

To our customers,

Old Company Name in Catalogs and Other Documents

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Renesas Electronics website: <http://www.renesas.com>

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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

DESCRIPTION

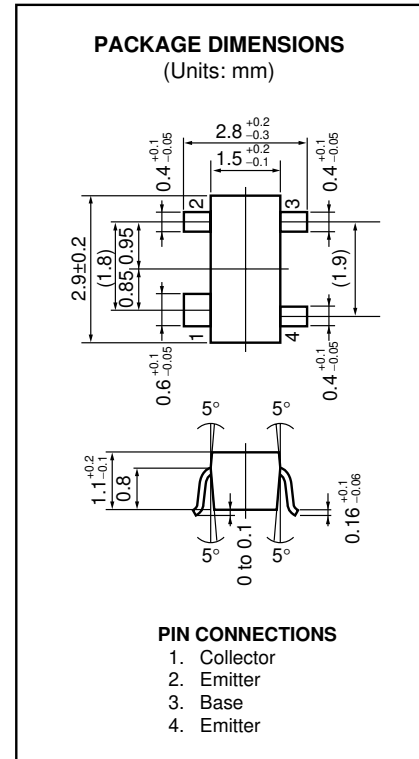
The 2SC4095 is an NPN epitaxial silicon transistor designed for use in low-noise and small signal amplifiers from VHF band to UHF band. 2SC4095 features excellent power gain with very low-noise figures. 2SC4095 employs direct nitride passivated base surface process (DNP process) which is an NEC proprietary new fabrication technique which provides excellent noise figures at high current values. This allows excellent associated gain and very wide dynamic range.

FEATURES

- NF = 1.8 dB TYP. @ f = 2.0 GHz, V_{CE} = 6 V, I_c = 5 mA
- |S_{21e}|² = 9.5 dB TYP. @ f = 2.0 GHz, V_{CE} = 6 V, I_c = 10 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 | 35 | mA |
| Total Power Dissipation | P _T | 200 | mW |
| Junction Temperature | T _j | 150 | °C |
| Storage Temperature | T _{stg} | -65 to +150 | °C |



ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

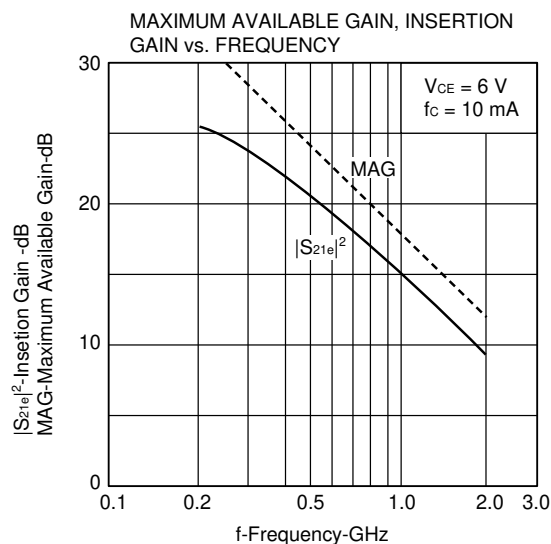
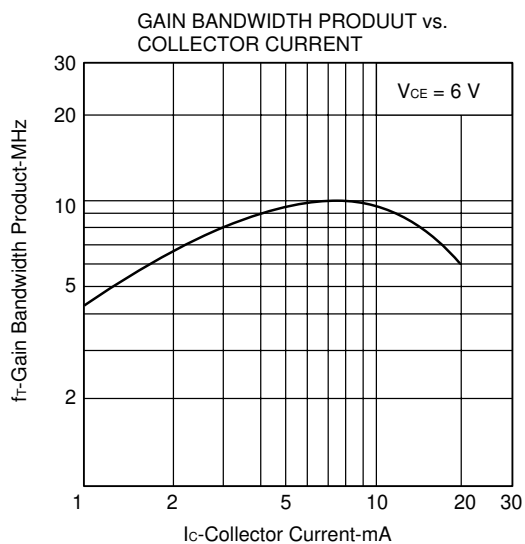
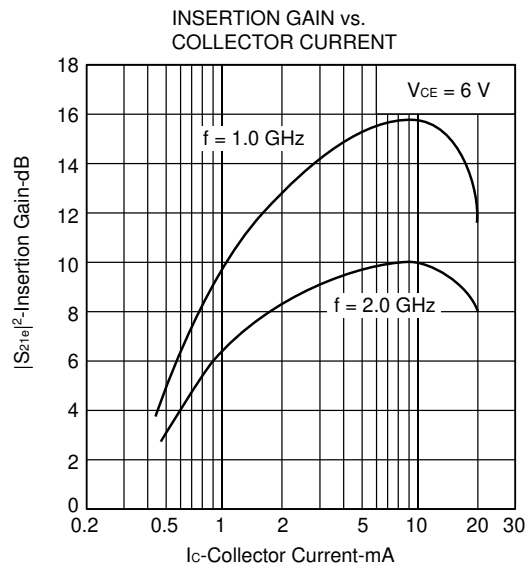
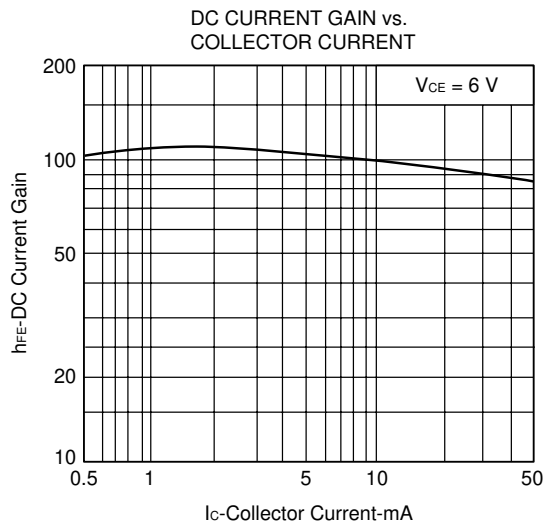
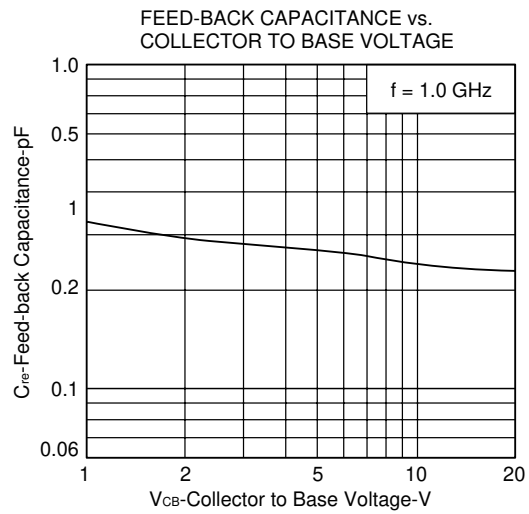
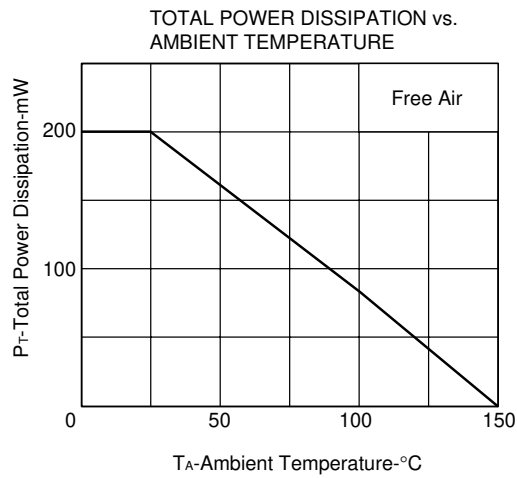
| CHARACTERISTIC | SYMBOL | MIN. | TYP. | MAX. | UNIT | TEST CONDITIONS |
|--------------------------|---------------------------------|------|------|------|------|--|
| Collector Cutoff Current | I _{CBO} | | | 1.0 | μA | V _{CB} = 10 V, I _E = 0 |
| Emitter Cutoff Current | I _{EBO} | | | 1.0 | μA | V _{EB} = 1 V, I _C = 0 |
| DC Current Gain | h _{FE} | 50 | 100 | 250 | | V _{CE} = 6 V, I _C = 10 mA |
| Gain Bandwidth Product | f _T | | 10 | | GHz | V _{CE} = 6 V, I _C = 10 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 | 7.5 | 9.5 | | dB | V _{CE} = 6 V, I _C = 10 mA, f = 2.0 GHz |
| Maximum Available Gain | MAG | | 12 | | dB | V _{CE} = 6 V, I _C = 10 mA, f = 2.0 GHz |
| Noise Figure | NF | | 1.8 | 3.0 | dB | V _{CE} = 6 V, I _C = 5 mA, f = 2.0 GHz |

