

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

DESCRIPTION

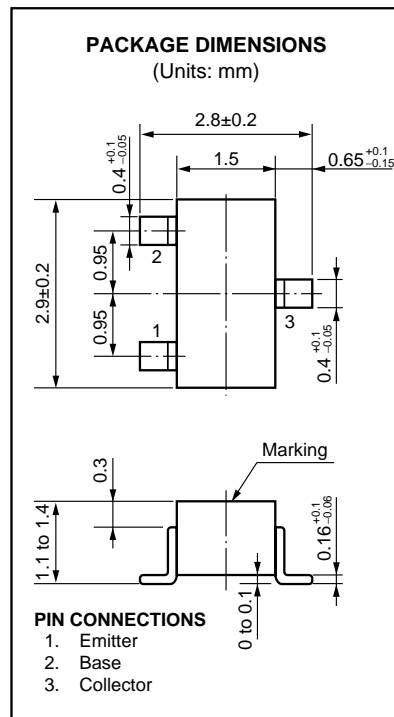
The 2SC3583 is an NPN epitaxial silicon transistor designed for use in low-noise and small signal amplifiers from VHF band to UHF band. Low-noise figure, high gain, and high current capability achieve a very wide dynamic range and excellent linearity. This is achieved by direct nitride passivated base surface process (DNP process) which is an NEC proprietary new fabrication technique.

FEATURES

- NF 1.2 dB TYP. @f = 1.0 GHz
- Ga 13 dB TYP. @f = 1.0 GHz

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C)

| | | | |
|------------------------------|------------------|-------------|----|
| Collector to Base Voltage | V _{CB0} | 20 | V |
| Collector to Emitter Voltage | V _{CE0} | 10 | V |
| Emitter to Base Voltage | V _{EB0} | 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 |



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 _E = 0 |
| DC Current Gain | h _{FE} * | 50 | 100 | 250 | | V _{CE} = 8 V, I _C = 20 mA |
| Gain Bandwidth Product | f _T | | 9 | | GHz | V _{CE} = 8 V, I _C = 20 mA |
| Feed-Back Capacitance | C _{re} ** | | 0.35 | 0.9 | pF | V _{CB} = 10 V, I _E = 0, f = 1.0 MHz |
| Insertion Power Gain | S _{21e} ² | 11 | 13 | | dB | V _{CE} = 8 V, I _C = 20 mA, f = 1.0 GHz |
| Maximum Available Gain | MAG | | 15 | | dB | V _{CE} = 8 V, I _C = 20 mA, f = 1.0 GHz |
| Noise Figure | NF | | 1.2 | 2.5 | dB | V _{CE} = 8 V, I _E = 7 mA, f = 1.0 GHz |

