NEC

SILICON TRANSISTOR
2SC4184

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

DESCRIPTION

The 2SC4184 is designed for use as an oscillator or a mixer in a UHF 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

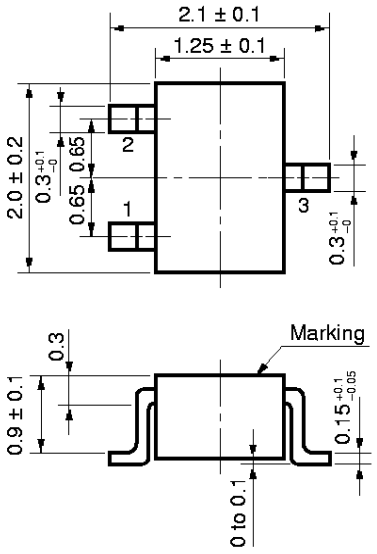
- High Gain Bandwidth Product : f_T = 1.8 GHz TYP.
- Low Collector to Base Time Constant : $C_C \cdot r_{b'b}$ = 3.5 ps TYP.
- Low Feedback Capacitance : C_{re} = 1.2 pF MAX.

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C)

Collector to Base Voltage	V_{CBO}	30	V
Collector to Emitter Voltage	V_{CEO}	15	V
Emitter to Base Voltage	V_{EBO}	4.0	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

PACKAGE DIMENSIONS

in millimeters



PIN CONNECTIONS
1. Emitter
2. Base
3. Collector

ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

Characteristics	Symbol	MIN.	TYP.	MAX.	Unit	Test Conditions
Collector Cutoff Current	I_{CBO}			0.1	μA	V_{CB} = 20 V, I_E = 0
DC Current Gain	h_{FE}	40	100	200		V_{CE} = 3 V, I_C = 5 mA
Collector Saturation Voltage	$V_{CE(sat)}$			0.5	V	I_C = 10 mA, I_B = 1 mA
Gain Bandwidth Product	f_T	1.2	1.8		GHz	V_{CE} = 3 V, I_C = 5 mA
Feedback Capacitance	C_{re}		0.55	1.2	pF	V_{CB} = 3 V, I_E = 0, f = 1 MHz
Collector to Base Time Constant	$C_C \cdot r_{b'b}$		3.5	8.0	ps	V_{CE} = 3 V, I_E = –5 mA, f = 31.9 MHz

h_{FE} Classifications

Rank	T42	T43	T44
Marking	T42	T43	T44
h_{FE}	40 to 80	60 to 120	100 to 200

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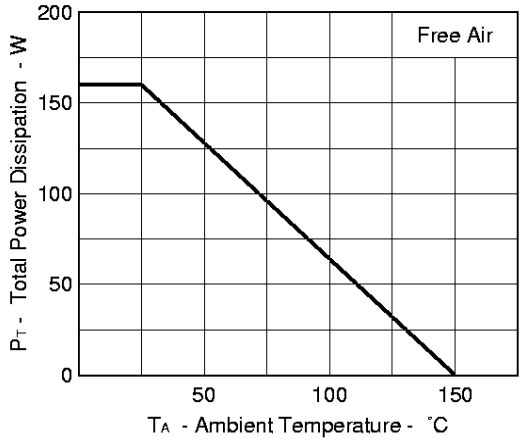
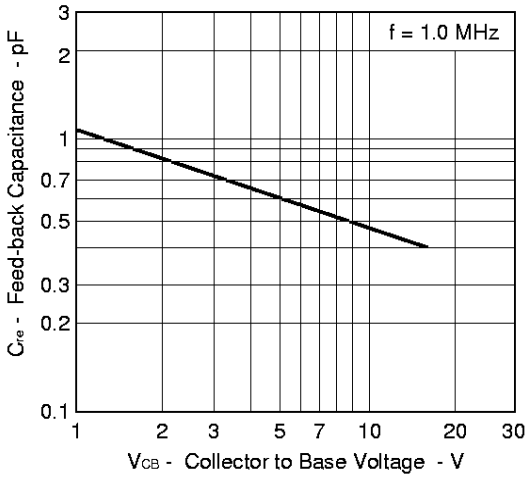
TYPICAL CHARACTERISTICS (T_A = 25 °C)

