DATA SHEET

NEC

SILICON TRANSISTOR
2SC4094

MICROWAVE LOW NOISE AMPLIFIER
NPN SILICON EPITAXIAL TRANSISTOR
4 PINS MINI MOLD

DESCRIPTION

The 2SC4094 is an NPN epitaxial silicon transistor designed for use in low-noise and small signal amplifiers from VHF band to UHF band. Low-noise figure, high gain, and high current capability achieve a very wide dynamic range and excellent linearity. This achieved by direct nitride passivated base surface process (DNP process) which is an NEC proprietary new fabrication technique.

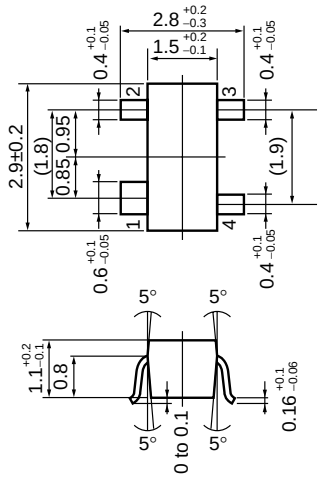
FEATURES

- NF = 1.2 dB TYP. @f = 1.0 GHz, V_{CE} = 8 V, I_C = 7 mA
- $|S_{21e}|^2$ = 15 dB TYP. @f = 1.0 GHz, V_{CE} = 8 V, I_C = 20 mA

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C)

Collector to Base Voltage	V_{CBO}	20	V
Collector to Emitter Voltage	V_{CEO}	10	V
Emitter to Base Voltage	V_{EBO}	1.5	V
Collector Current	I_C	65	mA
Total Power Dissipation	P_T	200	mW
Junction Temperature	T_j	150	°C
Storage Temperature	T_{stg}	–65 to +150	°C

PACKAGE DIMENSIONS
(Units: mm)



PIN CONNECTIONS
1. Collector
2. Emitter
3. Base
4. Emitter

ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Collector Cutoff Current	I_{CBO}			1.0	μA	V_{CB} = 10 V, I_E = 0
Emitter Cutoff Current	I_{EBO}			1.0	μA	V_{EB} = 1 V, I_C = 0
DC Current Gain	h_{FE}	50		250		V_{CE} = 8V, I_C = 20 mA
Gain Bandwidth Product	f_T		9		GHz	V_{CE} = 8 V, I_C = 20 mA, f = 1.0 GHz
Feed-Back Capacitance	C_{re}		0.25	0.8	pF	V_{CB} = 10 V, I_E = 0, f = 1.0 MHz
Insertion Power Gain	$\|S_{21e}\|^2$	13	15		dB	V_{CE} = 8 V, I_C = 20 mA, f = 1.0 GHz
Maximum Available Gain	MAG		17		dB	V_{CE} = 8 V, I_C = 20 mA, f = 1.0 GHz
Noise Figure	NF		1.2	2.0	dB	V_{CE} = 8 V, I_C = 7 mA, f = 1.0 GHz

h_{FE} Classification

Class	R36/RCF *	R37/RCG *	R38/RCH *
Marking	R36	R37	R38
h_{FE}	50 to 100	80 to 160	125 to 250

* Old Specification / New Specification

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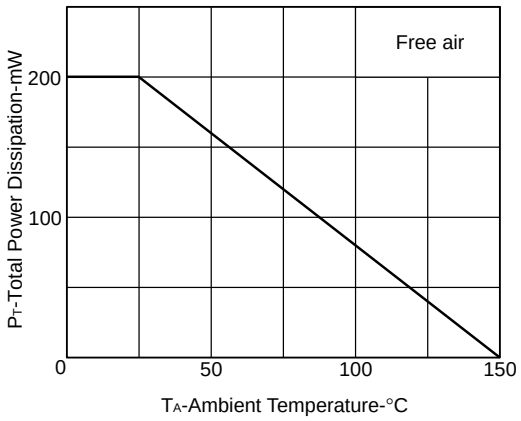
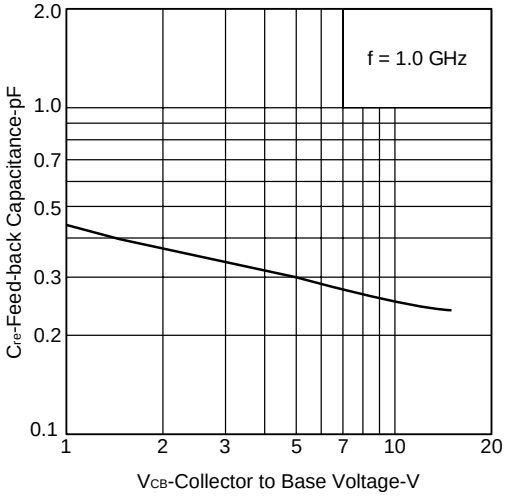
TYPICAL CHARACTERISTICS (T_A = 25 °C)

