

To our customers,

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## Old Company Name in Catalogs and Other Documents

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On April 1<sup>st</sup>, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

Renesas Electronics website: <http://www.renesas.com>

April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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**UHF/VHF OSCILLATOR AND VHF MIXER  
NPN SILICON EPITAXIAL TRANSISTOR  
SUPER MINI MOLD**

**DESCRIPTION**

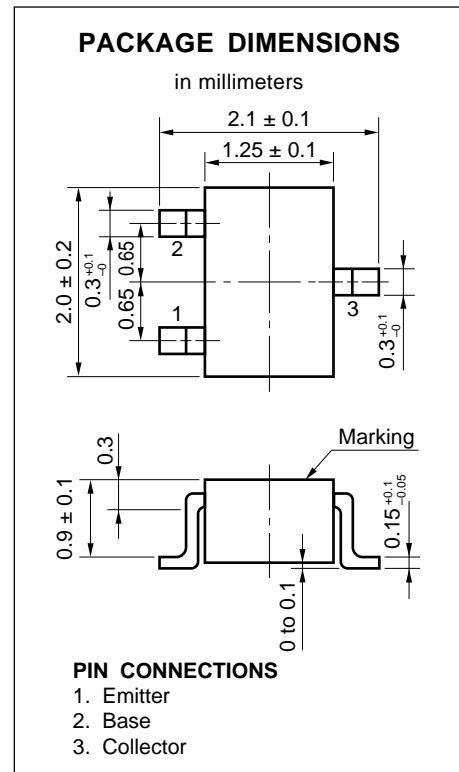
The 2SC4182 is designed for use as an oscillator or a mixer in a VHF TV tuners. Super mini mold package makes it suitable for use in small type equipments especially recommended for Hibrid Integrated Circuits and other applications.

**FEATURES**

- High Gain Bandwidth Product :  $f_T = 1.1 \text{ GHz TYP.}$
- Low Collector to Base Time Constant:  $C_C \cdot r_{b'b} = 9 \text{ ps TYP.}$
- Low Output Capacitance :  $C_{ob} = 1.5 \text{ pF MAX.}$

**ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25 °C)**

Collector to Base Voltage	V <sub>CB0</sub>	30	V
Collector to Emitter Voltage	V <sub>CE0</sub>	15	V
Emitter to Base Voltage	V <sub>EB0</sub>	4.5	V
Collector Current	I <sub>C</sub>	50	mA
Total Power Dissipation	P <sub>T</sub>	160	mW
Junction Temperature	T <sub>J</sub>	150	°C
Storage Temperature	T <sub>stg</sub>	-65 to +150	°C