* Pulse Measurement PW ≤ 350 μs, Duty Cycle ≤ 2 %

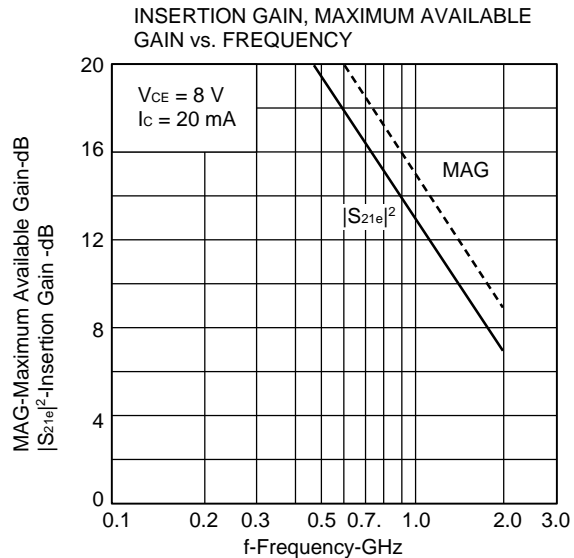
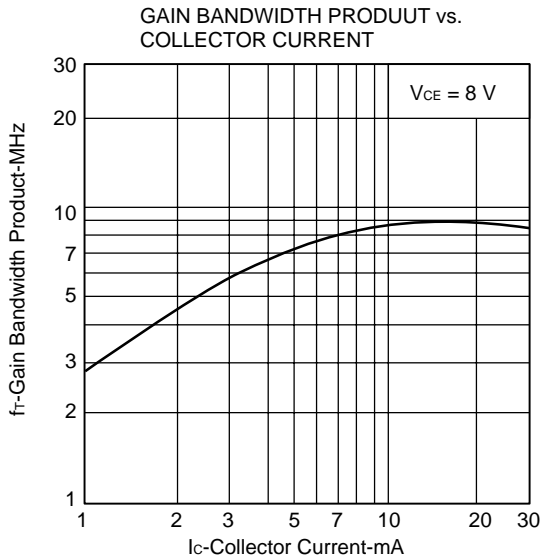
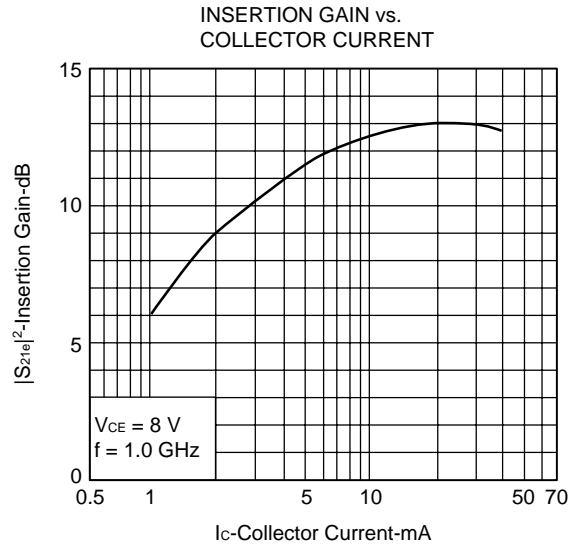
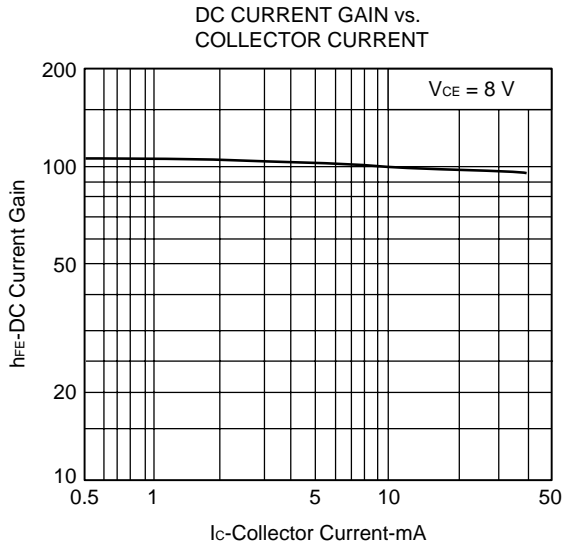
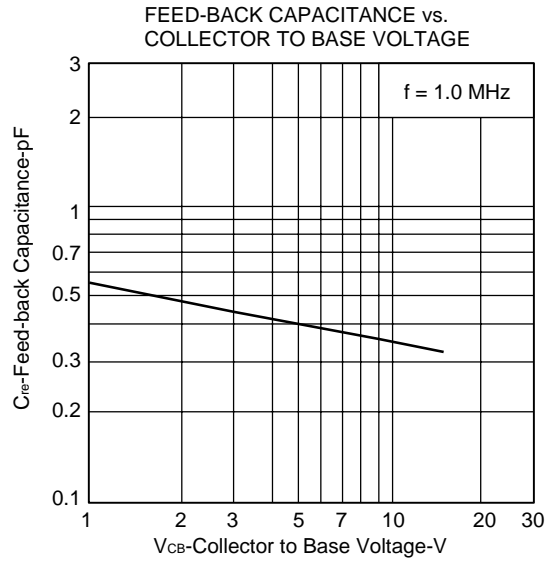
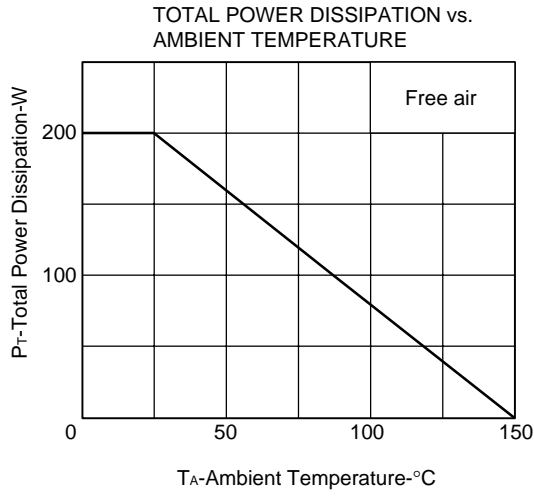
** The emitter terminal and the case shall be connected to the ground terminal of the three-terminal capacitance bridge.

