

MICROWAVE LOW NOISE AMPLIFIER NPN SILICON EPITAXIAL TRANSISTOR SUPER MINI MOLD

DESCRIPTION

The 2SC4187 is designed primarily for use in low voltage and low current application up to UHF band. The 2SC4187 is ideal for pagers, electro-optic detector postamplifier applications, and other battery powered systems. Super mini mold package makes it suitable for use in small type equipments such as HICs.

FEATURES

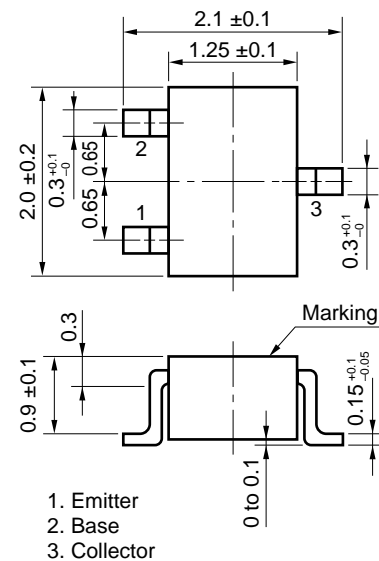
- Low Noise : $NF = 3.0$ dB TYP. @ $V_{CE} = 1$ V, $I_c = 250$ μ A, $f = 1.0$ GHz
- High Gain : $|S_{21e}|^2 = 6.5$ dB TYP. @ $V_{CE} = 1$ V, $I_c = 1$ mA, $f = 1.0$ GHz
- Small Package

ABSOLUTE MAXIMUM RATINGS ($T_A = 25$ °C)

Collector to Base Voltage	V_{CBO}	15	V
Collector to Emitter Voltage	V_{CEO}	8	V
Emitter to Base Voltage	V_{EBO}	2	V
Collector Current	I_c	5	mA
Total Power Dissipation	P_T	50	mW
Junction Temperature	T_j	150	°C
Storage Temperature	T_{stg}	-65 to +150	°C

PACKAGE DIMENSIONS

in millimeters



ELECTRICAL CHARACTERISTICS ($T_A = 25$ °C)

Characteristic	Symbol	MIN.	TYP.	MAX.	Unit	Test Conditions
Collector Cutoff Current	I_{CBO}			0.1	μ A	$V_{CB} = 5$ V, $I_E = 0$
Emitter Cutoff Current	I_{EBO}			0.1	μ A	$V_{EB} = 1$ V, $I_C = 0$
DC Current Gain	h_{FE}	50	100	250		$V_{CE} = 1$ V, $I_c = 250$ μ A, pulsed
Gain Bandwidth Product	f_T		4.0		GHz	$V_{CE} = 1$ V, $I_c = 1$ mA, $f = 1$ GHz
Feedback Capacitance	C_{re}		0.5	0.7	pF	$V_{CB} = 1$ V, $I_E = 0$, $f = 1$ MHz
Insertion Power Gain	$ S_{21e} ^2$	4.0	6.5		dB	$V_{CE} = 1$ V, $I_E = 1$ mA, $f = 1$ GHz
Noise Figure	NF		3.0	4.5	dB	$V_{CE} = 1$ V, $I_c = 250$ μ A, $f = 1$ GHz

