NEC

SILICON TRANSISTOR

2SC5408

NPN EPITAXIAL SILICON TRANSISTOR FOR MICROWAVE HIGH-GAIN AMPLIFICATION

FEATURE

- High f_T
  17 GHz TYP.
- High gain
  $|S_{21e}|^2$ = 15.5 dB TYP.
  @f = 2 GHz, V_{CE} = 2 V, I_C = 7 mA
- NF = 1.1 dB, @f = 2 GHz V_{CE} = 2 V, I_C = 1 mA
- 6-pin Small Mini Mold Package

ORDERING INFORMATION

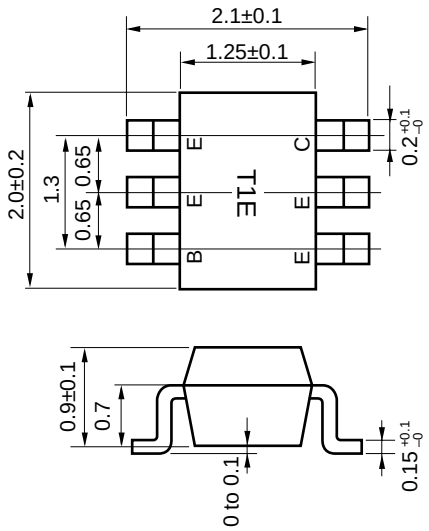
PART NUMBER	QUANTITY	PACKING STYLE
2SC5408-T1	3 kpcs/reel	8-mm wide emboss taping, 6-pin (collector) feed hole direction

Remark To order evaluation samples, consult your NEC sales personnel (supported in 50-pcs units).

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATING	UNIT
Collector to Base Voltage	V_{CBO}	5	V
Collector to Emitter Voltage	V_{CEO}	3	V
Emitter to Base Voltage	V_{EBO}	2	V
Collector Current	I_C	10	mA
Total Power Dissipation	P_T	30	mW
Junction Temperature	T_j	150	°C
Storage Temperature	T_{stg}	–65 to +150	°C

PACKAGE DIMENSIONS (in mm)



PIN CONNECTIONS

E: Emitter
C: Collector
B: Base

Because this product uses high-frequency process, avoid excessive input of static electricity, etc.

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ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Collector Cut-off Current	I_{CBO}	V_{CB} = 5 V, I_E = 0			0.1	μA
Emitter Cut-off Current	I_{EBO}	V_{EB} = 1 V, I_C = 0			0.1	μA
DC Current Gain	h_{FE}	V_{CE} = 2 V, I_C = 7 mA **Note 1**	70		140	
Gain Bandwidth Product	f_T	V_{CE} = 2 V, I_C = 7 mA, f = 2.0 GHz		17		GHz
Feed-back Capacitance	Cre	V_{CB} = 2 V, I_E = 0, f = 1 MHz **Note 2**		0.1	0.15	pF
Insertion Power Gain	$\|S_{21e}\|^2$	V_{CE} = 2 V, I_C = 7 mA, f = 2.0 GHz	13	15.5		dB
Noise Figure	NF	V_{CE} = 2 V, I_C = 1 mA, f = 2.0 GHz		1.1	1.8	dB

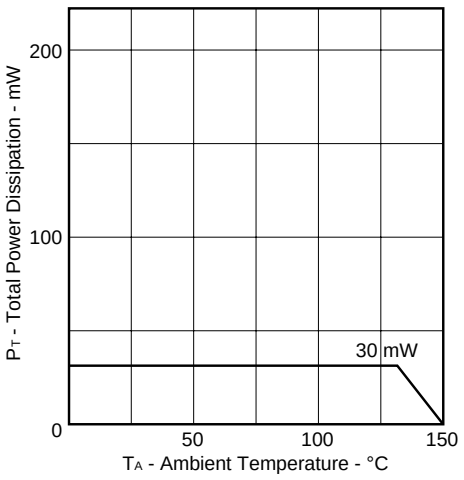
Rank	FB
Marking	T1E
h_{FE}	70 to 40

Notes 1. Pulse measurement PW ≤ 350 μs, duty cycle ≤ 2 %, pulsed

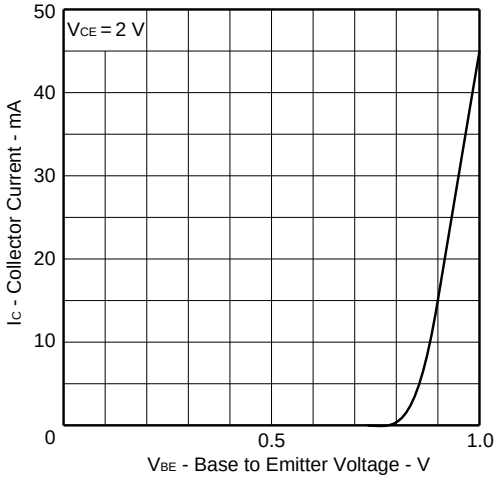
2. Measured with three-pin bridge, with emitter pin connected to the bridge guard.

