NEC

SILICON TRANSISTOR
2SC4959

HIGH FREQUENCY LOW NOISE AMPLIFIER
NPN SILICON EPITAXIAL TRANSISTOR
SUPER MINI MOLD

FEATURES

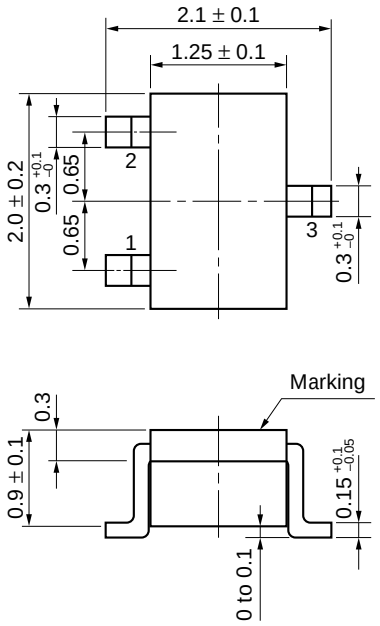
- Low Noise, High Gain
- Low Voltage Operation
- Low Feedback Capacitance
  C_{re} = 0.4 pF TYP.

ORDERING INFORMATION

PART NUMBER	QUANTITY	PACKING STYLE
2SC4959–T1	3 Kpcs/Reel.	Embossed tape 8 mm wide. Pin3 (Collector) face to perforation side of the tape.
2SC4959–T2	3 Kpcs/Reel.	Embossed tape 8 mm wide. Pin1 (Emitter), Pin2 (Base) face to perforation side of the tape.

* Please contact with responsible NEC person, if you require evaluation sample.
Unit sample quantity shall be 50 pcs. (Part No.: 2SC4959)

PACKAGE DIMENSIONS
in millimeters



PIN CONNECTIONS

1. Emitter
2. Base
3. Collector

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C)

Collector to Base Voltage	V_{CBO}	9	V
Collector to Emitter Voltage	V_{CEO}	6	V
Emitter to Base Voltage	V_{EBO}	2	V
Collector Current	I_C	30	mA
Total Power Dissipation	P_T	150	mW
Junction Temperature	T_j	150	°C
Storage Temperature	T_{stg}	–65 to +150	°C

Caution; Electrostatic sensitive Device.

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ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Collector Cutoff Current	I_{CBO}			0.1	μA	V_{CB} = 5 V, I_E = 0
Emitter Cutoff Current	I_{EBO}			0.1	μA	V_{EB} = 1 V, I_C = 0
DC Current Gain	h_{FE}	75		150		V_{CE} = 3 V, I_C = 10 mA***1**
Gain Bandwidth Product	f_T		12		GHz	V_{CE} = 3 V, I_C = 10 mA, f = 2.0 GHz
Feed back Capacitance	C_{re}		0.4	0.7	pF	V_{CB} = 3 V, I_E = 0, f = 1 MHz***2**
Insertion Power Gain	$\|S_{21e}\|^2$	7	8.5		dB	V_{CE} = 3 V, I_C = 10 mA, f = 2.0 GHz
Noise Figure	NF		1.5	2.5	dB	V_{CE} = 3 V, I_C = 3 mA, f = 2.0 GHz

***1** Pulse Measurement ; PW ≤ 350 μs, Duty Cycle ≤ 2 % Pulsed.

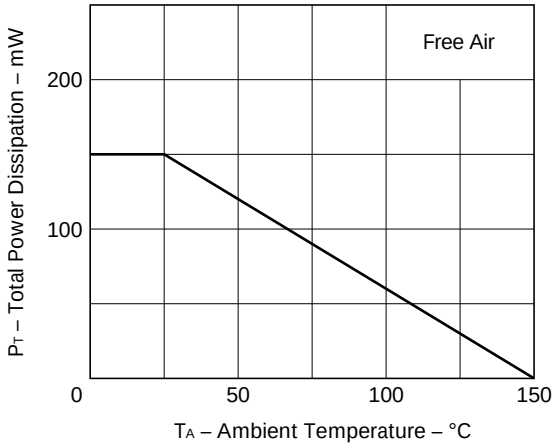
***2** Measured with 3 terminals bridge, Emitter and Case should be grounded.