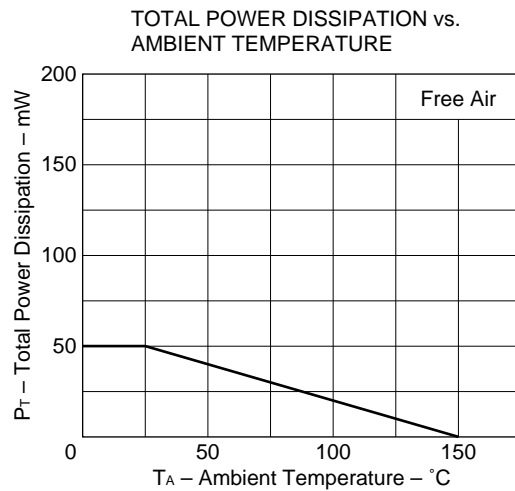
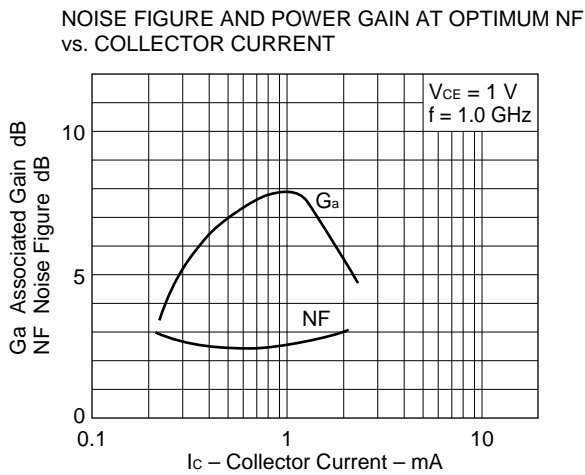
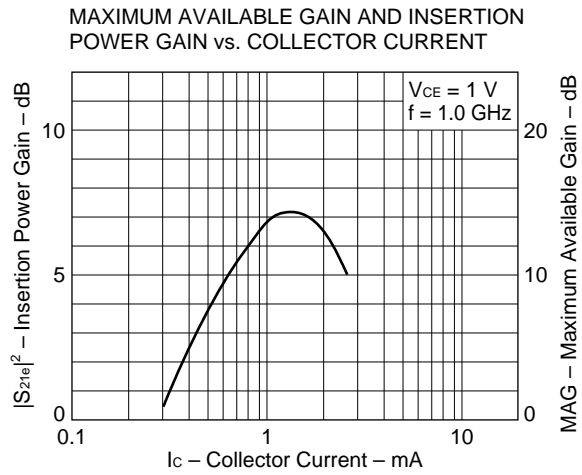
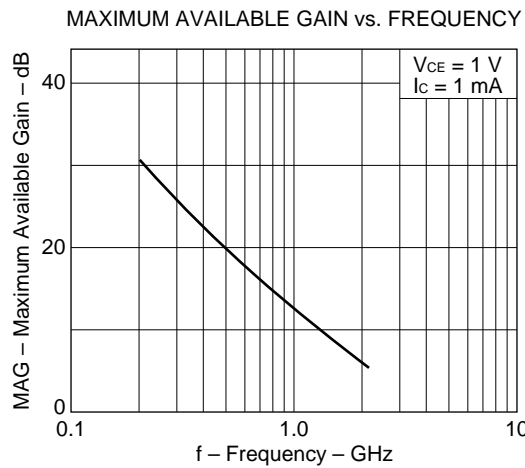
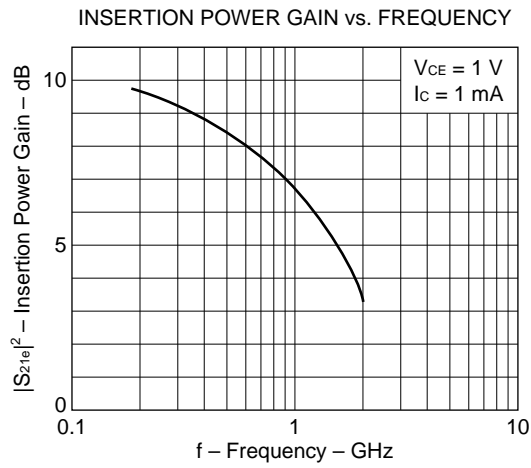
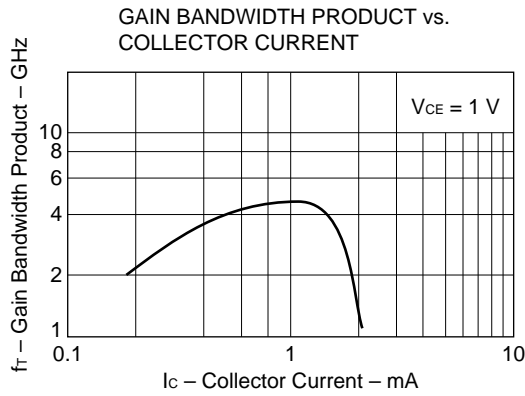
h_{FE} Classification

Class	R6A	R6B	R6C
Marking	R6A	R6B	R6C
h_{FE}	50 to 100	80 to 160	125 to 250

PRECAUTION

Avoid high static voltages or electric fields so that this device would not suffer any damage due to those voltages or fields.