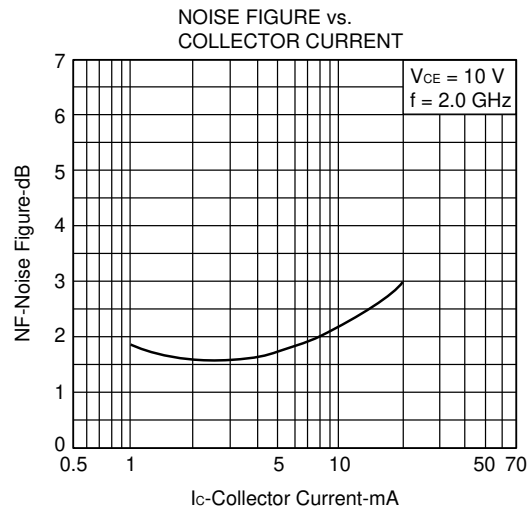
h_{FE} Classification

| | | | |
|-----------------|-----------|-----------|------------|
| Class | R46/RDF * | R47/RDG * | R48/RDH * |
| Marking | R46 | R47 | R48 |
| h _{FE} | 50 to 100 | 80 to 160 | 125 to 250 |

* Old Specification / New Specification

TYPICAL CHARACTERISTICS (T_A = 25 °C)





S-PARAMETER

$V_{CE} = 6.0 \text{ V}$, $I_C = 3.0 \text{ mA}$, $Z_O = 50 \Omega$

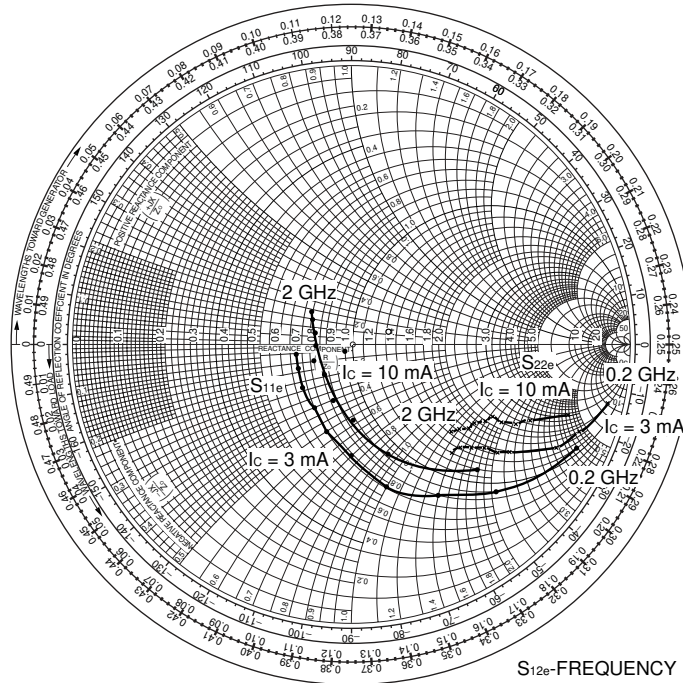
| f (MHz) | $ S_{11} $ | $\angle S_{11}$ | $ S_{21} $ | $\angle S_{21}$ | $ S_{12} $ | $\angle S_{12}$ | $ S_{22} $ | $\angle S_{22}$ |
|---------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 200 | 0.870 | -24.2 | 9.193 | 155.6 | 0.031 | 53.6 | 0.946 | -12.8 |
| 400 | 0.747 | -44.6 | 7.780 | 136.6 | 0.040 | 66.2 | 0.876 | -20.7 |
| 600 | 0.628 | -59.8 | 7.058 | 122.1 | 0.064 | 54.7 | 0.816 | -26.4 |
| 800 | 0.516 | -75.1 | 5.675 | 109.4 | 0.066 | 56.0 | 0.743 | -30.9 |
| 1000 | 0.400 | -87.7 | 5.180 | 99.6 | 0.090 | 49.4 | 0.689 | -33.0 |
| 1200 | 0.327 | -103.4 | 4.269 | 89.8 | 0.084 | 47.9 | 0.654 | -35.7 |
| 1400 | 0.262 | -118.7 | 3.950 | 81.7 | 0.106 | 48.5 | 0.604 | -37.7 |
| 1600 | 0.231 | -135.5 | 3.406 | 74.0 | 0.105 | 42.1 | 0.581 | -41.5 |
| 1800 | 0.205 | -155.3 | 3.290 | 66.4 | 0.126 | 46.4 | 0.548 | -43.9 |
| 2000 | 0.196 | -170.6 | 2.867 | 60.8 | 0.124 | 40.9 | 0.529 | -47.1 |