TYPICAL CHARACTERISTICS (T_A = 25 °C)

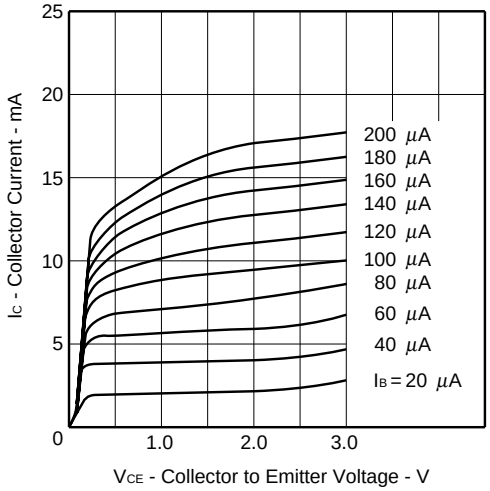
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



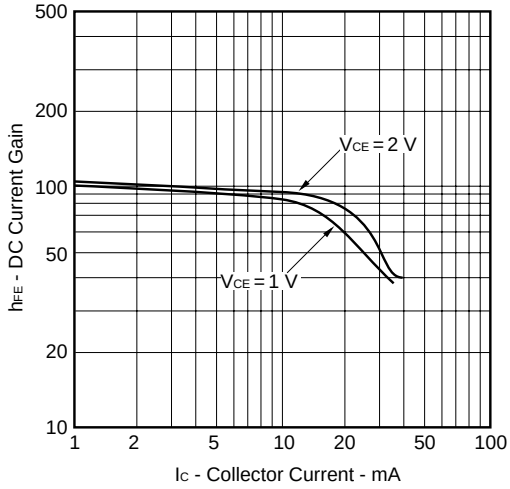
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



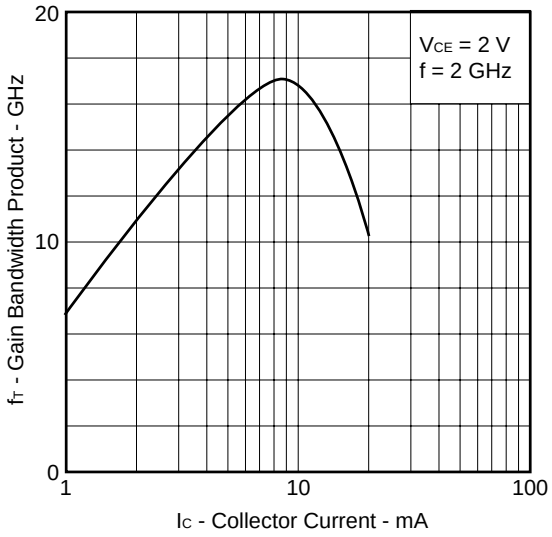
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



