

# DATA SHEET

# NEC

# SILICON TRANSISTOR 2SC4094

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

### DESCRIPTION

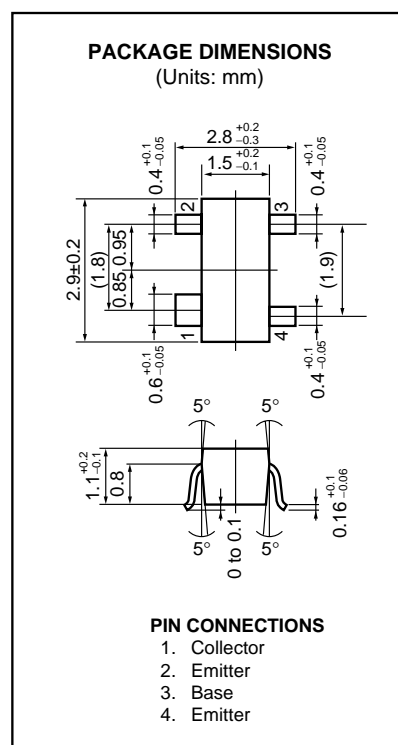
The 2SC4094 is an NPN epitaxial silicon transistor designed for use in low-noise and small signal amplifiers from VHF band to UHF band. Low-noise figure, high gain, and high current capability achieve a very wide dynamic range and excellent linearity. This achieved by direct nitride passivated base surface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

### FEATURES

- NF = 1.2 dB TYP. @f = 1.0 GHz, V<sub>CE</sub> = 8 V, I<sub>c</sub> = 7 mA
- |S<sub>21e</sub>|<sup>2</sup> = 15 dB TYP. @f = 1.0 GHz, V<sub>CE</sub> = 8 V, I<sub>c</sub> = 20 mA

### ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25 °C)

Collector to Base Voltage	V <sub>CB0</sub>	20	V
Collector to Emitter Voltage	V <sub>CE0</sub>	10	V
Emitter to Base Voltage	V <sub>EBO</sub>	1.5	V
Collector Current	I <sub>c</sub>	65	mA
Total Power Dissipation	P <sub>T</sub>	200	mW
Junction Temperature	T <sub>j</sub>	150	°C
Storage Temperature	T <sub>stg</sub>	-65 to +150	°C



### ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C)

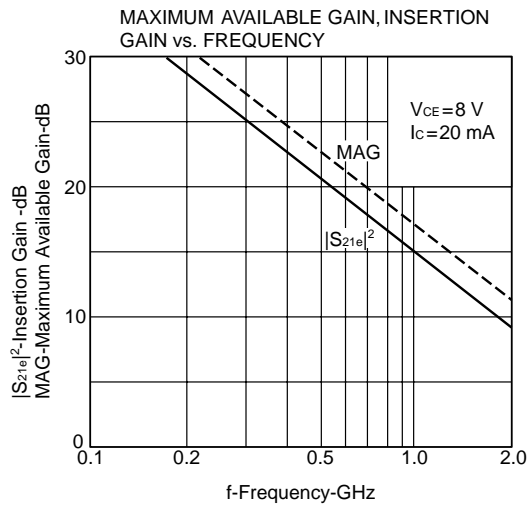
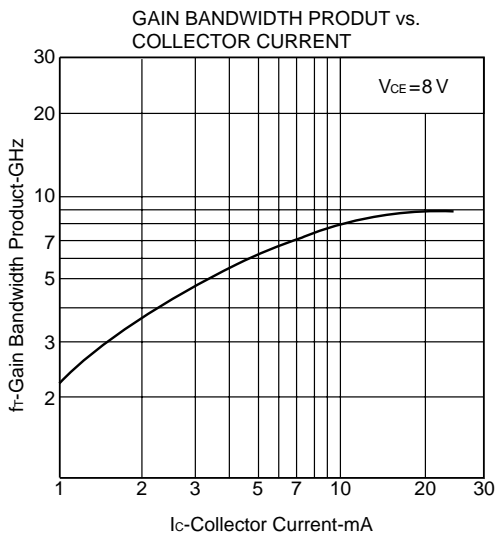
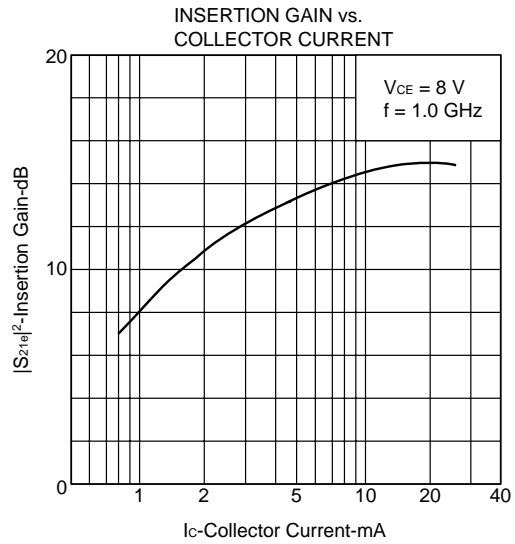
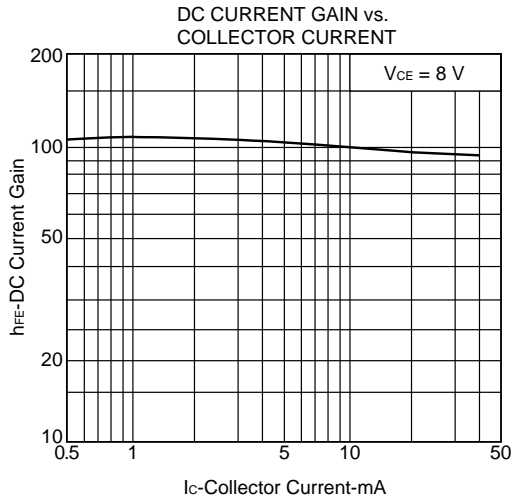
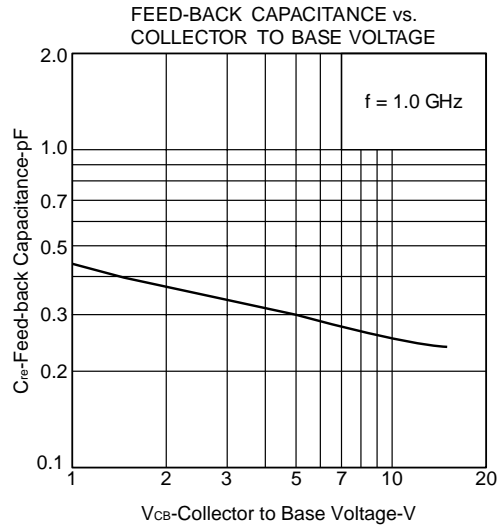
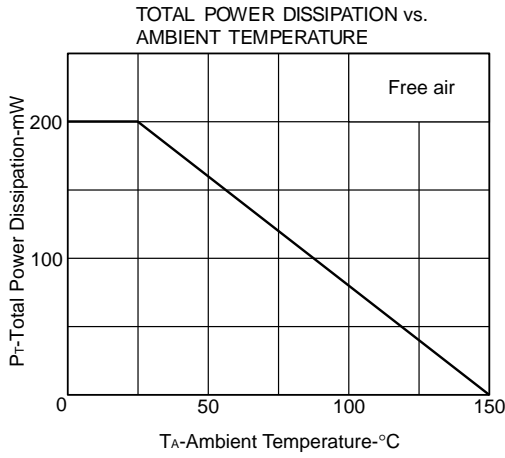
CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Collector Cutoff Current	I <sub>CB0</sub>			1.0	μA	V <sub>CB</sub> = 10 V, I <sub>E</sub> = 0
Emitter Cutoff Current	I <sub>EBO</sub>			1.0	μA	V <sub>EB</sub> = 1 V, I <sub>c</sub> = 0
DC Current Gain	h <sub>FE</sub>	50		250		V <sub>CE</sub> = 8 V, I <sub>c</sub> = 20 mA
Gain Bandwidth Product	f <sub>T</sub>		9		GHz	V <sub>CE</sub> = 8 V, I <sub>c</sub> = 20 mA, f = 1.0 GHz
Feed-Back Capacitance	C <sub>re</sub>		0.25	0.8	pF	V <sub>CB</sub> = 10 V, I <sub>E</sub> = 0, f = 1.0 MHz
Insertion Power Gain	S <sub>21e</sub>   <sup>2</sup>	13	15		dB	V <sub>CE</sub> = 8 V, I <sub>c</sub> = 20 mA, f = 1.0 GHz
Maximum Available Gain	MAG		17		dB	V <sub>CE</sub> = 8 V, I <sub>c</sub> = 20 mA, f = 1.0 GHz
Noise Figure	NF		1.2	2.0	dB	V <sub>CE</sub> = 8 V, I <sub>c</sub> = 7 mA, f = 1.0 GHz

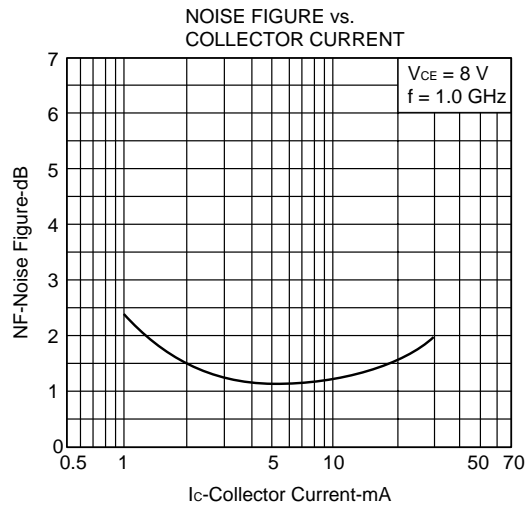
### h<sub>FE</sub> Classification

Class	R36/RCF *	R37/RCG *	R38/RCH *
Marking	R36	R37	R38
h <sub>FE</sub>	50 to 100	80 to 160	125 to 250

\* Old Specification / New Specification

TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C)