TYPICAL CHARACTERISTICS (T_A = 25 °C)



S-PARAMETER

V_{CE} = 1 V, I_c = 1 mA

Frequency MHz	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.952	-6.7	3.197	169.7	0.023	88.6	0.995	-4.5
200.00	0.936	-12.2	3.025	162.0	0.042	80.9	0.979	-7.9
300.00	0.881	-17.5	2.940	151.3	0.062	74.2	0.943	-12.8
400.00	0.865	-22.2	2.764	146.4	0.080	73.1	0.927	-15.0
500.00	0.839	-26.2	2.653	137.4	0.094	69.4	0.870	-17.3
600.00	0.803	-32.8	2.624	133.2	0.111	68.6	0.865	-19.6
700.00	0.741	-37.2	2.515	123.8	0.125	65.1	0.833	-20.8
800.00	0.664	-41.1	2.442	117.7	0.142	63.2	0.825	-23.9
900.00	0.620	-42.5	2.274	110.9	0.150	62.5	0.805	-25.6
1000.00	0.580	-44.0	2.150	105.1	0.162	59.4	0.772	-29.4
1100.00	0.558	-47.7	2.051	101.1	0.172	59.8	0.745	-31.3
1200.00	0.524	-50.7	1.991	96.1	0.183	57.9	0.705	-33.3
1300.00	0.472	-54.0	1.916	92.6	0.200	56.1	0.676	-34.2
1400.00	0.432	-55.4	1.833	87.5	0.201	54.8	0.648	-35.2
1500.00	0.398	-56.6	1.763	83.5	0.212	52.4	0.637	-35.8
1600.00	0.372	-58.3	1.713	80.6	0.215	54.4	0.619	-37.0
1700.00	0.343	-60.6	1.665	77.2	0.225	53.0	0.609	-39.0
1800.00	0.314	-62.6	1.651	74.9	0.242	54.0	0.589	-40.9
1900.00	0.289	-64.0	1.628	70.1	0.252	52.4	0.571	-42.5
2000.00	0.265	-65.8	1.611	65.2	0.267	49.7	0.552	-44.2

V_{CE} = 1 V, I_c = 3 mA

Frequency MHz	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.832	-18.3	5.286	153.1	0.024	80.8	0.941	-7.2
200.00	0.702	-29.6	4.385	134.4	0.039	72.1	0.881	-10.7
300.00	0.564	-35.7	3.568	118.9	0.054	65.6	0.820	-13.9
400.00	0.488	-37.9	3.016	111.0	0.064	68.0	0.793	-13.9
500.00	0.433	-38.3	2.571	102.9	0.074	66.5	0.751	-14.0
600.00	0.385	-40.3	2.284	99.0	0.086	69.0	0.753	-14.7
700.00	0.340	-41.0	2.057	91.7	0.097	67.5	0.743	-14.7
800.00	0.296	-40.2	1.884	87.3	0.110	67.6	0.748	-16.8
900.00	0.269	-36.8	1.689	82.2	0.119	68.3	0.746	-18.0
1000.00	0.254	-34.2	1.554	78.0	0.132	66.6	0.733	-21.3
1100.00	0.243	-33.8	1.449	75.2	0.143	67.9	0.719	-23.0
1200.00	0.229	-33.8	1.378	71.3	0.154	66.6	0.693	-25.0
1300.00	0.204	-33.5	1.306	68.1	0.170	66.1	0.678	-25.9
1400.00	0.187	-30.4	1.225	64.7	0.176	65.2	0.660	-26.8
1500.00	0.175	-26.7	1.157	61.2	0.189	63.2	0.664	-27.8
1600.00	0.168	-25.1	1.116	60.1	0.196	65.0	0.654	-29.3
1700.00	0.157	-24.3	1.072	57.9	0.209	63.5	0.653	-31.9
1800.00	0.140	-22.7	1.066	56.5	0.227	64.4	0.643	-34.0
1900.00	0.129	-19.7	1.055	53.0	0.240	62.6	0.629	-36.5
2000.00	0.119	-15.5	1.051	48.7	0.257	59.5	0.616	-38.6