h_{FE} Classification

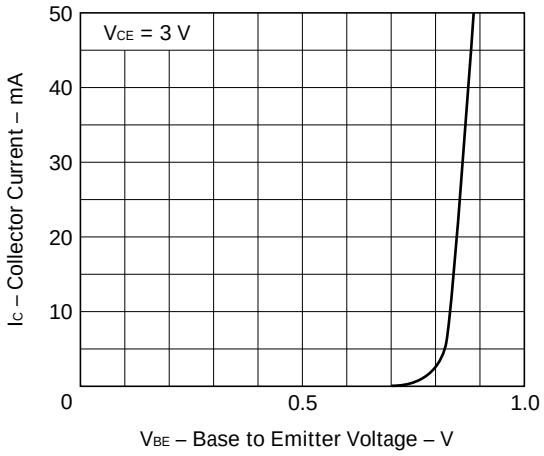
Rank	T83
Marking	T83
h_{FE}	75 to 150

TYPICAL CHARACTERISTICS (T_A = 25 °C)

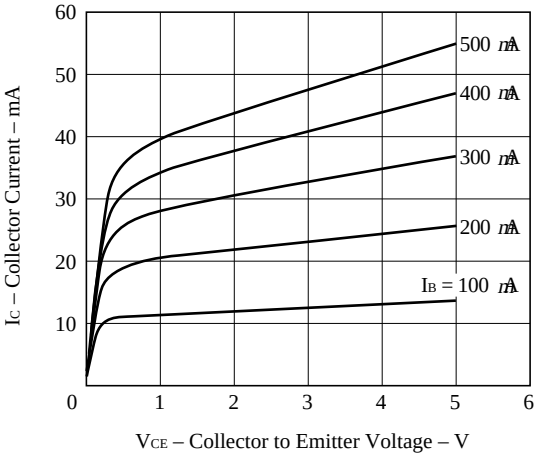
TOTAL POWER DISSIPATION vs.AMBIENT TEMPERATURE



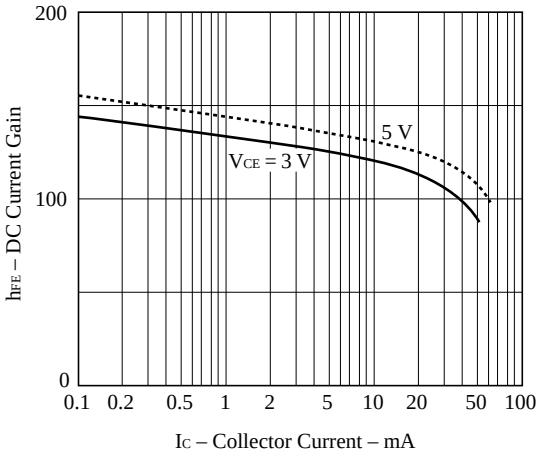
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



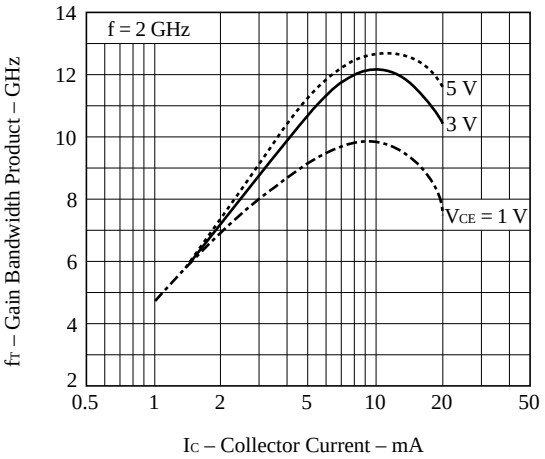
COLLECTOR CURRENT vs.
COLLECTOR TO EMITTER VOLTAGE