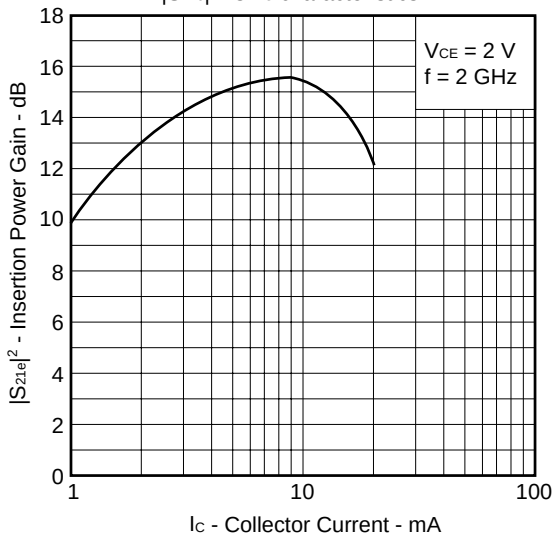
DC CURRENT GAIN vs. COLLECTOR CURRENT



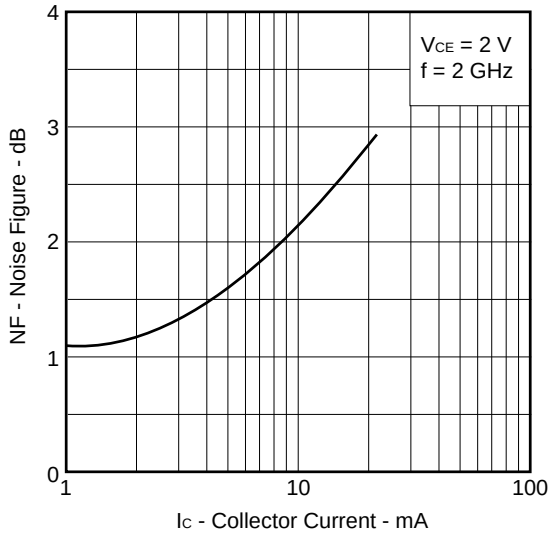
f_T vs. I_C characteristics



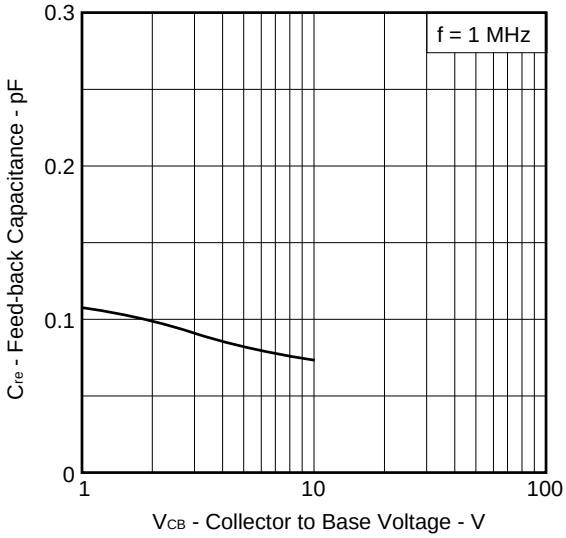
$|S_{21e}|^2$ vs. I_C characteristics



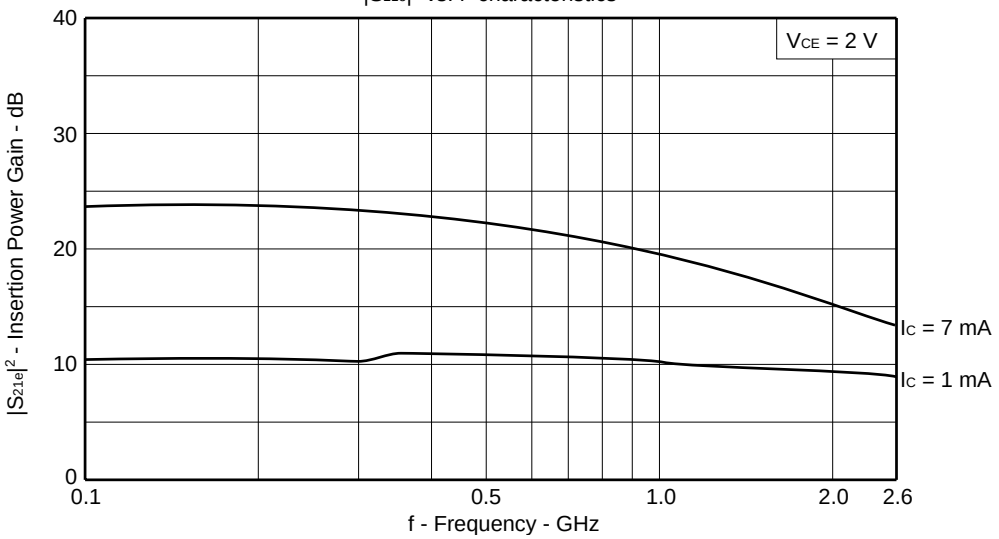
NF vs. I_C characteristics



C_{re} vs. V_{CB}



$|S_{21e}|^2$ vs. f characteristics



S PARAMETER

V_{CE} = 2 V I_C = 1 mA

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.000	0.969	–4.1	3.345	174.9	0.006	84.6	0.991	–3.2
200.000	0.967	–8.2	3.287	170.3	0.012	82.8	0.993	–6.8
300.000	0.959	–12.3	3.334	165.9	0.018	79.0	0.990	–10.0
400.000	0.952	–16.6	3.361	161.4	0.024	75.8	0.990	–13.6
500.000	0.943	–20.8	3.280	156.3	0.031	71.8	0.980	–17.3
600.000	0.931	–25.2	3.307	151.2	0.036	68.4	0.971	–20.8
700.000	0.919	–29.5	3.286	146.9	0.042	64.5	0.963	–24.2
800.000	0.903	–34.1	3.278	141.6	0.047	61.0	0.952	–28.1
900.000	0.883	–38.6	3.268	136.4	0.052	57.0	0.940	–31.6
1 000.000	0.865	–42.9	3.226	132.3	0.057	53.4	0.927	–35.3
1 100.000	0.842	–47.4	3.197	127.4	0.060	49.9	0.913	–38.8
1 200.000	0.817	–51 9	3.175	122.4	0.065	46.0	0.901	–42.6
1 300.000	0.796	–56.6	3.127	118.2	0.067	42.8	0.885	–46.2
1 400.000	0.774	–61.3	3.077	113.1	0.070	39.4	0.863	–49.6
1 500.000	0.748	–66.2	3.059	108.5	0.072	36.6	0.852	–53.2
1 600.000	0.725	–71.1	3.047	103.9	0.073	33.5	0.836	–56.8
1 700.000	0.702	–76.1	2.978	99.4	0.074	30.8	0.824	–60.0
1 800.000	0.678	–81.1	2.920	95.4	0.075	28.1	0.808	–64.0
1 900.000	0.653	–86.3	2.920	90.5	0.074	25.7	0.794	–67.2
2 000.000	0.633	–91.5	2.856	86.3	0.074	23.5	0.780	–70.8
2 100.000	0.611	–97.3	2.834	82.0	0.074	21.1	0.771	–74.1
2 200.000	0.591	–102.9	2.795	77.6	0.073	19.0	0.756	–77.6
2 300.000	0.571	–108.8	2.751	73.0	0.072	16.9	0.748	–81.4
