To our customers,

Old Company Name in Catalogs and Other Documents

On April 1st, 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 1st, 2010
Renesas Electronics Corporation

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

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RENESAS

SILICON TRANSISTOR
2SC4185

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

DESCRIPTION

The 2SC4185 is an NPN silicon epitaxial transistor intended for use as a UHF oscillator and a mixer in a tuner of a TV receiver. The device features stable oscillation and small frequency drift against any change of the supply voltage and the ambient temperature.

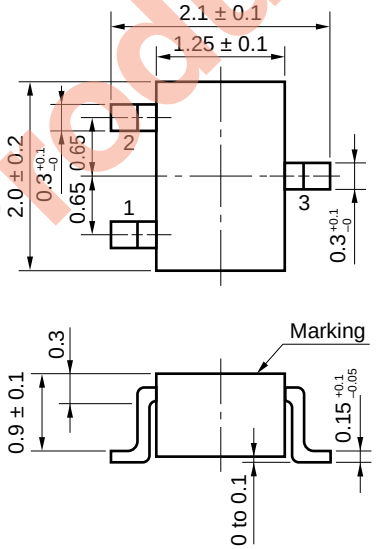
It is designed for use in small type equipments especially recommended for Hybrid Integrated Circuit and other applications.

FEATURES

- Low Noise
- High Conversion Gain
- Easy & economical mounting realizable with plastic mold package for Hybrid IC.

PACKAGE DIMENSIONS

in millimeters



PIN CONNECTIONS
1. Emitter
2. Base
3. Collector

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C)

Collector to Base Voltage	V_{CB0}	30	V
Collector to Emitter Voltage	V_{CE0}	14	V
Emitter to Base Voltage	V_{EB0}	3.0	V
Collector Current	I_C	50	mA
Total Power Dissipation	P_T	160	mW
Junction Temperature	T_j	150	°C
Storage Temperature	T_{stg}	–65 to +150	°C

ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

Characteristics	Symbol	MIN.	TYP.	MAX.	Unit	Test Conditions
Collector Cutoff Current	I_{CB0}			0.1	μA	V_{CB} = 15 V, I_E = 0
DC Current Gain	h_{FE}	40	100	180		V_{CE} = 10 V, I_C = 5 mA
Gain Bandwidth Product	f_T	1.5	2.0		GHz	V_{CE} = 10 V, I_C = 5 mA, f = 1 GHz
Output Capacitance	C_{ob}		1.0	1.3	pF	V_{CB} = 10 V, I_E = 0, f = 1 MHz

h_{FE} Classifications

Rank	U21	U22	U23
Marking	U21	U22	U23
h_{FE}	40 to 80	60 to 120	90 to 180

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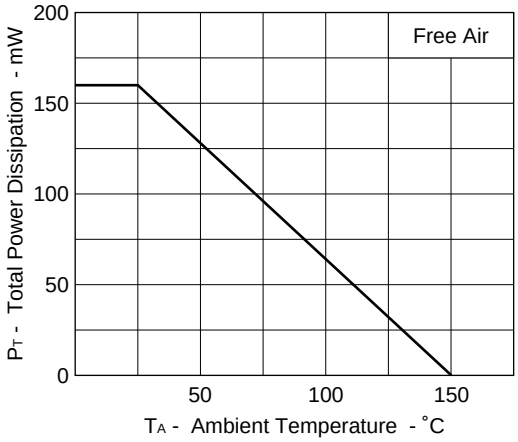
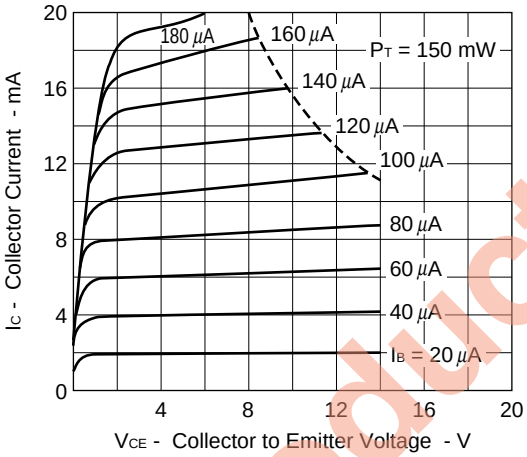
Printed in Japan