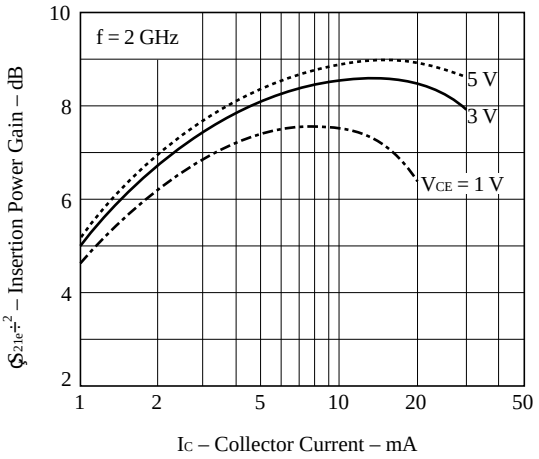
DC CURRENT GAIN vs.
COLLECTOR CURRENT



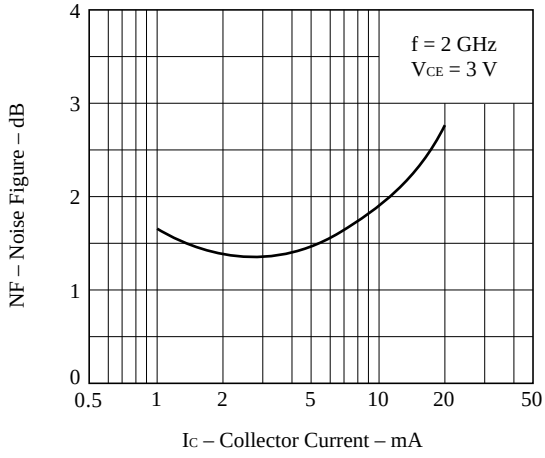
GAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENT



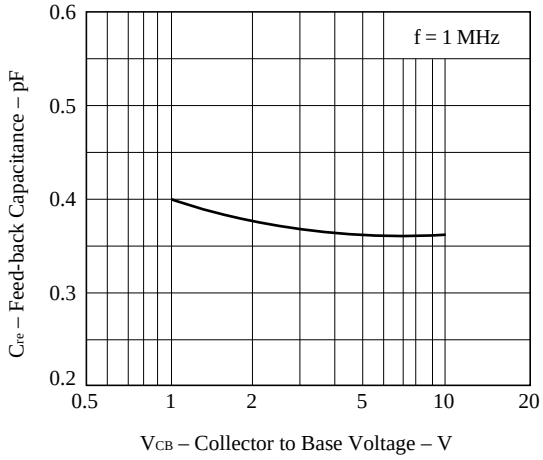
INSERTION POWER GAIN vs.
COLLECTOR CURRENT



NOISE FIGURE vs.
COLLECTOR CURRENT



FEED-BACK CAPACITANCE vs.
COLLECTOR TO BASE VOLTAGE



S–PARAMETER

(V_{CE} = 3 V, I_C = 1 mA, Z_O = 50 Ω)

f	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
0.200	0.9340	–15.7	3.5100	164.8	0.0450	82.6	0.9850	–8.7
0.400	0.9040	–29.4	3.3520	150.7	0.0780	68.0	0.9410	–17.1
0.600	0.8150	–43.4	3.1060	138.0	0.1140	62.8	0.8960	–23.6
0.800	0.7530	–56.6	2.8840	126.3	0.1370	58.0	0.8260	–29.9
1.000	0.6540	–68.9	2.6050	115.1	0.1490	55.2	0.7830	–34.7
1.200	0.5900	–79.8	2.4490	105.4	0.1660	45.4	0.7220	–38.0
1.400	0.5160	–90.1	2.2610	96.8	0.1770	44.8	0.6790	–42.0
1.600	0.4590	–101.5	2.0780	89.4	0.1780	45.1	0.6430	–45.2
1.800	0.4230	–110.8	1.9250	83.7	0.1880	42.5	0.6290	–46.8
2.000	0.3670	–123.9	1.8700	76.3	0.1900	41.9	0.5880	–51.4
2.200	0.3370	–136.7	1.7790	69.9	0.2110	43.9	0.5630	–54.3
2.400	0.3150	–145.5	1.6600	64.1	0.2140	41.9	0.5520	–57.0
2.600	0.3080	–159.1	1.5690	59.4	0.2070	42.8	0.5450	–59.2
2.800	0.2930	–164.8	1.5190	55.3	0.2140	45.8	0.5220	–64.5
3.000	0.2950	–179.6	1.4610	50.7	0.2260	45.4	0.4960	–61.3