$V_{CE} 6.0 \text{ V}$, $I_C = 10.0 \text{ mA}$, $Z_O = 50 \Omega$

| f (MHz) | $ S_{11} $ | $\angle S_{11}$ | $ S_{21} $ | $\angle S_{21}$ | $ S_{12} $ | $\angle S_{12}$ | $ S_{22} $ | $\angle S_{22}$ |
|---------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 200 | 0.671 | -43.5 | 18.685 | 137.9 | 0.023 | 52.1 | 0.832 | -19.0 |
| 400 | 0.458 | -68.7 | 12.702 | 115.2 | 0.029 | 62.2 | 0.710 | -23.9 |
| 600 | 0.319 | -83.7 | 9.895 | 102.8 | 0.046 | 54.4 | 0.649 | -26.0 |
| 800 | .0239 | -101.9 | 7.275 | 92.3 | 0.049 | 63.1 | 0.600 | -27.5 |
| 1000 | 0.172 | -119.3 | 6.261 | 85.1 | 0.067 | 58.6 | 0.578 | -28.4 |
| 1200 | 0.149 | -141.4 | 5.038 | 77.4 | 0.070 | 57.9 | 0.559 | -30.3 |
| 1400 | 0.131 | -163.0 | 4.597 | 71.0 | 0.088 | 56.1 | 0.527 | -32.5 |
| 1600 | 0.132 | 179.6 | 3.927 | 64.8 | 0.094 | 54.0 | 0.514 | -35.7 |
| 1800 | 0.150 | 160.0 | 3.743 | 58.8 | 0.113 | 55.3 | 0.494 | -38.1 |
| 2000 | 0.163 | 150.1 | 3.233 | 54.5 | 0.115 | 50.0 | 0.478 | -41.6 |