V_{CE} = 3 V, I_c = 1 mA

Frequency MHz	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.956	-6.2	3.189	170.4	0.021	89.3	0.997	-4.1
200.00	0.942	-11.1	3.027	163.5	0.038	79.4	0.983	-7.0
300.00	0.892	-15.7	2.961	153.2	0.057	75.3	0.950	-11.6
400.00	0.880	-20.0	2.799	149.0	0.073	75.0	0.939	-13.5
500.00	0.861	-23.8	2.696	140.2	0.086	71.4	0.887	-15.5
600.00	0.831	-30.1	2.686	136.4	0.101	70.9	0.885	-17.7
700.00	0.771	-34.2	2.583	127.3	0.114	67.5	0.857	-18.8
800.00	0.696	-37.9	2.516	121.2	0.130	65.7	0.852	-21.9
900.00	0.656	-39.1	2.352	114.7	0.138	64.8	0.834	-23.5
1000.00	0.619	-40.5	2.226	109.0	0.150	61.8	0.803	-27.2
1100.00	0.602	-44.2	2.128	105.1	0.160	62.2	0.777	-29.1
1200.00	0.568	-47.1	2.073	100.3	0.169	60.2	0.737	-31.0
1300.00	0.515	-50.4	2.000	97.0	0.186	58.6	0.708	-31.9
1400.00	0.475	-51.8	1.920	91.9	0.188	57.5	0.681	-32.7
1500.00	0.441	-52.6	1.853	88.0	0.198	55.2	0.672	-33.3
1600.00	0.417	-54.4	1.800	85.0	0.201	57.1	0.654	-34.3
1700.00	0.389	-56.5	1.758	81.6	0.211	55.8	0.645	-36.3
1800.00	0.359	-58.5	1.741	79.3	0.228	56.7	0.628	-38.0
1900.00	0.334	-59.9	1.713	74.5	0.237	55.1	0.610	-39.6
2000.00	0.312	-61.6	1.692	69.8	0.251	52.4	0.591	-41.2

V_{CE} = 3 V, I_c = 3 mA

Frequency MHz	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.881	-12.2	6.511	161.7	0.019	87.2	0.982	-6.2
200.00	0.811	-21.2	5.892	147.7	0.034	76.6	0.938	-10.3
300.00	0.706	-28.1	5.207	133.4	0.050	71.3	0.876	-14.9
400.00	0.642	-32.5	4.598	125.8	0.061	70.9	0.840	-15.8
500.00	0.585	-35.3	4.021	116.6	0.071	69.0	0.781	-16.4
600.00	0.530	-39.9	3.721	112.3	0.083	70.2	0.772	-17.1
700.00	0.470	-42.3	3.348	103.8	0.093	68.6	0.752	-16.9
800.00	0.410	-43.3	3.227	99.4	0.106	68.7	0.749	-18.6
900.00	0.372	-41.8	2.890	93.5	0.113	69.2	0.741	-19.5
1000.00	0.347	-40.6	2.660	89.0	0.125	67.2	0.722	-22.3
1100.00	0.330	-41.5	2.474	85.9	0.135	68.2	0.705	-23.5
1200.00	0.309	-42.3	2.335	81.8	0.144	67.2	0.675	-24.9
1300.00	0.278	-43.3	2.210	78.8	0.160	66.4	0.659	-25.3
1400.00	0.253	-42.0	2.064	75.2	0.165	66.0	0.640	-25.6
1500.00	0.234	-40.0	1.952	71.7	0.177	63.9	0.642	-26.0
1600.00	0.222	-39.6	1.873	70.2	0.183	66.0	0.632	-26.9
1700.00	0.207	-40.0	1.799	67.8	0.195	64.8	0.632	-29.1
1800.00	0.186	-40.2	1.773	66.1	0.211	65.9	0.622	-30.6
1900.00	0.170	-39.3	1.739	62.4	0.223	63.8	0.608	-32.5
2000.00	0.156	-37.9	1.713	57.9	0.239	61.2	0.598	-34.2