TYPICAL CHARACTERISTICS (T_A = 25 °C)

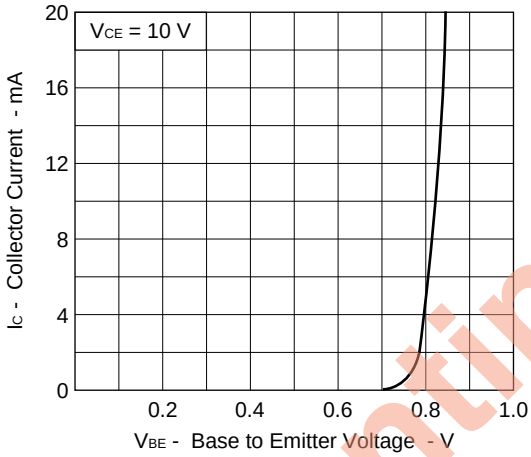
TOTAL POWER DISSIPATIOH vs.
AMBIENT TEMPERATURE



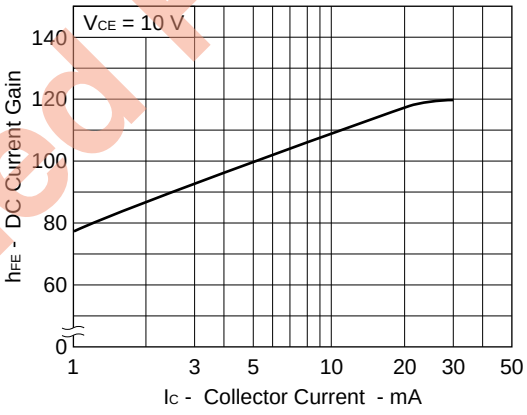
COLLECTOR CURRENT vs.
COLLECTOR TO EMITTER VOLTAGE



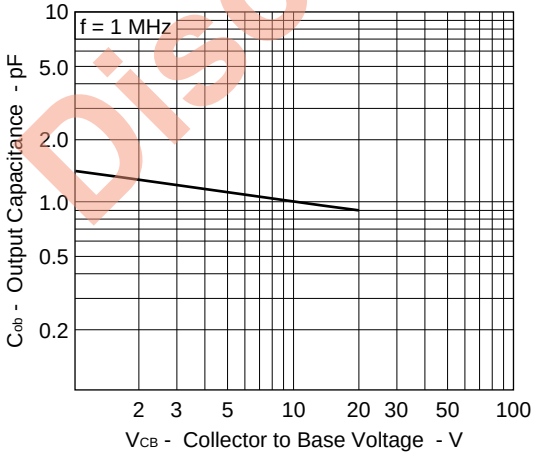
COLLECTOR CURRENT vs.
BASE TO EMITTER VOLTAGE



