

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

DESCRIPTION

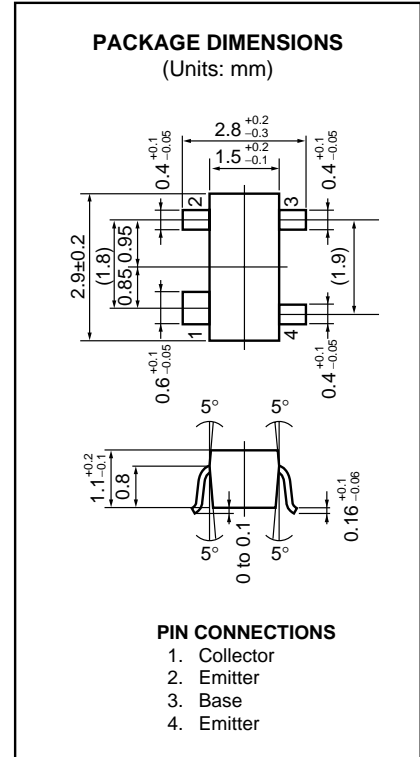
The 2SC4094 is an NPN epitaxial silicon transistor designed for use in low-noise and small signal amplifiers from VHF band to UHF band. Low-noise figure, high gain, and high current capability achieve a very wide dynamic range and excellent linearity. This achieved by direct nitride passivated base surface 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>CEO</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)

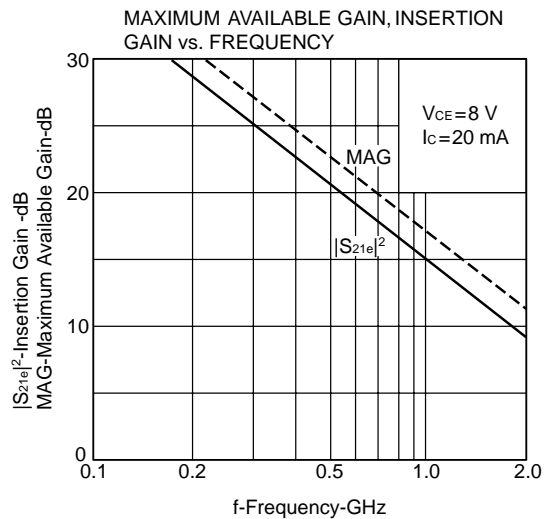