V_{CE} = 5 V, I_c = 1 mA

Frequency MHz	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.957	-5.9	3.166	170.5	0.020	87.6	0.998	-3.8
200.00	0.944	-10.7	3.008	163.8	0.037	82.2	0.984	-6.7
300.00	0.895	-15.2	2.944	153.6	0.055	76.7	0.953	-11.1
400.00	0.885	-19.5	2.788	149.6	0.070	75.6	0.942	-12.9
500.00	0.867	-23.1	2.688	140.9	0.083	71.7	0.891	-14.8
600.00	0.838	-29.4	2.681	137.1	0.098	71.6	0.891	-17.1
700.00	0.779	-33.3	2.582	128.1	0.111	68.2	0.865	-18.0
800.00	0.704	-36.9	2.518	122.1	0.126	66.3	0.860	-21.1
900.00	0.667	-38.1	2.353	115.5	0.134	65.6	0.843	-22.6
1000.00	0.631	-39.4	2.228	109.9	0.146	62.4	0.813	-26.4
1100.00	0.613	-43.1	2.135	106.1	0.156	62.7	0.788	-28.2
1200.00	0.581	-45.9	2.082	101.3	0.165	61.0	0.747	-30.0
1300.00	0.528	-49.1	2.005	98.0	0.181	59.7	0.720	-30.9
1400.00	0.487	-50.5	1.927	92.8	0.183	58.2	0.693	-31.6
1500.00	0.454	-51.2	1.864	89.1	0.194	56.1	0.685	-32.2
1600.00	0.431	-52.9	1.813	86.1	0.197	58.1	0.668	-33.3
1700.00	0.403	-55.0	1.767	82.6	0.206	56.8	0.660	-35.3
1800.00	0.373	-56.9	1.749	80.4	0.222	57.8	0.642	-36.8
1900.00	0.348	-58.3	1.724	75.6	0.231	56.0	0.624	-38.6
2000.00	0.326	-59.7	1.703	71.0	0.246	53.3	0.607	-39.9

V_{CE} = 5 V, I_c = 3 mA

Frequency MHz	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.887	-11.4	6.558	162.4	0.020	84.1	0.983	-5.9
200.00	0.823	-20.1	5.978	149.0	0.034	78.8	0.943	-10.0
300.00	0.722	-26.9	5.324	134.9	0.049	71.6	0.883	-14.4
400.00	0.662	-31.3	4.734	127.5	0.060	72.1	0.848	-15.5
500.00	0.607	-34.2	4.155	118.3	0.069	70.0	0.789	-16.2
600.00	0.553	-38.8	3.876	114.1	0.080	70.9	0.781	-16.9
700.00	0.491	-41.2	3.486	105.6	0.091	69.1	0.758	-16.7
800.00	0.429	-42.6	3.234	100.7	0.103	68.9	0.756	-18.5
900.00	0.391	-41.2	3.020	95.1	0.111	69.5	0.747	-19.2
1000.00	0.366	-40.0	2.776	90.5	0.123	67.6	0.728	-22.1
1100.00	0.350	-41.0	2.585	87.4	0.132	68.7	0.710	-23.3
1200.00	0.328	-42.1	2.437	83.4	0.141	67.6	0.680	-24.6
1300.00	0.295	-43.1	2.307	80.3	0.157	67.0	0.664	-24.9
1400.00	0.270	-41.8	2.159	76.7	0.161	66.4	0.645	-25.2
1500.00	0.251	-40.0	2.037	73.3	0.173	64.5	0.647	-25.5
1600.00	0.239	-39.9	1.958	71.9	0.179	66.7	0.637	-26.3
1700.00	0.224	-40.4	1.882	69.4	0.190	65.3	0.638	-28.4
1800.00	0.204	-40.6	1.849	67.7	0.207	66.4	0.628	-29.7
1900.00	0.187	-39.9	1.818	63.9	0.218	64.5	0.614	-31.7
2000.00	0.172	-39.0	1.785	59.5	0.234	61.6	0.603	-33.3

No part of this document may be copied or reproduced in any form or by any means without the prior written consent of NEC Corporation. NEC Corporation assumes no responsibility for any errors which may appear in this document.

NEC Corporation does not assume any liability for infringement of patents, copyrights or other intellectual property rights of third parties by or arising from use of a device described herein or any other liability arising from use of such device. No license, either express, implied or otherwise, is granted under any patents, copyrights or other intellectual property rights of NEC Corporation or others.

While NEC Corporation has been making continuous effort to enhance the reliability of its semiconductor devices, the possibility of defects cannot be eliminated entirely. To minimize risks of damage or injury to persons or property arising from a defect in an NEC semiconductor device, customer must incorporate sufficient safety measures in its design, such as redundancy, fire-containment, and anti-failure features.

NEC devices are classified into the following three quality grades:

"Standard", "Special", and "Specific". The Specific quality grade applies only to devices developed based on a customer designated "quality assurance program" for a specific application. The recommended applications of a device depend on its quality grade, as indicated below. Customers must check the quality grade of each device before using it in a particular application.

Standard: Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots

Special: Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)

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

The quality grade of NEC devices in "Standard" unless otherwise specified in NEC's Data Sheets or Data Books. If customers intend to use NEC devices for applications other than those specified for Standard quality grade, they should contact NEC Sales Representative in advance.

Anti-radioactive design is not implemented in this product.