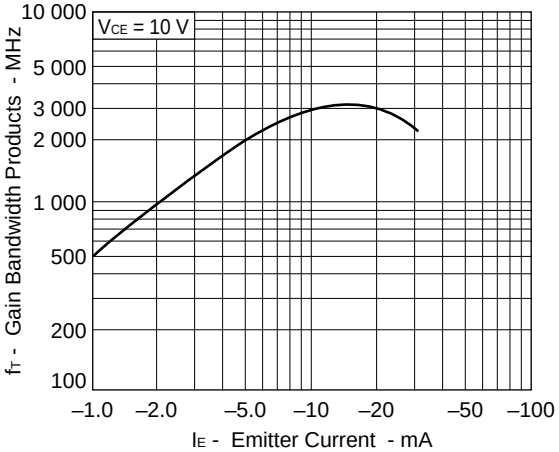
DC CURRENT GAIN vs.
COLLECTOR CURRENT



COLLECTOR CAPACITANCE vs.
COLLECTOR TO BASE VOLTAGE



GAIN BANDWIDTH PRODUCT vs.
EMITTER CURRENT



S-PARAMETER

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

Frequency	S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.000	0.804	–45.7	8.213	145.8	0.051	70.5	0.904	–18.9
200.000	0.663	–78.7	6.354	123.4	0.074	55.7	0.749	–27.9
300.000	0.544	–103.3	4.902	107.4	0.090	47.4	0.627	–33.1
400.000	0.483	–121.1	3.925	98.0	0.098	47.5	0.558	–33.6
500.000	0.450	–135.5	3.238	89.4	0.104	46.3	0.501	–33.8
600.000	0.433	–148.6	2.887	84.7	0.115	48.3	0.481	–34.0
700.000	0.418	–160.0	2.571	77.0	0.122	48.4	0.461	–34.2
800.000	0.414	–168.5	2.332	72.3	0.133	50.1	0.455	–36.3
900.000	0.412	–175.2	2.063	66.7	0.139	52.8	0.447	–38.2
1000.000	0.429	178.0	1.899	62.1	0.149	52.6	0.432	–41.9
1100.000	0.445	171.0	1.750	58.6	0.160	55.6	0.423	–45.0
1200.000	0.449	163.0	1.648	53.5	0.172	55.3	0.404	–48.2
1300.000	0.447	157.8	1.575	49.1	0.188	55.8	0.390	–51.1
1400.000	0.446	153.9	1.438	45.2	0.192	55.9	0.379	–54.1
1500.000	0.466	150.6	1.350	39.8	0.206	54.9	0.372	–57.6
1600.000	0.485	147.2	1.267	39.1	0.215	58.1	0.367	–62.0
1700.000	0.502	142.0	1.186	36.3	0.229	57.5	0.359	–66.7
1800.000	0.518	138.0	1.182	34.2	0.249	59.2	0.347	–72.7
1900.000	0.525	134.7	1.135	31.0	0.268	58.1	0.339	–77.7
2000.000	0.538	131.6	1.122	25.8	0.286	56.0	0.330	–82.9

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

Frequency	S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.000	0.537	–84.5	14.925	124.8	0.034	63.8	0.705	–29.3
200.000	0.438	–123.6	9.075	103.9	0.047	57.7	0.516	–31.2
300.000	0.393	–145.1	6.339	92.2	0.062	57.9	0.436	–30.4
400.000	0.383	–158.6	4.804	85.5	0.073	62.0	0.401	–28.2
500.000	0.386	–168.4	3.887	79.4	0.084	62.4	0.375	–27.0
600.000	0.390	–177.2	3.368	76.3	0.099	65.7	0.368	–26.8
700.000	0.389	175.1	3.003	70.3	0.111	65.0	0.361	–27.1
800.000	0.392	170.2	2.697	66.3	0.128	65.2	0.359	–28.9
900.000	0.397	166.7	2.371	61.9	0.139	66.3	0.357	–31.2
1000.000	0.422	162.8	2.169	57.9	0.154	64.8	0.346	–34.8
1100.000	0.444	158.1	1.997	55.1	0.166	66.1	0.339	–38.1
1200.000	0.451	151.7	1.872	50.5	0.180	64.8	0.325	–41.3
1300.000	0.456	147.6	1.786	46.3	0.198	64.4	0.315	–44.3
1400.000	0.457	144.9	1.620	42.8	0.205	63.4	0.303	–47.2
1500.000	0.477	142.5	1.519	37.6	0.221	61.8	0.299	–50.7
1600.000	0.495	140.2	1.419	37.1	0.231	63.8	0.294	–55.3
1700.000	0.515	135.9	1.322	34.4	0.246	62.4	0.287	–60.4
1800.000	0.532	132.8	1.313	32.6	0.266	63.3	0.276	–66.6
1900.000	0.541	130.0	1.259	29.5	0.285	61.5	0.269	–72.0
2000.000	0.557	127.3	1.240	24.4	0.305	58.9	0.262	–78.0