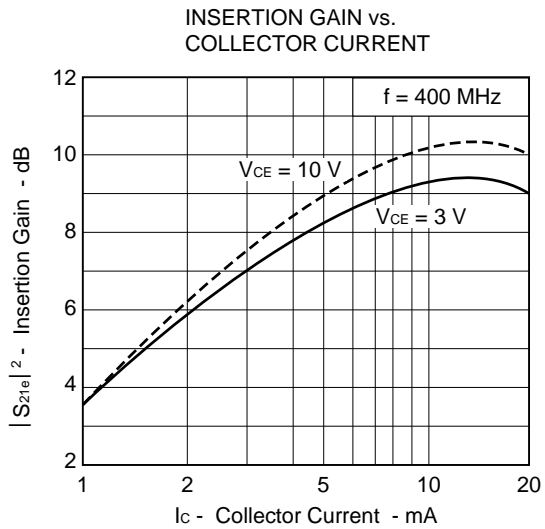
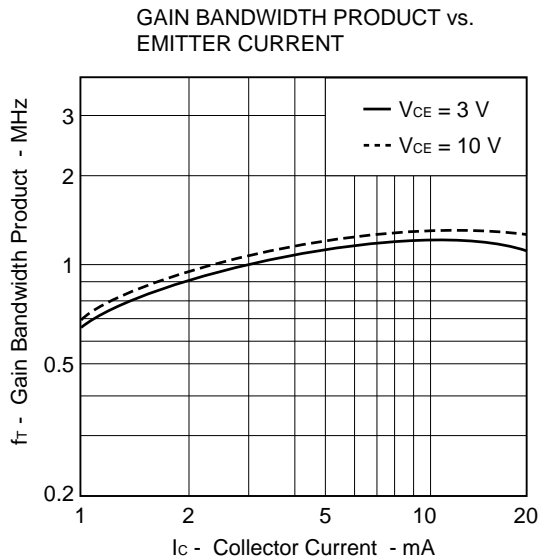
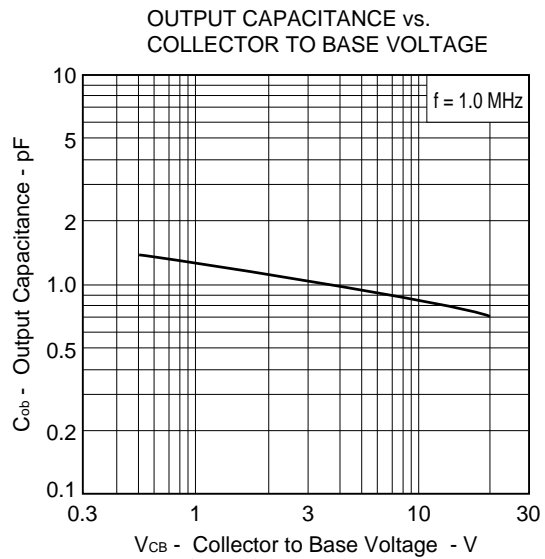
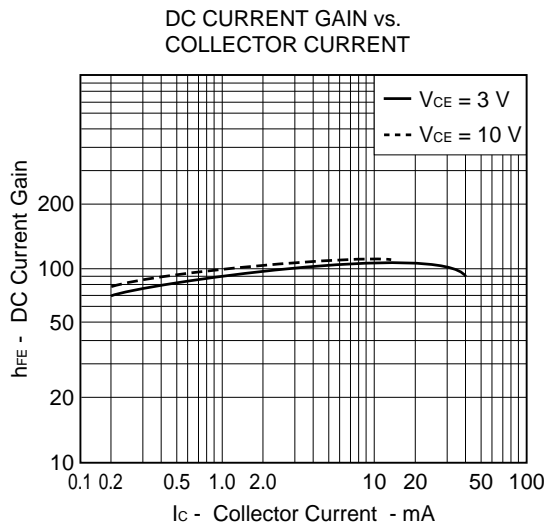
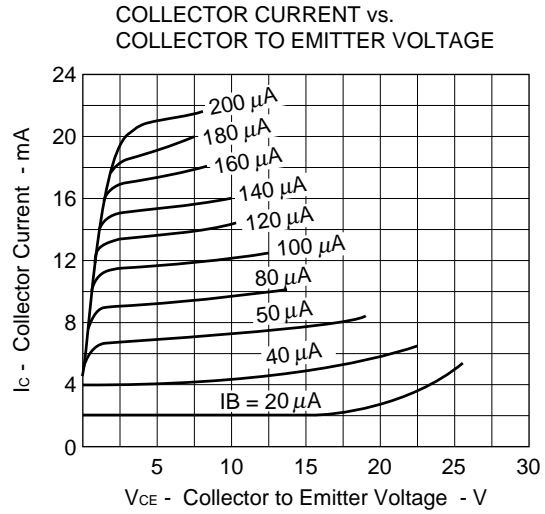
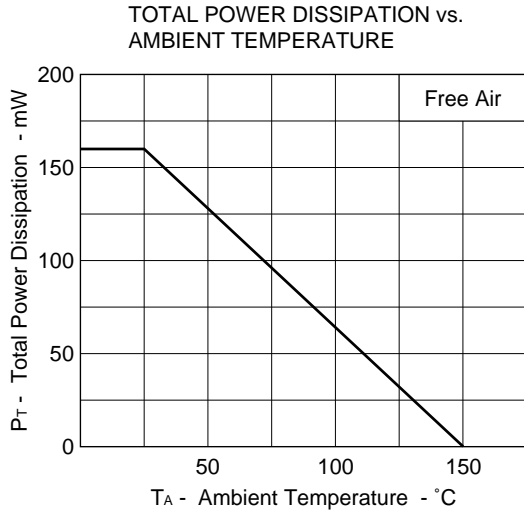
**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C)**