2 400.000	0.554	–114.9	2.713	68.6	0.071	15.0	0.744	–85.0
2 500.000	0.535	–120.7	2.656	64.2	0.068	13.6	0.733	–88.5
2 600.000	0.520	–127.0	2.619	59.7	0.065	12.7	0.727	–91.6

V_{CE} = 2 V I_C = 7 mA

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.000	0.828	–9.4	15.424	169.5	0.005	82.0	0.969	–5.9
200.000	0.806	–18.5	14.864	160.4	0.011	77.6	0.951	–11.9
300.000	0.765	–27.2	14.467	151.7	0.016	72.4	0.920	–17.2
400.000	0.722	–35.7	13.904	143.2	0.020	67.5	0.892	–22.0
500.000	0.675	–43.3	12.879	135.6	0.024	62.8	0.846	–26.7
600.000	0.625	–50.8	12.259	127.9	0.028	59.6	0.809	–30.5
700.000	0.575	–57.8	11.555	121.5	0.030	56.6	0.772	–33.9
800.000	0.527	–64.6	10.806	115.1	0.033	54.4	0.738	–37.6
900.000	0.481	–70.9	10.151	109.2	0.035	52.6	0.708	–40.2
1 000.000	0.439	–77.0	9.573	104.2	0.037	51.0	0.678	–42.9
1 100.000	0.400	–82.9	8.988	99.2	0.038	50.0	0.650	–45.4
1 200.000	0.364	–89.1	8.510	94.4	0.039	49.3	0.628	–47.9
1 300.000	0.335	–95.3	8.017	90.2	0.041	48.9	0.611	–50.3
1 400.000	0.309	–101.6	7.572	85.8	0.042	48.9	0.589	–52.4
1 500.000	0.284	–108.2	7.203	82.0	0.043	48.7	0.575	–54.8
1 600.000	0.264	–115.1	6.876	78.1	0.044	49.5	0.563	–57.4
1 700.000	0.249	–122.5	6.569	74.1	0.046	49.4	0.553	–59.5
1 800.000	0.239	–129.9	6.225	70.9	0.047	50.1	0.541	–62.4
1 900.000	0.226	–138.1	6.019	67.4	0.048	50.8	0.532	–64.7
2 000.000	0.222	–145.1	5.728	63.8	0.050	50.9	0.525	–68.0
2 100.000	0.220	–154.2	5.541	60.6	0.052	51.9	0.519	–70.5
2 200.000	0.220	–161.9	5.326	57.0	0.054	52.3	0.511	–73.1
2 300.000	0.223	–169.9	5.112	53.7	0.056	52.5	0.511	–76.3
2 400.000	0.230	–176.7	4.951	50.6	0.059	53.1	0.510	–79.8
2 500.000	0.235	176.3	4.761	47.3	0.062	53.1	0.510	–83.1
2 600.000	0.245	169.7	4.602	43.9	0.065	53.0	0.513	–86.4

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