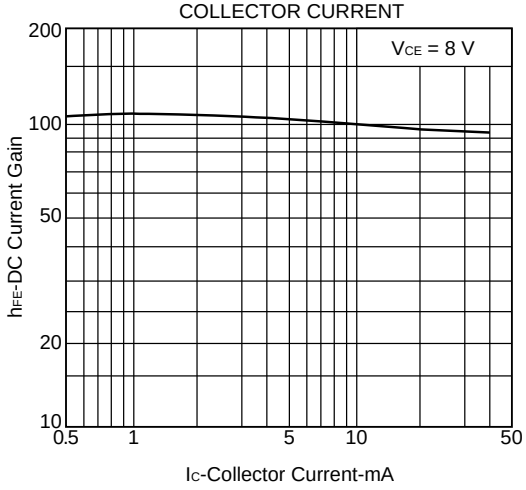
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



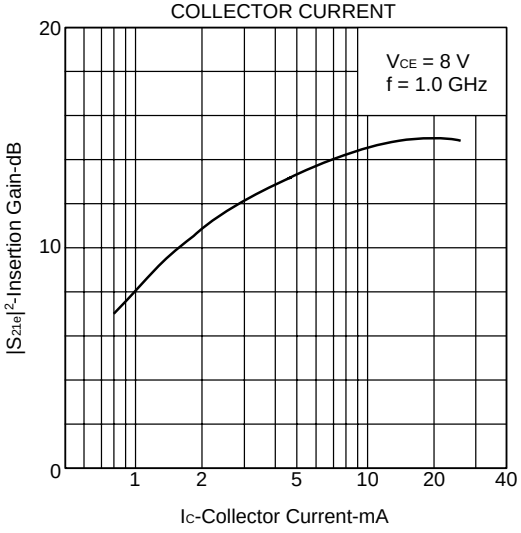
FEED-BACK CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