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

Frequency	S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.000	0.816	–42.4	8.284	147.4	0.044	69.4	0.920	–16.7
200.000	0.673	–73.7	6.531	125.5	0.066	57.1	0.777	–24.8
300.000	0.546	–97.6	5.085	109.6	0.083	49.3	0.663	–29.7
400.000	0.478	–115.1	4.100	100.1	0.090	49.3	0.597	–30.1
500.000	0.440	–129.6	3.399	91.5	0.096	48.3	0.542	–30.1
600.000	0.419	–143.0	3.035	86.8	0.106	50.4	0.525	–30.4
700.000	0.402	–154.8	2.708	79.1	0.113	50.5	0.505	–30.4
800.000	0.394	–163.8	2.459	74.4	0.124	51.9	0.501	–32.4
900.000	0.392	–171.1	2.172	68.8	0.130	54.9	0.494	–34.1
1000.000	0.405	–178.3	1.998	64.1	0.139	54.8	0.480	–37.6
1100.000	0.420	174.2	1.839	60.7	0.149	57.9	0.470	–40.5
1200.000	0.423	166.0	1.734	55.6	0.160	57.7	0.451	–43.1
1300.000	0.423	160.6	1.652	51.4	0.175	58.4	0.437	–45.8
1400.000	0.422	156.6	1.509	47.4	0.180	58.9	0.425	–48.2
1500.000	0.442	153.2	1.420	42.3	0.194	58.2	0.420	–51.1
1600.000	0.460	149.5	1.332	41.4	0.203	61.4	0.414	–54.9
1700.000	0.478	144.2	1.249	38.5	0.216	60.9	0.407	–59.1
1800.000	0.494	140.1	1.244	36.4	0.236	62.5	0.395	–64.2
1900.000	0.502	136.6	1.197	33.2	0.254	61.4	0.385	–68.4
2000.000	0.515	133.5	1.181	27.9	0.273	59.3	0.375	–73.2

V_{CE} = 5 V, I_C = 10 mA

Frequency	S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.000	0.548	–77.8	15.356	126.9	0.032	64.6	0.742	–26.0
200.000	0.427	–116.4	9.522	105.5	0.043	59.2	0.562	–27.7
300.000	0.372	–138.7	6.709	93.9	0.057	59.2	0.483	–27.0
400.000	0.355	–153.1	5.100	87.1	0.067	62.7	0.449	–24.9
500.000	0.354	–163.7	4.127	81.0	0.078	63.7	0.423	–23.8
600.000	0.357	–173.0	3.574	77.9	0.092	66.7	0.419	–23.6
700.000	0.357	178.8	3.187	71.9	0.104	66.4	0.411	–23.6
800.000	0.360	173.6	2.864	68.1	0.120	66.8	0.412	–25.5
900.000	0.366	169.6	2.517	63.6	0.130	67.8	0.410	–27.5
1000.000	0.389	165.3	2.302	59.7	0.144	66.7	0.400	–31.0
1100.000	0.410	160.4	2.114	56.9	0.156	67.8	0.391	–33.9
1200.000	0.419	154.0	1.984	52.4	0.168	66.5	0.378	–36.7
1300.000	0.423	149.9	1.889	48.3	0.185	66.4	0.366	–39.1
1400.000	0.426	147.0	1.714	44.7	0.192	65.6	0.356	–41.5
1500.000	0.446	144.7	1.607	39.6	0.207	64.3	0.352	–44.3
1600.000	0.465	142.2	1.505	39.3	0.218	66.4	0.347	–48.1
1700.000	0.485	137.9	1.405	36.5	0.231	65.2	0.341	–52.3
1800.000	0.504	134.6	1.395	34.5	0.251	66.0	0.330	–57.5
1900.000	0.513	131.7	1.337	31.5	0.270	64.5	0.322	–62.1
2000.000	0.529	129.2	1.318	26.4	0.289	62.1	0.313	–67.0

