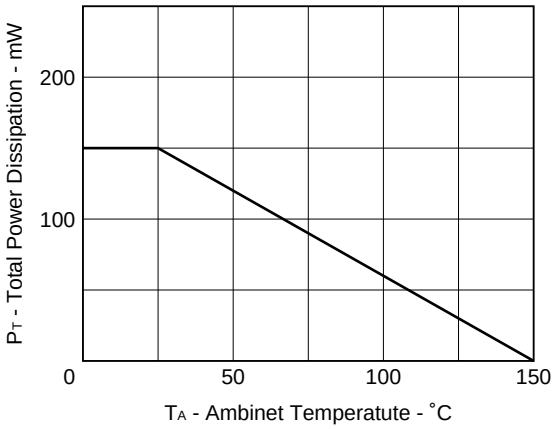
***2** Measured with 3 terminals bridge, Emitter and Case should be grounded.

h_{FE} Classification

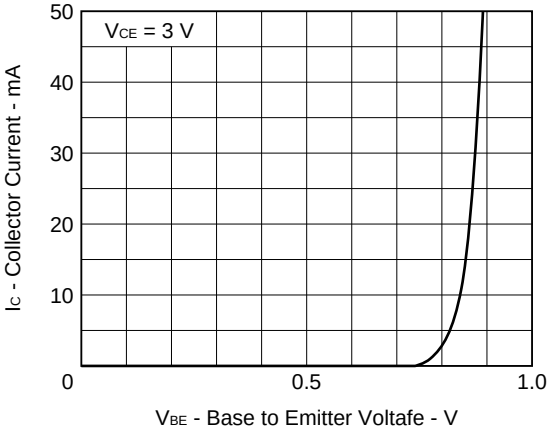
Rank	KB
Marking	T83
h_{FE}	75 to 150

TYPICAL CHARACTERISTICS (T_A = 25 °C)

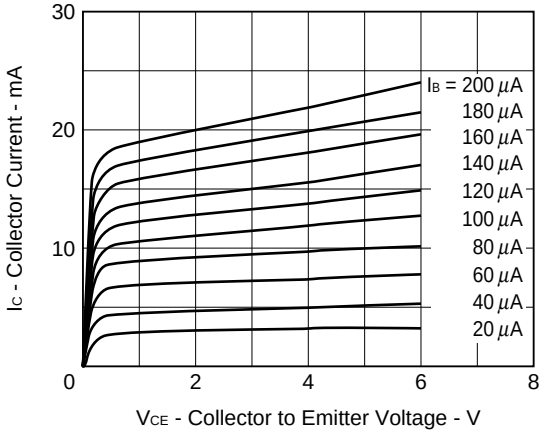
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



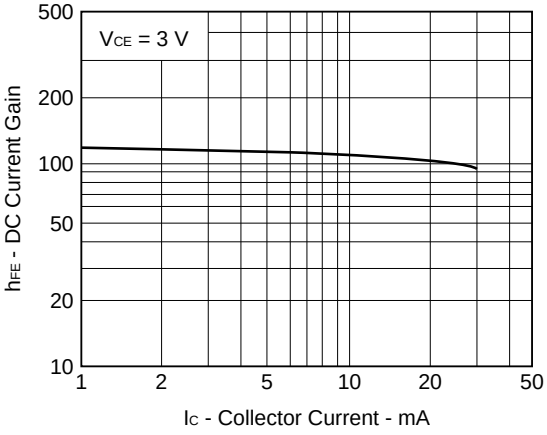
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



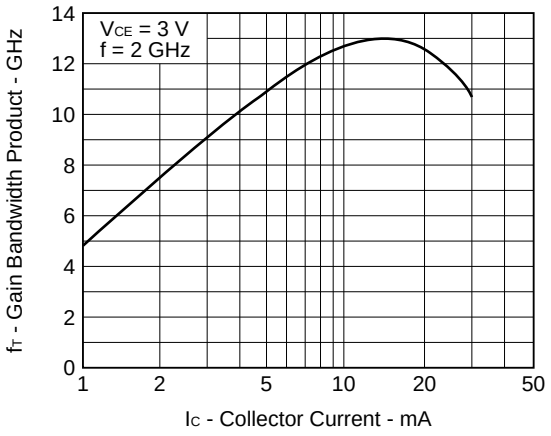
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