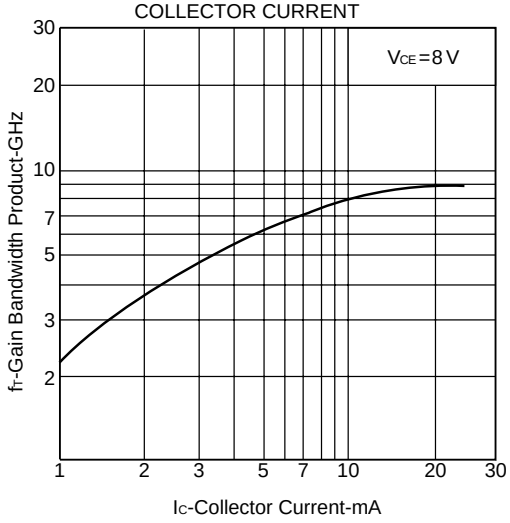
DC CURRENT GAIN vs. COLLECTOR CURRENT



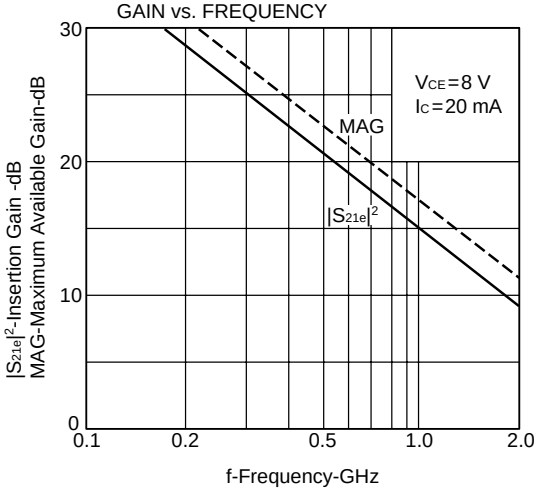
INSERTION GAIN vs. COLLECTOR CURRENT

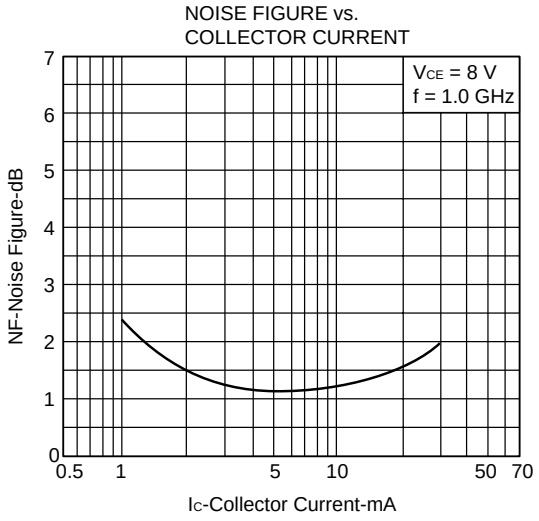


GAIN BANDWIDTH PRODUT vs. COLLECTOR CURRENT



MAXIMUM AVAILABLE GAIN, INSERTION GAIN vs. FREQUENCY





S-PARAMETER

V_{CE} = 8.0 V, I_C = 5.0 mA, Z_O = 50 Ω

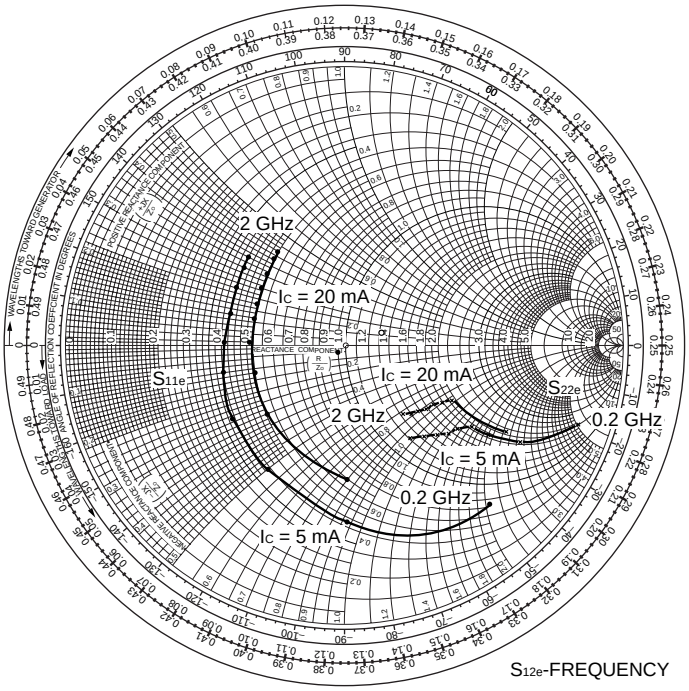
f (MHz)	$\|S_{11}\|$	$\angle S_{11}$	$\|S_{21}\|$	$\angle S_{21}$	$\|S_{12}\|$	$\angle S_{12}$	$\|S_{22}\|$	$\angle S_{22}$
200	0.774	−47.8	12.689	146.5	0.031	65.4	0.882	−19.1
400	0.631	−88.8	9.952	119.4	0.048	53.4	0.723	−29.5
600	0.523	−120.9	7.813	100.9	0.058	46.2	0.611	−33.4
800	0.460	−145.1	5.966	87.6	0.067	43.9	0.564	−34.5
1000	0.426	−166.6	4.841	76.7	0.074	43.8	0.515	−37.6
1200	0.416	178.2	4.065	68.8	0.083	43.5	0.488	−39.6
1400	0.417	163.0	3.413	60.7	0.087	41.2	0.459	−44.1
1600	0.430	152.1	3.035	54.1	0.098	42.8	0.443	−45.9
1800	0.443	142.1	2.659	48.0	0.105	40.1	0.428	−51.1
2000	0.458	136.5	2.482	44.3	0.114	43.0	0.414	−53.5