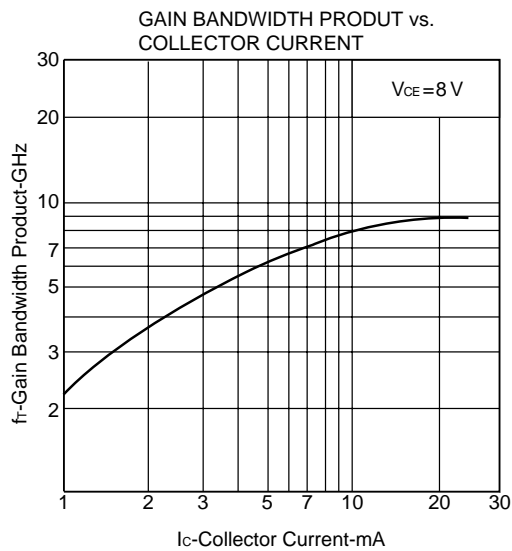
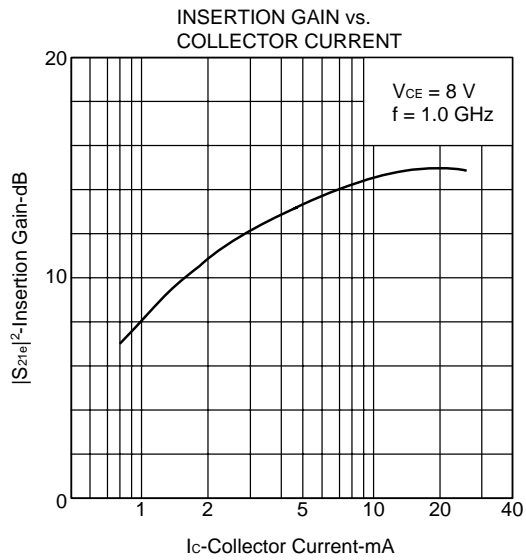
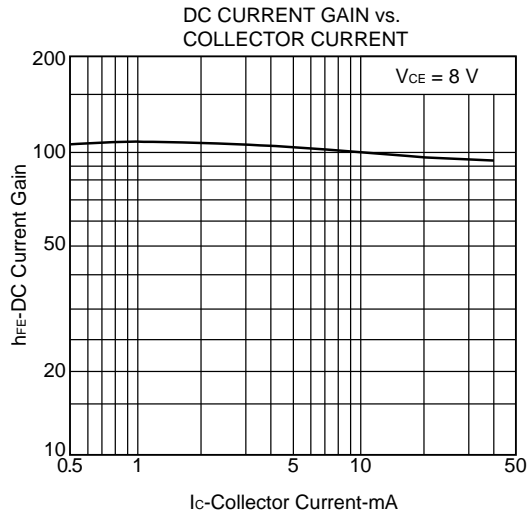
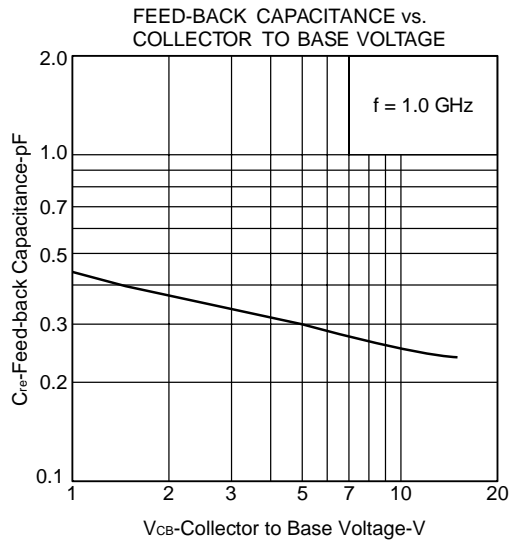
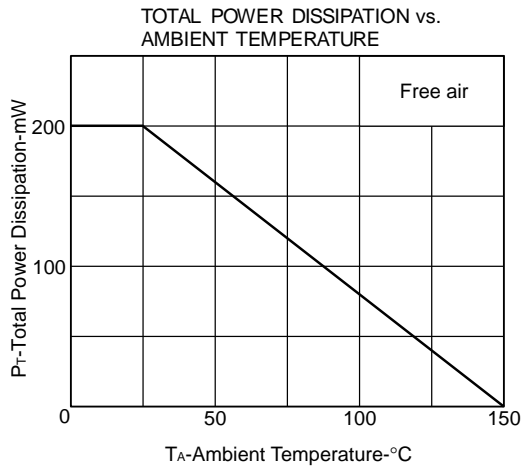
| CHARACTERISTIC           | SYMBOL                          | MIN. | TYP. | MAX. | UNIT | TEST CONDITIONS  |
|--------------------------|---------------------------------|------|------|------|------|--|
| Collector Cutoff Current | I <sub>CB0</sub>                |      |      | 1.0  | μA   | V <sub>CB</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  |