Characteristics	Symbol	MIN.	TYP.	MAX.	Unit	Test Conditions
Collector Cutoff Current	I <sub>CB0</sub>			0.1	μA	V <sub>CB</sub> = 20 V, I <sub>E</sub> = 0
DC Current Gain	h <sub>FE</sub>	60		220		V <sub>CE</sub> = 3 V, I <sub>C</sub> = 5 mA
Collector Saturation Voltage	V <sub>CE(sat)</sub>			0.5	V	I <sub>C</sub> = 10 mA, I <sub>B</sub> = 1 mA
Gain Bandwidth Product	f <sub>T</sub>		1 100		MHz	V <sub>CE</sub> = 3 V, I <sub>C</sub> = 5 mA
Output Capacitance	C <sub>ob</sub>		1.1	1.5	pF	V <sub>CB</sub> = 3 V, I <sub>E</sub> = 0
Collector to Base Time Constant	C <sub>C</sub> · r <sub>b'b</sub>		9	15	ps	V <sub>CE</sub> = 3 V, I <sub>E</sub> = -5 mA, f = 31.9 MHz

**h<sub>FE</sub> Classifications**

Rank	T32	T33	T34
Marking	T32	T33	T34
h <sub>FE</sub>	60 to 105	85 to 150	120 to 220

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



**S-PARAMETER**

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

Frequency MHz	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.644	-57.9	6.137	125.9	0.045	66.9	0.857	-14.1
200.00	0.466	-85.1	3.833	104.4	0.065	59.1	0.764	-15.7
300.00	0.388	-103.6	2.855	91.8	0.085	54.1	0.718	-18.6
400.00	0.365	-117.7	2.189	83.9	0.100	54.0	0.701	-19.7
500.00	0.363	-130.2	1.802	76.5	0.111	50.7	0.670	-21.5
600.00	0.371	-142.2	1.559	71.6	0.125	50.5	0.675	-23.8
700.00	0.378	-153.2	1.392	64.2	0.133	48.2	0.665	-25.6
800.00	0.390	-161.9	1.268	59.0	0.144	47.3	0.673	-29.6
900.00	0.403	-169.1	1.132	53.7	0.147	48.7	0.671	-32.7
1000.00	0.429	-176.5	1.040	49.1	0.153	47.5	0.658	-38.1
1100.00	0.454	175.9	0.969	45.6	0.159	50.1	0.653	-42.2
1200.00	0.466	167.3	0.918	40.3	0.167	49.9	0.631	-46.4
1300.00	0.473	161.5	0.886	35.9	0.178	50.8	0.618	-50.4
1400.00	0.476	157.0	0.799	31.7	0.179	51.8	0.607	-54.3
1500.00	0.503	153.0	0.757	26.1	0.189	52.1	0.604	-58.7
1600.00	0.527	148.9	0.696	26.0	0.196	56.4	0.599	-64.0
1700.00	0.547	142.8	0.647	23.2	0.207	57.0	0.591	-69.6
1800.00	0.566	138.1	0.636	22.6	0.227	59.8	0.578	-76.3
1900.00	0.574	134.2	0.604	20.1	0.247	59.8	0.568	-81.5
2000.00	0.588	130.5	0.594	16.7	0.267	58.3	0.549	-87.6

**V<sub>CE</sub> = 3 V, I<sub>c</sub> = 10 mA**

Frequency MHz	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.411	-89.0	9.009	109.8	0.031	63.2	0.727	-14.9
200.00	0.371	-119.5	5.001	93.7	0.050	59.7	0.663	-14.3
300.00	0.377	-137.9	3.455	83.5	0.066	56.7	0.632	-16.4
400.00	0.398	-150.7	2.725	77.1	0.075	57.8	0.622	-17.3
500.00	0.423	-161.2	2.198	70.6	0.084	56.5	0.601	-18.9
600.00	0.441	-170.7	1.874	66.3	0.095	58.8	0.608	-21.0
700.00	0.452	-179.3	1.644	59.5	0.103	58.7	0.605	-22.9
800.00	0.466	174.9	1.478	54.7	0.113	60.0	0.614	-26.8
900.00	0.476	170.4	1.298	49.9	0.120	62.7	0.617	-30.1
1000.00	0.510	165.1	1.182	45.5	0.130	62.8	0.608	-35.4
1100.00	0.539	159.6	1.088	42.6	0.140	65.9	0.604	-39.8
1200.00	0.549	152.3	1.021	37.7	0.151	66.4	0.585	-44.1
1300.00	0.554	147.3	0.977	33.4	0.168	67.6	0.573	-48.2
1400.00	0.554	143.7	0.874	29.6	0.177	68.6	0.564	-52.5
1500.00	0.577	140.5	0.821	24.1	0.195	67.9	0.561	-57.0
1600.00	0.596	137.3	0.750	24.4	0.209	71.0	0.557	-62.5
1700.00	0.615	132.3	0.693	21.7	0.228	69.9	0.548	-68.4
1800.00	0.629	128.5	0.676	21.3	0.253	71.0	0.536	-75.4
1900.00	0.636	125.1	0.640	19.1	0.277	69.2	0.527	-81.1
2000.00	0.649	121.9	0.626	15.9	0.302	66.3	0.510	-87.4