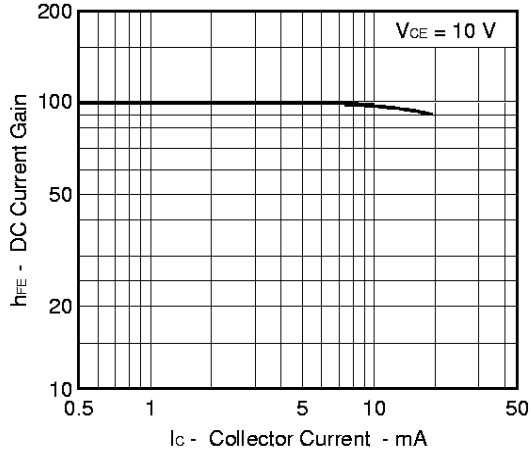
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



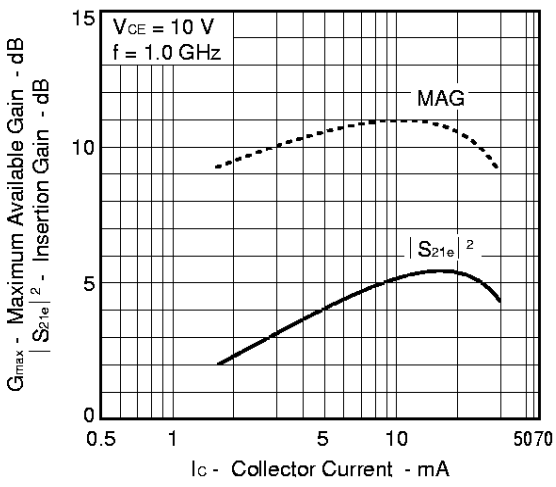
TYPICAL DEVICE CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



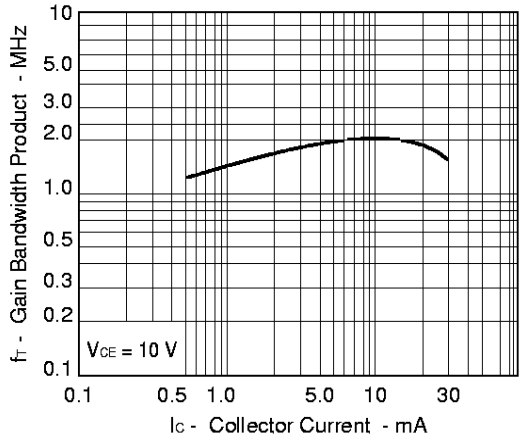
DC CURRENT GAIN vs. COLLECTOR CURRENT



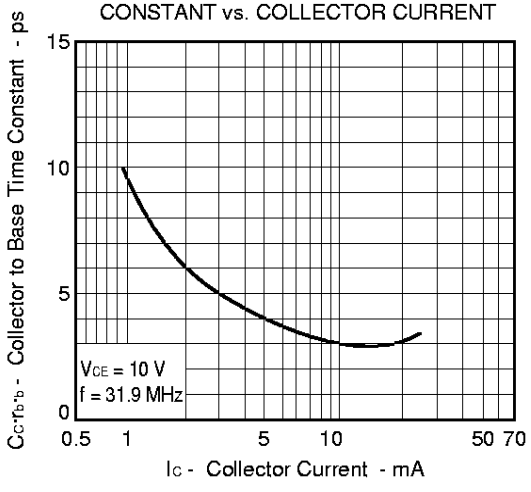
INSERTION GAIN, MAXIMUM AVAILABLE GAIN vs. COLLECTOR CURRENT



GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



COLLECTOR TO BASE TIME CONSTANT vs. COLLECTOR 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
100.00	0.780	–45.1	7.990	142.7	0.038	72.2	0.912	–14.1
200.00	0.599	–75.4	5.939	120.0	0.055	58.9	0.787	–18.6
300.00	0.461	–97.5	4.471	104.5	0.070	52.2	0.702	–21.4
400.00	0.389	–113.6	3.554	95.7	0.079	54.5	0.666	–20.8
500.00	0.349	–127.2	3.002	88.2	0.087	54.5	0.625	–20.8
600.00	0.327	–140.4	2.590	83.5	0.098	57.4	0.623	–21.4
700.00	0.311	–152.0	2.301	76.2	0.107	56.8	0.613	–21.7
800.00	0.304	–161.4	2.086	71.6	0.121	57.7	0.617	–24.0
900.00	0.303	–169.1	1.845	66.3	0.128	59.5	0.616	–26.0
1000.00	0.315	–176.4	1.697	61.8	0.139	58.7	0.604	–29.8
1100.00	0.329	175.8	1.567	58.5	0.149	60.7	0.595	–32.6
1200.00	0.335	167.5	1.480	53.8	0.160	60.3	0.575	–35.2
1300.00	0.337	161.8	1.412	49.6	0.175	60.1	0.561	–37.4
1400.00	0.341	157.7	1.294	45.5	0.179	60.2	0.548	–39.5
1500.00	0.359	154.0	1.215	40.5	0.192	59.0	0.547	–41.9
1600.00	0.378	150.3	1.144	39.9	0.200	62.0	0.541	–45.1
1700.00	0.395	144.9	1.071	37.1	0.212	61.2	0.535	–48.8
1800.00	0.412	140.7	1.065	35.3	0.230	62.8	0.524	–52.9
1900.00	0.421	137.4	1.028	32.3	0.246	61.8	0.515	–56.6
2000.00	0.436	134.3	1.018	27.4	0.263	59.6	0.502	–60.5

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

Frequency	S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.471	–83.2	13.160	120.4	0.026	64.3	0.757	–17.7
200.00	0.349	–119.5	7.654	100.5	0.037	63.0	0.646	–16.0
300.00	0.301	–140.2	5.293	89.6	0.050	63.2	0.605	–16.1
400.00	0.291	–153.2	3.997	83.3	0.061	67.1	0.592	–15.5
500.00	0.295	–163.3	3.219	77.5	0.072	66.9	0.572	–15.5
600.00	0.301	–172.5	2.829	74.7	0.085	69.9	0.579	–16.5
700.00	0.306	179.5	2.483	68.7	0.096	68.7	0.577	–17.1
800.00	0.313	174.1	2.232	64.8	0.111	68.7	0.584	–19.8
900.00	0.323	169.9	1.961	60.5	0.120	70.1	0.587	–22.1
1000.00	0.346	165.4	1.794	56.7	0.132	68.4	0.577	–26.1
1100.00	0.370	160.2	1.652	53.9	0.144	70.0	0.570	–29.0
1200.00	0.380	153.6	1.552	49.4	0.153	69.0	0.552	–31.9
1300.00	0.386	149.0	1.479	45.4	0.170	69.0	0.540	–34.2
1400.00	0.391	146.0	1.346	41.8	0.177	69.0	0.529	–36.5
1500.00	0.410	143.2	1.259	36.9	0.191	67.6	0.529	–39.1
1600.00	0.430	140.6	1.181	36.5	0.201	70.2	0.523	–42.4
1700.00	0.448	136.2	1.100	34.0	0.215	69.1	0.520	–46.2
1800.00	0.466	132.8	1.094	32.5	0.236	70.4	0.509	–50.6
1900.00	0.475	129.9	1.047	29.7	0.253	68.8	0.499	–54.5
2000.00	0.490	127.0	1.034	24.9	0.273	66.3	0.487	–58.6