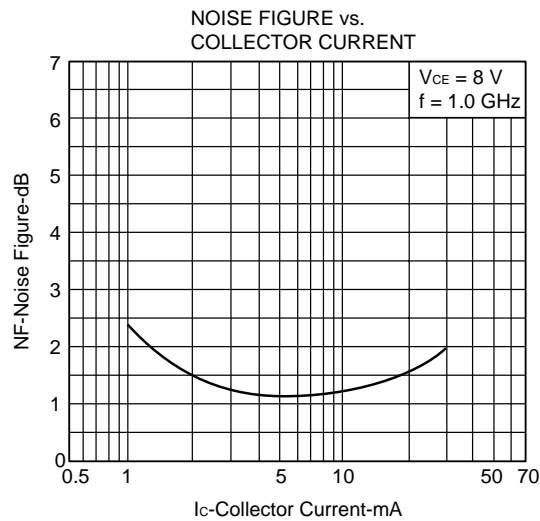
h<sub>FE</sub> Classification

| 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>0</sub> = 50 Ω

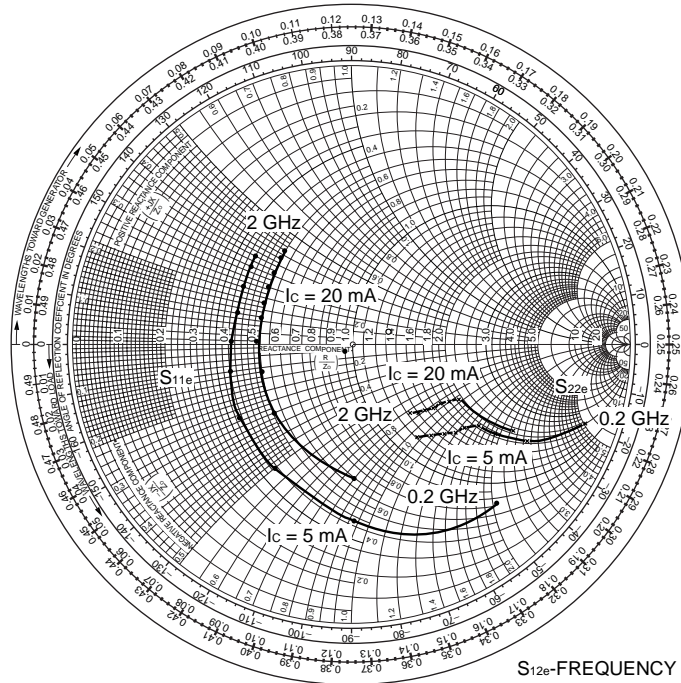
| f (MHz) | S <sub>11</sub> | ∠ S <sub>11</sub> | S <sub>21</sub> | ∠ S <sub>21</sub> | S <sub>12</sub> | ∠ S <sub>12</sub> | S <sub>22</sub> | ∠ S <sub>22</sub> |
|---------|-----------------|-------------------|-----------------|-------------------|-----------------|-------------------|-----------------|-------------------|
| 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>0</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             |

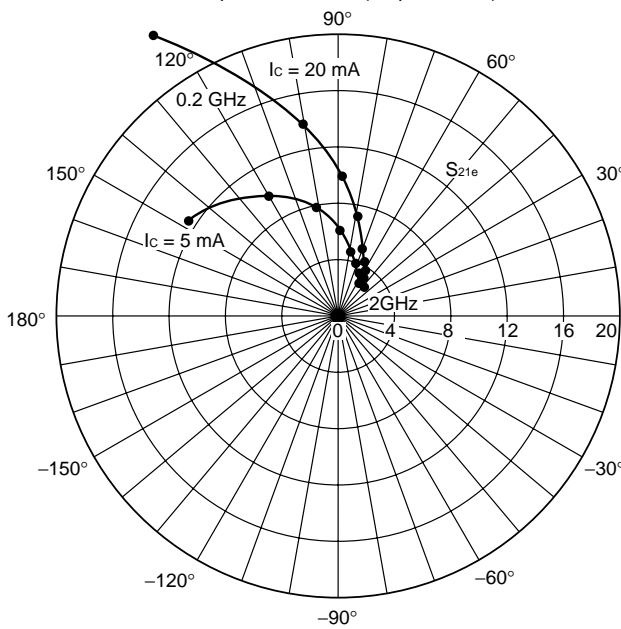
S-PARAMETER

S<sub>11e</sub>, S<sub>22e</sub>-FREQUENCY CONDITION V<sub>CE</sub> = 8 V, I<sub>C</sub> = 20/5 mA, freq. = 0.2 to 2 GHz (Step 200 MHz)



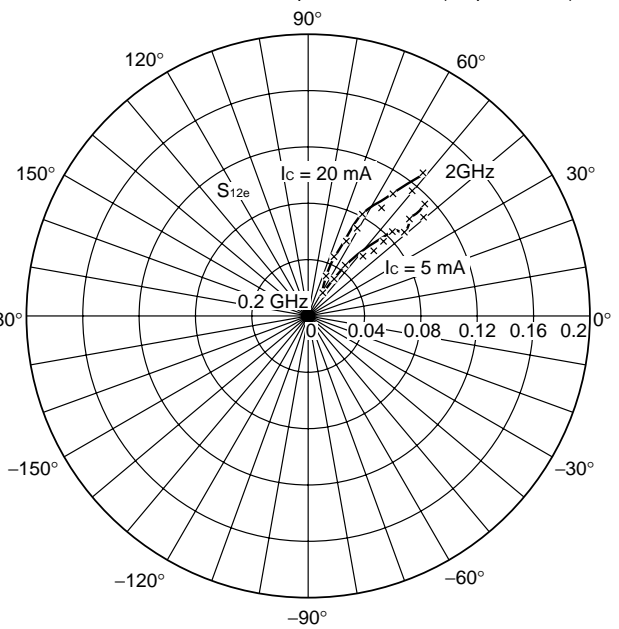
S<sub>21e</sub>-FREQUENCY

CONDITION V<sub>CE</sub> = 8 V  
I<sub>C</sub> = 20/5 mA  
freq. = 0.2 to 2 GHz (Step 200 MHz)



S<sub>12e</sub>-FREQUENCY

CONDITION V<sub>CE</sub> = 8 V  
I<sub>C</sub> = 20/5 mA  
freq. = 0.2 to 2 GHz (Step 200 MHz)



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