**S-PARAMETER**

V<sub>CE</sub> = 8.0 V, I<sub>c</sub> = 5.0 mA, Z<sub>o</sub> = 50 Ω

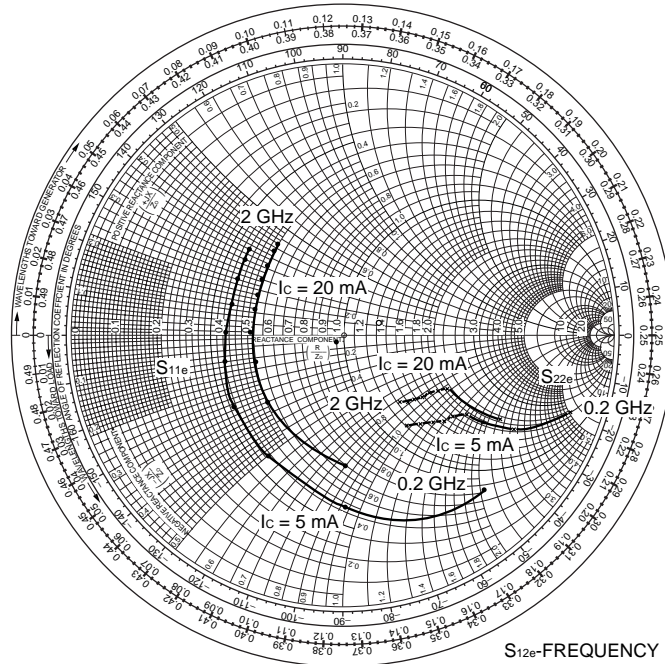
f (MHz)	S <sub>11</sub>	∠ S <sub>11</sub>	S <sub>21</sub>	∠ S <sub>21</sub>	S <sub>12</sub>	∠ S <sub>12</sub>	S <sub>22</sub>	∠ S <sub>22</sub>
200	0.774	-47.8	12.689	146.5	0.031	65.4	0.882	-19.1
400	0.631	-88.8	9.952	119.4	0.048	53.4	0.723	-29.5
600	0.523	-120.9	7.813	100.9	0.058	46.2	0.611	-33.4
800	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<sub>CE</sub> = 8.0 V, I<sub>c</sub> = 20.0 mA, Z<sub>o</sub> = 50 Ω

f (MHz)	S <sub>11</sub>	∠ S <sub>11</sub>	S <sub>21</sub>	∠ S <sub>21</sub>	S <sub>12</sub>	∠ S <sub>12</sub>	S <sub>22</sub>	∠ S <sub>22</sub>
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

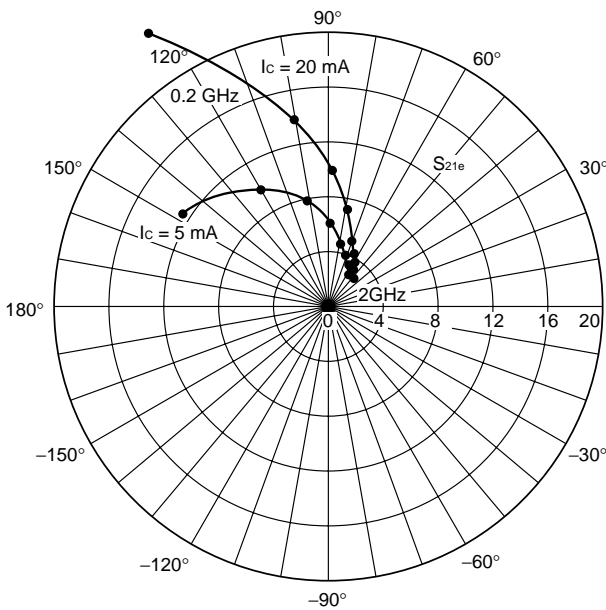
S-PARAMETER

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



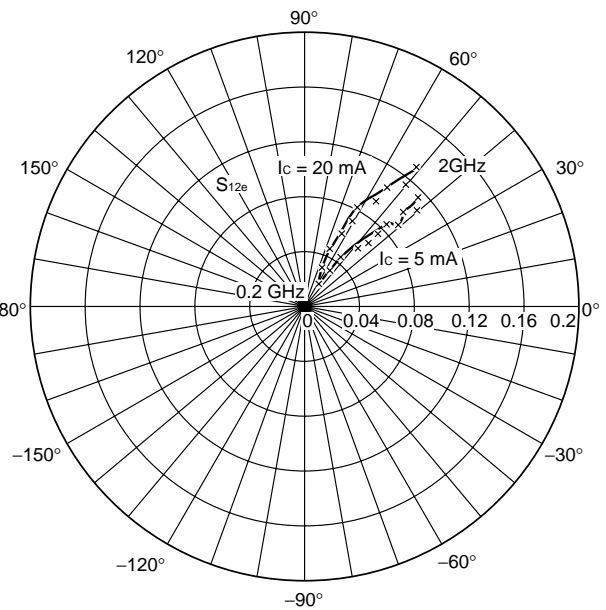
$S_{21e}$ -FREQUENCY

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



$S_{12e}$ -FREQUENCY

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



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