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

Frequency	S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.000	0.833	–38.7	8.311	149.3	0.037	73.0	0.934	–14.4
200.000	0.692	–67.4	6.682	128.1	0.058	58.4	0.809	–21.5
300.000	0.555	–90.0	5.274	112.1	0.074	51.6	0.703	–26.2
400.000	0.478	–106.8	4.293	102.7	0.082	51.1	0.644	–26.3
500.000	0.430	–121.0	3.569	93.9	0.088	50.2	0.587	–26.4
600.000	0.403	–134.8	3.201	89.4	0.097	52.7	0.575	–26.6
700.000	0.381	–146.8	2.866	81.5	0.104	52.5	0.556	–26.5
800.000	0.369	–156.6	2.602	76.9	0.113	54.1	0.554	–28.4
900.000	0.365	–164.7	2.301	71.0	0.120	57.0	0.548	–29.8
1000.000	0.374	–172.5	2.116	66.5	0.129	57.3	0.534	–33.2
1100.000	0.385	179.5	1.947	63.0	0.137	60.0	0.525	–35.6
1200.000	0.388	170.8	1.834	58.0	0.147	60.1	0.504	–38.0
1300.000	0.388	165.1	1.746	53.9	0.161	61.0	0.491	–40.1
1400.000	0.387	160.9	1.595	49.8	0.167	61.7	0.478	–42.1
1500.000	0.408	157.0	1.498	44.8	0.179	61.4	0.475	–44.4
1600.000	0.426	153.2	1.413	43.9	0.187	64.5	0.470	–47.4
1700.000	0.444	147.5	1.324	41.0	0.200	64.1	0.465	–51.0
1800.000	0.460	143.2	1.313	38.8	0.219	66.0	0.453	–55.4
1900.000	0.468	139.6	1.267	35.5	0.236	65.1	0.444	–59.1
2000.000	0.482	136.3	1.253	30.2	0.254	63.0	0.433	–63.1

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

Frequency	S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.000	0.575	–68.9	15.642	129.8	0.029	67.0	0.783	–22.3
200.000	0.424	–105.2	9.996	108.2	0.040	61.1	0.616	–24.1
300.000	0.351	–128.2	7.060	96.0	0.053	59.6	0.537	–23.8
400.000	0.322	–143.4	5.391	89.1	0.063	63.9	0.505	–21.8
500.000	0.315	–155.1	4.362	83.0	0.073	64.0	0.478	–20.7
600.000	0.314	–165.5	3.794	79.8	0.086	67.4	0.476	–20.7
700.000	0.313	–174.5	3.274	73.4	0.097	67.2	0.470	–20.6
800.000	0.316	179.6	3.044	70.1	0.111	67.5	0.472	–22.4
900.000	0.323	175.0	2.679	65.5	0.120	68.8	0.472	–24.0
1000.000	0.344	170.0	2.450	61.7	0.133	67.6	0.462	–27.4
1100.000	0.363	164.6	2.250	58.9	0.144	69.1	0.454	–29.8
1200.000	0.374	157.9	2.109	54.5	0.155	68.1	0.438	–32.3
1300.000	0.378	153.6	2.008	50.5	0.171	67.9	0.427	–34.2
1400.000	0.382	150.7	1.822	46.9	0.177	67.7	0.417	–36.0
1500.000	0.403	148.2	1.709	41.9	0.191	66.3	0.415	–38.2
1600.000	0.423	145.6	1.600	41.5	0.201	68.9	0.410	–41.2
1700.000	0.443	141.1	1.497	38.8	0.214	67.8	0.406	–44.8
1800.000	0.463	137.7	1.484	36.8	0.233	69.0	0.396	–49.1
1900.000	0.474	134.7	1.429	33.8	0.249	67.4	0.388	–52.8
2000.000	0.490	131.9	1.405	28.5	0.268	65.0	0.378	–57.0