V<sub>CE</sub> = 5 V, I<sub>c</sub> = 3 mA

Frequency MHz	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.657	-54.8	6.220	127.2	0.038	66.5	0.876	-12.6
200.00	0.473	-80.6	3.926	105.9	0.058	60.5	0.793	-14.0
300.00	0.391	-98.6	2.930	93.4	0.078	55.6	0.748	-16.8
400.00	0.364	-112.6	2.253	85.6	0.091	55.7	0.734	-17.8
500.00	0.359	-125.0	1.855	78.5	0.102	52.4	0.702	-19.4
600.00	0.365	-137.5	1.606	73.9	0.115	52.1	0.709	-21.5
700.00	0.370	-148.9	1.437	66.5	0.122	50.2	0.700	-23.1
800.00	0.381	-158.2	1.307	61.5	0.133	49.7	0.709	-26.9
900.00	0.393	-165.8	1.164	56.2	0.135	50.7	0.709	-29.7
1000.00	0.417	-173.6	1.074	51.6	0.141	49.7	0.697	-34.8
1100.00	0.442	178.4	0.998	48.1	0.147	52.6	0.692	-38.5
1200.00	0.454	169.6	0.945	42.9	0.153	52.9	0.669	-42.4
1300.00	0.460	163.6	0.911	38.5	0.164	53.9	0.656	-45.8
1400.00	0.463	159.0	0.822	34.3	0.165	55.4	0.645	-49.4
1500.00	0.491	154.8	0.779	28.9	0.176	55.9	0.642	-53.3
1600.00	0.515	150.5	0.717	28.7	0.183	60.6	0.639	-58.0
1700.00	0.536	144.3	0.667	25.8	0.195	61.2	0.631	-63.1
1800.00	0.555	139.4	0.657	25.1	0.214	64.0	0.618	-69.2
1900.00	0.563	135.4	0.625	22.5	0.234	64.0	0.609	-74.0
2000.00	0.578	131.6	0.614	18.9	0.255	62.6	0.589	-79.5

V<sub>CE</sub> = 5 V, I<sub>c</sub> = 10 mA

Frequency MHz	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.420	-83.2	9.315	111.3	0.029	67.9	0.759	-13.4
200.00	0.366	-112.8	5.199	95.2	0.045	62.5	0.701	-12.8
300.00	0.364	-132.2	3.618	85.3	0.060	57.8	0.669	-14.9
400.00	0.381	-146.0	2.856	78.9	0.070	59.4	0.661	-15.7
500.00	0.403	-156.9	2.306	72.7	0.078	57.8	0.638	-17.0
600.00	0.420	-167.0	1.967	68.5	0.088	59.6	0.647	-19.0
700.00	0.432	-176.0	1.729	61.8	0.095	60.0	0.644	-20.5
800.00	0.446	177.8	1.553	57.0	0.106	61.0	0.655	-24.1
900.00	0.457	172.8	1.367	52.2	0.111	64.0	0.658	-27.0
1000.00	0.490	167.3	1.243	48.0	0.121	64.3	0.648	-32.0
1100.00	0.518	161.5	1.147	44.9	0.130	67.6	0.644	-36.0
1200.00	0.529	154.0	1.074	40.1	0.140	68.5	0.626	-39.8
1300.00	0.535	149.0	1.029	35.7	0.155	70.0	0.615	-43.4
1400.00	0.536	145.3	0.920	31.9	0.164	71.2	0.605	-47.0
1500.00	0.559	142.1	0.865	26.4	0.181	70.9	0.604	-51.0
1600.00	0.579	138.7	0.791	26.7	0.196	74.1	0.600	-55.8
1700.00	0.598	133.7	0.732	23.9	0.213	73.4	0.593	-61.2
1800.00	0.614	129.8	0.716	23.2	0.237	74.5	0.580	-67.3
1900.00	0.621	126.3	0.677	20.9	0.260	73.1	0.571	-72.4
2000.00	0.635	123.0	0.663	17.4	0.285	70.2	0.553	-78.0