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

Frequency	S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.787	–43.0	8.019	143.8	0.035	70.1	0.923	–12.5
200.00	0.606	–72.3	6.026	121.4	0.051	60.3	0.810	–16.8
300.00	0.465	–93.7	4.568	105.8	0.065	54.3	0.729	–19.4
400.00	0.389	–109.3	3.640	97.1	0.073	56.6	0.695	–18.9
500.00	0.345	–122.8	3.081	89.6	0.080	55.6	0.656	–18.8
600.00	0.320	–136.0	2.658	84.8	0.091	58.7	0.656	–19.4
700.00	0.302	–147.7	2.367	77.6	0.099	58.1	0.647	–19.6
800.00	0.294	–157.5	2.144	73.1	0.112	59.3	0.653	–22.0
900.00	0.291	–165.6	1.897	67.7	0.119	61.4	0.653	–23.7
1000.00	0.301	–173.4	1.743	63.4	0.130	60.8	0.641	–27.4
1100.00	0.313	178.4	1.610	60.2	0.139	62.8	0.633	–29.9
1200.00	0.319	170.0	1.520	55.3	0.149	62.3	0.612	–32.4
1300.00	0.320	164.0	1.447	51.3	0.164	62.4	0.599	–34.4
1400.00	0.324	159.7	1.326	47.2	0.168	62.6	0.587	–36.3
1500.00	0.343	155.9	1.244	42.4	0.181	61.8	0.586	–38.3
1600.00	0.363	151.9	1.172	41.6	0.187	64.8	0.581	–41.1
1700.00	0.379	146.5	1.100	38.9	0.200	64.2	0.579	–44.7
1800.00	0.396	142.2	1.095	37.0	0.216	65.9	0.568	–48.3
1900.00	0.406	138.7	1.054	34.0	0.233	65.1	0.560	–51.7
2000.00	0.421	135.5	1.043	29.1	0.250	63.0	0.547	–55.3

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

Frequency	S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.487	–77.7	13.538	122.2	0.024	64.1	0.785	–16.2
200.00	0.346	–113.2	8.008	101.9	0.035	63.2	0.681	–14.7
300.00	0.290	–134.4	5.559	90.9	0.048	63.6	0.638	–14.8
400.00	0.275	–148.3	4.216	84.6	0.057	67.6	0.626	–14.1
500.00	0.275	–158.7	3.396	78.8	0.067	68.0	0.606	–14.1
600.00	0.280	–168.6	2.974	76.0	0.080	70.5	0.613	–15.0
700.00	0.284	–176.9	2.610	70.2	0.090	69.6	0.612	–15.5
800.00	0.291	177.1	2.347	66.4	0.104	70.0	0.620	–17.9
900.00	0.302	172.6	2.065	62.0	0.112	71.2	0.625	–20.1
1000.00	0.324	167.8	1.884	58.2	0.124	69.8	0.616	–23.9
1100.00	0.346	162.2	1.734	55.5	0.134	71.3	0.608	–26.5
1200.00	0.358	155.4	1.630	51.2	0.143	70.7	0.590	–29.1
1300.00	0.364	150.7	1.548	47.3	0.159	71.0	0.579	–31.1
1400.00	0.369	147.6	1.410	43.7	0.165	71.1	0.568	–33.0
1500.00	0.389	144.8	1.320	38.9	0.179	70.0	0.569	–35.2
1600.00	0.408	142.0	1.236	38.5	0.189	72.6	0.564	–38.1
1700.00	0.427	137.5	1.153	35.9	0.203	71.5	0.563	–41.8
1800.00	0.445	134.0	1.147	34.3	0.222	73.1	0.553	–45.6
1900.00	0.455	131.1	1.102	31.7	0.238	71.7	0.545	–49.1
2000.00	0.470	128.3	1.089	26.5	0.258	69.2	0.533	–52.9