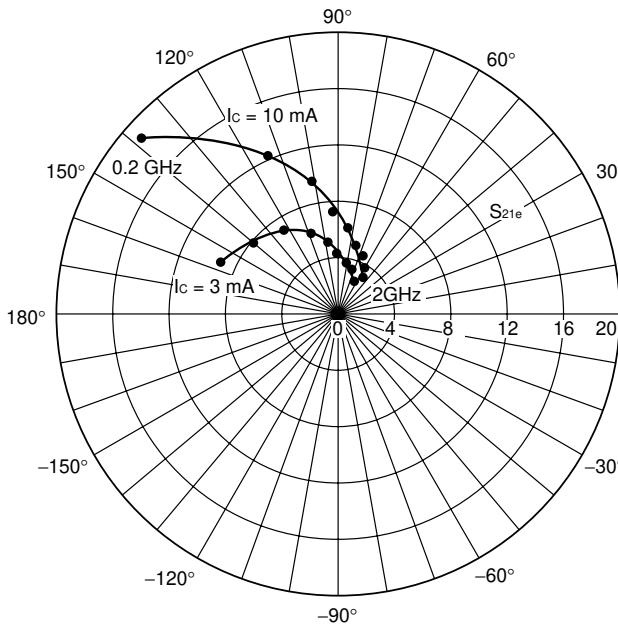
S-PARAMETER

S_{11e}, S_{22e}-FREQUENCY CONDITION V_{CE} = 6 V, I_C = 10/3 mA, freq. = 0.2 to 2 GHz (Step 200 MHz)



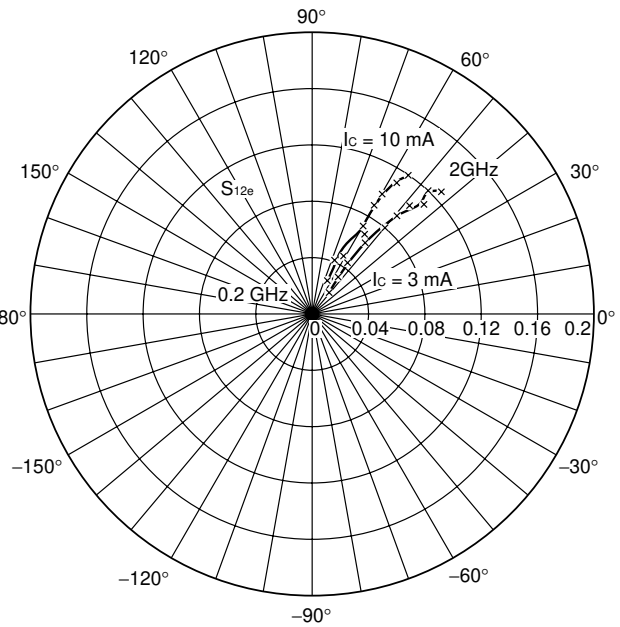
S_{21e}-FREQUENCY

CONDITION V_{CE} = 6 V
I_C = 10/3 mA
freq. = 0.2 to 2 GHz (Step 200 MHz)



S_{12e}-FREQUENCY

CONDITION V_{CE} = 6 V
I_C = 10/3 mA
freq. = 0.2 to 2 GHz (Step 200 MHz)



RECOMMENDED SOLDERING CONDITIONS

The following conditions (see table below) must be met then soldering this product. Please consult with our sales offices in case other soldering process is used, or in case soldering is done under different contions.

TYPES OF SURFACE MOUNT DEVICE

For more details, refer to our document "SMT MANUAL" (IEI-1207).

2SC4095

| Soldering process | Soldering conditions | Symbol |
|------------------------|--|-----------|
| Infrared ray reflow | Peak package's surface temperature: 230 °C or below, Reflow time: 30 seconds or below (210 °C or higher), Number of reflow process: 1, Exposure limit*: None | IR30-00-1 |
| VPS | Peak package's surface temperature: 215 °C or below, Reflow time: 40 seconds or below (200 °C or higher), Number of reflow process: 1, Exposure limit*: None | VP15-00-1 |
| Wave soldering | Solder temperature: 260 °C or below, Flow time: 10 seconds or below, Number of reflow process: 1, Exposure limit*: None | WS60-00-1 |
| Partial heating method | Terminal temperature: 300 °C or below, Flow time: 3 seconds or below, Exposure limit*: None | ○ |

*: Exposure limit before soldering after dry-pack package is opened.

Storage conditions: 25 °C and relative humidity at 65 % or less.

Note: Do not apply more than a single process at once, except for "Partial heating method".

[MEMO]

[MEMO]

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Standard: Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots

Special: Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)

Specific: Aircrafts, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems or medical equipment for life support, etc.

The quality grade of NEC devices is "Standard" unless otherwise specified in NEC's Data Sheets or Data Books. If customers intend to use NEC devices for applications other than those specified for Standard quality grade, they should contact an NEC sales representative in advance.

Anti-radioactive design is not implemented in this product.