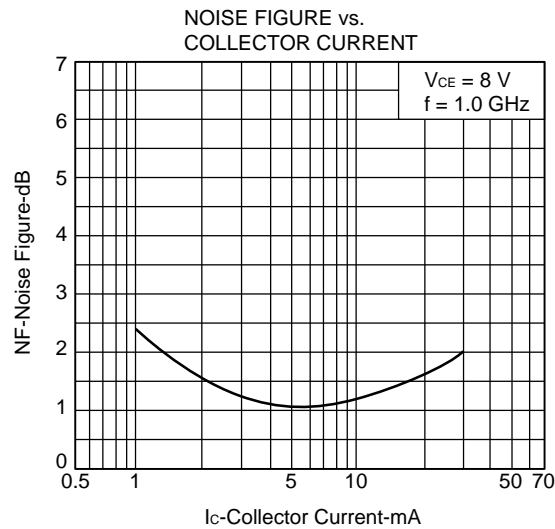
h_{FE} Classification

| Class | R33/Q * | R34/R * | R35/S * |
|-----------------|-----------|-----------|------------|
| Marking | R33 | R34 | R35 |
| 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} = 8.0 V, I_c = 5.0 mA, Z_o = 50 Ω

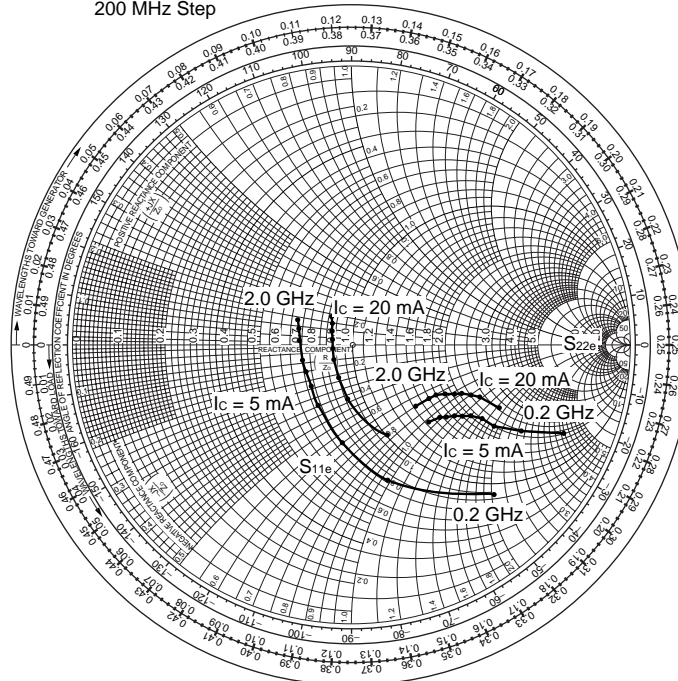
| f (MHz) | S ₁₁ | ∠ S ₁₁ | S ₂₁ | ∠ S ₂₁ | S ₁₂ | ∠ S ₁₂ | S ₂₂ | ∠ S ₂₂ |
|---------|-----------------|-------------------|-----------------|-------------------|-----------------|-------------------|-----------------|-------------------|
| 200 | 0.728 | -45.3 | 12.107 | 138.7 | 0.036 | 66.2 | 0.825 | -21.6 |
| 400 | 0.490 | -74.5 | 8.097 | 114.2 | 0.065 | 61.6 | 0.675 | -26.6 |
| 600 | 0.343 | -93.2 | 6.260 | 102.3 | 0.079 | 61.6 | 0.582 | -29.0 |
| 800 | 0.253 | -110.1 | 4.623 | 90.1 | 0.090 | 61.2 | 0.529 | -28.6 |
| 1000 | 0.202 | -131.1 | 4.004 | 83.6 | 0.101 | 61.3 | 0.500 | -30.1 |
| 1200 | 0.176 | -148.9 | 3.250 | 75.8 | 0.125 | 60.8 | 0.470 | -31.4 |
| 1400 | 0.176 | -162.8 | 3.021 | 69.4 | 0.144 | 60.0 | 0.448 | -33.4 |
| 1600 | 0.179 | 173.9 | 2.575 | 63.4 | 0.160 | 59.8 | 0.427 | -34.8 |
| 1800 | 0.186 | 163.3 | 2.520 | 58.9 | 0.188 | 59.1 | 0.406 | -37.5 |
| 2000 | 0.211 | 151.1 | 2.183 | 53.4 | 0.202 | 58.9 | 0.386 | -44.5 |