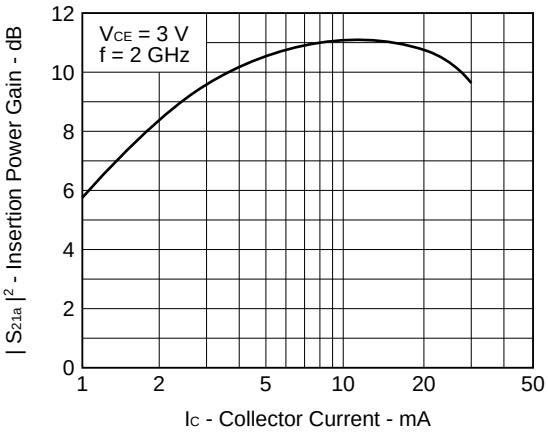
DC CURRENT GAIN vs. COLLECTOR CURRENT



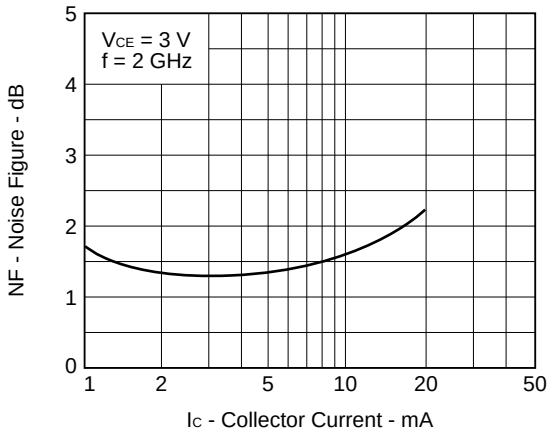
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



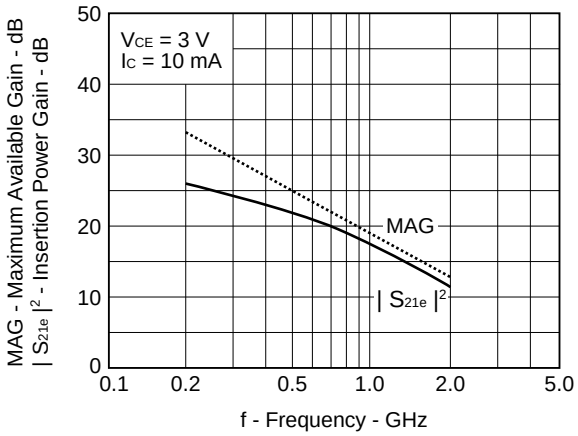
INSERTION POWER GAIN vs. COLLECTOR CURRENT



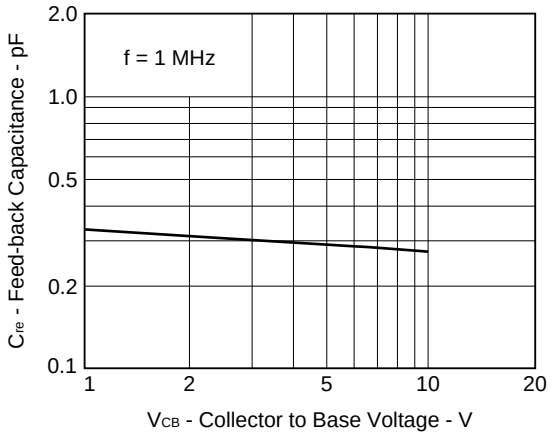
NOISE FIGURE
vs. COLLECTOR CURRENT



MAXIMUM AVAILABLE GAIN/INSERTION POWER GAIN
vs. FREQUENCY



FEED-BACK CAPACITANCE vs.
COLLECTOR TO BASE VOLTAGE



S-PARAMETER

V_{CE} = 3 V, I_C = 10 mA

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}	
f (MHz)	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_{CE} = 3 V, I_C = 5 mA

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}	
f (MHz)	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_{CE} = 3 V, I_C = 3 mA

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}	
f (MHz)	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_{CE} = 3 V, I_C = 1 mA

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}	
f (MHz)	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

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NEC devices are classified into the following three quality grades:

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- Specific: Aircrafts, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems or medical equipment for life support, etc.

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