(V_{CE} = 3 V, I_C = 3 mA, Z_O = 50 Ω)

f	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
0.200	0.8020	–25.9	8.8990	154.2	0.0370	67.2	0.9420	–15.7
0.400	0.6780	–45.8	7.4880	134.4	0.0760	65.6	0.8040	–26.6
0.600	0.5440	–62.8	6.1260	119.6	0.0860	60.9	0.7060	–33.2
0.800	0.4430	–75.7	5.1230	108.1	0.1050	58.4	0.6250	–36.6
1.000	0.3540	–87.3	4.3050	99.1	0.1210	55.9	0.5660	–38.3
1.200	0.2930	–99.7	3.7880	91.3	0.1330	61.2	0.5190	–41.4
1.400	0.2360	–108.4	3.3560	84.8	0.1440	55.4	0.4950	–43.9
1.600	0.2000	–121.0	3.0100	79.1	0.1570	56.2	0.4660	–44.5
1.800	0.1820	–129.5	2.6960	74.4	0.1760	58.0	0.4560	–44.5
2.000	0.1480	–151.7	2.5340	69.4	0.1940	56.1	0.4310	–48.8
2.200	0.1370	–166.1	2.3820	64.0	0.2150	56.3	0.4050	–51.9
2.400	0.1340	175.2	2.1870	60.0	0.2130	57.8	0.3990	–52.8
2.600	0.1640	169.7	2.0530	55.8	0.2410	57.6	0.3950	–52.9
2.800	0.1500	170.9	1.9660	53.0	0.2490	55.2	0.3750	–59.2
3.000	0.1780	147.7	1.8710	49.6	0.2750	56.6	0.3740	–60.8

S–PARAMETER

(V_{CE} = 3 V, I_C = 5 mA, Z_O = 50 Ω)

f	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
0.200	0.6900	–33.3	12.2960	147.1	0.0320	74.8	0.8850	–19.7
0.400	0.5360	–54.7	9.4300	125.5	0.0610	66.3	0.7210	–30.3
0.600	0.4010	–70.0	7.2390	111.3	0.0700	59.6	0.6030	–34.5
0.800	0.3150	–82.4	5.8220	101.1	0.0950	63.8	0.5230	–36.7
1.000	0.2360	–93.8	4.7830	93.4	0.1090	62.3	0.4870	–38.0
1.200	0.1850	–105.4	4.1700	86.4	0.1260	61.9	0.4600	–38.8
1.400	0.1440	–115.8	3.6410	80.7	0.1350	65.9	0.4360	–40.4
1.600	0.1230	–134.4	3.2380	76.1	0.1560	61.2	0.4170	–42.6
1.800	0.1040	–144.6	2.8910	71.4	0.1770	62.4	0.4020	–43.9
2.000	0.1000	–170.6	2.7040	67.3	0.1930	60.7	0.3940	–45.8
2.200	0.1110	167.4	2.5330	62.6	0.2080	60.6	0.3710	–50.3
2.400	0.1040	158.2	2.3270	58.7	0.2260	61.6	0.3500	–50.2
2.600	0.1180	156.3	2.1850	54.9	0.2560	58.2	0.3560	–51.2
2.800	0.1190	150.0	2.0910	52.6	0.2560	56.8	0.3520	–58.1
3.000	0.1490	142.4	1.9760	49.0	0.2860	56.6	0.3410	–56.9

(V_{CE} = 3 V, I_C = 10 mA, Z_O = 50 Ω)

f	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
0.200	0.5080	–43.6	17.0900	135.9	0.0330	63.8	0.7930	–26.2
0.400	0.3410	–65.3	11.3980	114.2	0.0520	68.5	0.5910	–32.9
0.600	0.2320	–80.7	8.2250	102.0	0.0690	69.0	0.5130	–32.9
0.800	0.1770	–90.8	6.3950	93.8	0.0880	71.6	0.4480	–32.8
1.000	0.1220	–108.2	5.1870	87.2	0.1060	69.3	0.4180	–35.9
1.200	0.1010	–121.8	4.4390	81.6	0.1260	70.1	0.4030	–33.3
1.400	0.0670	–138.2	3.8770	76.9	0.1450	70.5	0.3930	–36.5
1.600	0.0620	–167.6	3.4350	72.4	0.1590	65.5	0.3680	–36.2
1.800	0.0660	–171.3	3.0650	68.8	0.1790	65.0	0.3610	–39.5
2.000	0.0770	146.7	2.8540	65.0	0.2060	63.9	0.3480	–42.3
2.200	0.0990	146.5	2.6590	60.5	0.2220	62.8	0.3360	–46.6
2.400	0.1140	128.1	2.4400	57.0	0.2420	60.9	0.3370	–48.8
2.600	0.1260	136.8	2.2790	53.5	0.2660	59.9	0.3170	–47.2
2.800	0.1020	129.6	2.1950	50.9	0.2770	59.6	0.3280	–55.1
3.000	0.1370	123.5	2.0800	47.9	0.2860	58.3	0.3100	–51.2