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

Frequency	S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.799	–40.5	7.976	145.0	0.030	71.8	0.937	–10.9
200.00	0.618	–68.1	6.066	122.9	0.046	60.5	0.836	–14.6
300.00	0.471	–88.5	4.643	107.4	0.057	56.0	0.763	–17.0
400.00	0.390	–103.5	3.710	98.6	0.065	57.7	0.733	–16.5
500.00	0.340	–116.4	3.144	91.1	0.073	57.3	0.695	–16.5
600.00	0.311	–129.5	2.719	86.4	0.083	60.3	0.698	–17.0
700.00	0.290	–141.4	2.419	79.2	0.090	60.1	0.690	–17.0
800.00	0.278	–151.6	2.194	74.7	0.103	61.0	0.698	–19.3
900.00	0.273	–160.3	1.941	69.4	0.108	63.5	0.699	–20.8
1000.00	0.280	–168.7	1.782	65.1	0.118	62.7	0.689	–24.4
1100.00	0.291	–177.4	1.644	61.8	0.127	65.1	0.679	–26.7
1200.00	0.296	173.6	1.551	57.0	0.136	64.9	0.657	–28.9
1300.00	0.298	167.4	1.474	53.0	0.149	65.0	0.646	–30.4
1400.00	0.302	162.8	1.350	49.0	0.153	65.7	0.633	–32.0
1500.00	0.321	158.6	1.269	44.3	0.165	65.0	0.637	–33.7
1600.00	0.340	154.4	1.197	43.5	0.172	67.9	0.631	–36.1
1700.00	0.357	148.7	1.124	40.9	0.184	67.7	0.632	–39.3
1800.00	0.374	144.1	1.117	39.1	0.201	69.6	0.624	–42.5
1900.00	0.385	140.4	1.077	36.0	0.214	68.9	0.616	–45.6
2000.00	0.399	137.1	1.064	31.0	0.230	66.7	0.606	–48.7

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

Frequency	S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.507	–71.4	13.698	124.2	0.022	69.9	0.816	–14.2
200.00	0.348	–104.2	8.229	103.6	0.032	65.4	0.719	–13.1
300.00	0.279	–124.9	5.731	92.4	0.044	64.5	0.678	–13.3
400.00	0.254	–139.4	4.348	86.2	0.054	68.8	0.669	–12.6
500.00	0.249	–150.8	3.504	80.2	0.062	68.1	0.647	–12.5
600.00	0.251	–161.6	3.083	77.6	0.074	71.4	0.657	–13.3
700.00	0.254	–170.8	2.710	71.8	0.083	70.4	0.656	–13.6
800.00	0.261	–177.6	2.436	68.1	0.096	70.8	0.665	–15.9
900.00	0.271	177.0	2.141	63.7	0.103	72.0	0.669	–17.8
1000.00	0.292	171.7	1.953	60.0	0.114	70.8	0.661	–21.4
1100.00	0.314	165.4	1.798	57.3	0.123	72.8	0.654	–23.7
1200.00	0.324	158.4	1.691	52.9	0.132	72.2	0.634	–26.0
1300.00	0.332	153.5	1.604	49.1	0.147	72.8	0.625	–27.7
1400.00	0.338	150.0	1.461	45.6	0.151	72.8	0.613	–29.3
1500.00	0.358	147.1	1.369	40.9	0.165	72.1	0.618	–30.9
1600.00	0.378	144.0	1.282	40.4	0.174	75.1	0.613	–33.4
1700.00	0.397	139.5	1.201	38.0	0.187	74.3	0.615	–36.7
1800.00	0.415	135.8	1.188	36.4	0.205	75.8	0.607	–39.8
1900.00	0.426	132.7	1.147	33.4	0.219	74.6	0.599	–43.1
2000.00	0.442	129.9	1.130	28.6	0.238	72.4	0.589	–46.4