V_{CE} = 8.0 V, I_C = 20.0 mA, Z_O = 50 Ω

f (MHz)	$\|S_{11}\|$	$\angle S_{11}$	$\|S_{21}\|$	$\angle S_{21}$	$\|S_{12}\|$	$\angle S_{12}$	$\|S_{22}\|$	$\angle S_{22}$
200	0.461	−89.8	23.331	121.6	0.021	60.7	0.665	−27.7
400	0.364	−135.8	13.501	99.2	0.033	61.2	0.511	−30.5
600	0.338	−163.4	9.535	86.4	0.046	61.5	0.448	−29.5
800	0.330	177.9	7.083	77.5	0.056	62.1	0.430	−29.5
1000	0.334	163.2	5.604	69.3	0.070	60.0	0.402	−32.5
1200	0.344	153.9	4.722	63.5	0.084	60.4	0.385	−34.8
1400	0.359	143.1	3.982	56.8	0.091	54.9	0.362	−39.5
1600	0.383	136.1	3.517	51.1	0.104	54.5	0.350	−42.1
1800	0.401	128.3	3.094	45.6	0.116	49.9	0.337	−47.4
2000	0.419	124.7	2.882	42.7	0.127	50.8	0.323	−50.5

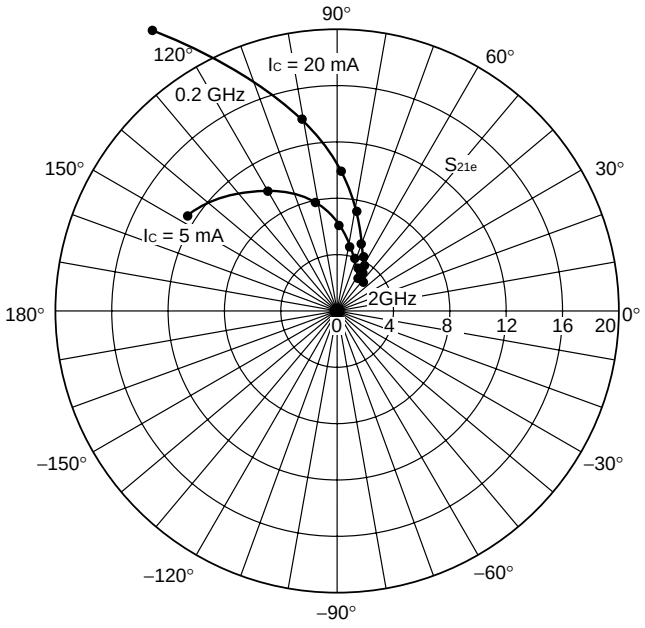
S-PARAMETER

S_{11e}, S_{22e}-FREQUENCY CONDITION V_{CE} = 8 V, I_C = 20/5 mA, freq. = 0.2 to 2 GHz (Step 200 MHz)



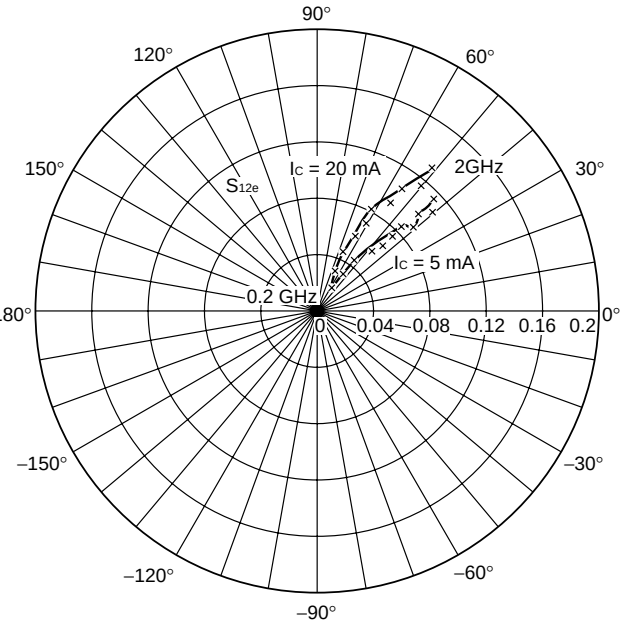
S_{21e}-FREQUENCY

CONDITION V_{CE} = 8 V
I_C = 20/5 mA
freq. = 0.2 to 2 GHz (Step 200 MHz)



S_{12e}-FREQUENCY

CONDITION V_{CE} = 8 V
I_C = 20/5 mA
freq. = 0.2 to 2 GHz (Step 200 MHz)



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