V<sub>CE</sub> = 10 V, I<sub>c</sub> = 3 mA

Frequency MHz	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.671	-50.9	6.248	128.7	0.035	69.8	0.897	-10.6
200.00	0.486	-74.5	3.991	107.7	0.052	62.3	0.824	-12.2
300.00	0.398	-91.4	2.991	95.4	0.070	57.2	0.781	-14.9
400.00	0.367	-104.8	2.306	87.9	0.083	57.2	0.770	-15.8
500.00	0.356	-117.2	1.902	80.9	0.092	54.0	0.738	-17.2
600.00	0.359	-130.2	1.654	76.4	0.104	54.5	0.747	-19.1
700.00	0.361	-142.0	1.482	69.3	0.111	52.1	0.739	-20.3
800.00	0.367	-152.0	1.347	64.4	0.121	51.7	0.750	-23.8
900.00	0.379	-160.5	1.202	59.0	0.123	53.2	0.751	-26.3
1000.00	0.399	-168.8	1.110	54.4	0.129	52.1	0.739	-31.1
1100.00	0.422	-177.3	1.030	50.9	0.134	55.0	0.734	-34.5
1200.00	0.433	173.5	0.976	45.8	0.140	55.5	0.711	-37.9
1300.00	0.440	167.2	0.940	41.4	0.149	56.7	0.698	-40.8
1400.00	0.445	162.3	0.848	37.2	0.151	58.6	0.686	-43.8
1500.00	0.472	157.8	0.803	31.8	0.161	59.6	0.687	-47.0
1600.00	0.497	153.2	0.743	31.6	0.167	64.5	0.683	-51.2
1700.00	0.517	146.7	0.691	28.6	0.180	65.5	0.678	-55.8
1800.00	0.537	141.5	0.681	27.7	0.198	68.3	0.667	-61.0
1900.00	0.546	137.3	0.649	25.0	0.216	68.8	0.657	-65.4
2000.00	0.561	133.5	0.637	21.2	0.237	67.2	0.638	-70.2

V<sub>CE</sub> = 10 V, I<sub>c</sub> = 10 mA

Frequency MHz	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.438	-73.6	9.469	113.2	0.026	67.2	0.799	-11.6
200.00	0.363	-101.5	5.347	97.4	0.042	63.1	0.744	-11.4
300.00	0.348	-121.7	3.753	87.6	0.057	58.9	0.711	-13.6
400.00	0.356	-136.7	2.984	81.4	0.066	60.0	0.703	-14.2
500.00	0.373	-148.8	2.420	75.4	0.073	58.6	0.678	-15.2
600.00	0.388	-159.8	2.073	71.3	0.082	60.5	0.688	-16.9
700.00	0.398	-169.7	1.824	64.7	0.089	60.1	0.685	-18.1
800.00	0.412	-176.6	1.644	60.0	0.099	61.4	0.697	-21.4
900.00	0.425	177.7	1.449	55.2	0.103	64.5	0.701	-23.9
1000.00	0.456	171.7	1.321	50.9	0.112	64.6	0.692	-28.5
1100.00	0.483	165.3	1.216	47.7	0.120	68.1	0.688	-31.9
1200.00	0.495	157.6	1.147	43.0	0.128	69.4	0.667	-35.3
1300.00	0.501	152.4	1.093	38.6	0.142	71.0	0.657	-38.3
1400.00	0.504	148.5	0.978	34.8	0.149	72.8	0.646	-41.1
1500.00	0.528	145.1	0.922	29.2	0.165	72.9	0.648	-44.4
1600.00	0.550	141.6	0.846	29.2	0.178	76.4	0.644	-48.5
1700.00	0.570	136.4	0.784	26.2	0.194	75.9	0.640	-53.1
1800.00	0.587	132.1	0.766	25.3	0.217	77.6	0.630	-58.4
1900.00	0.595	128.7	0.728	22.7	0.238	76.4	0.621	-62.9
2000.00	0.610	125.2	0.711	18.8	0.262	74.0	0.603	-67.8

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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.