V_{CE} = 8.0 V, I_c = 20 mA, Z_o = 50 Ω

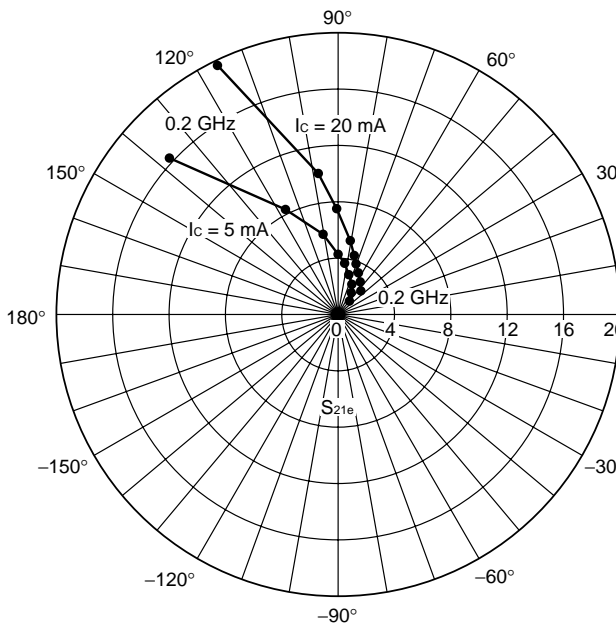
| f (MHz) | S ₁₁ | ∠ S ₁₁ | S ₂₁ | ∠ S ₂₁ | S ₁₂ | ∠ S ₁₂ | S ₂₂ | ∠ S ₂₂ |
|---------|-----------------|-------------------|-----------------|-------------------|-----------------|-------------------|-----------------|-------------------|
| 200 | 0.366 | -66.8 | 19.757 | 116.9 | 0.033 | 62.6 | 0.587 | -22.5 |
| 400 | 0.194 | -88.9 | 10.502 | 98.8 | 0.055 | 70.6 | 0.485 | -23.8 |
| 600 | 0.124 | -104.3 | 7.591 | 91.1 | 0.072 | 74.6 | 0.453 | -24.3 |
| 800 | 0.077 | -132.0 | 5.446 | 82.0 | 0.095 | 73.2 | 0.419 | -23.2 |
| 1000 | 0.063 | -156.4 | 4.653 | 77.6 | 0.107 | 72.1 | 0.413 | -24.2 |
| 1200 | 0.065 | 179.5 | 3.754 | 71.6 | 0.135 | 72.1 | 0.392 | -26.4 |
| 1400 | 0.074 | 168.0 | 3.460 | 66.5 | 0.164 | 70.1 | 0.369 | -29.9 |
| 1600 | 0.108 | 147.0 | 2.934 | 61.9 | 0.178 | 69.6 | 0.347 | -32.2 |
| 1800 | 0.116 | 137.6 | 2.870 | 58.2 | 0.205 | 66.3 | 0.333 | -34.3 |
| 2000 | 0.134 | 131.2 | 2.479 | 53.4 | 0.221 | 64.0 | 0.312 | -42.1 |

S-PARAMETER

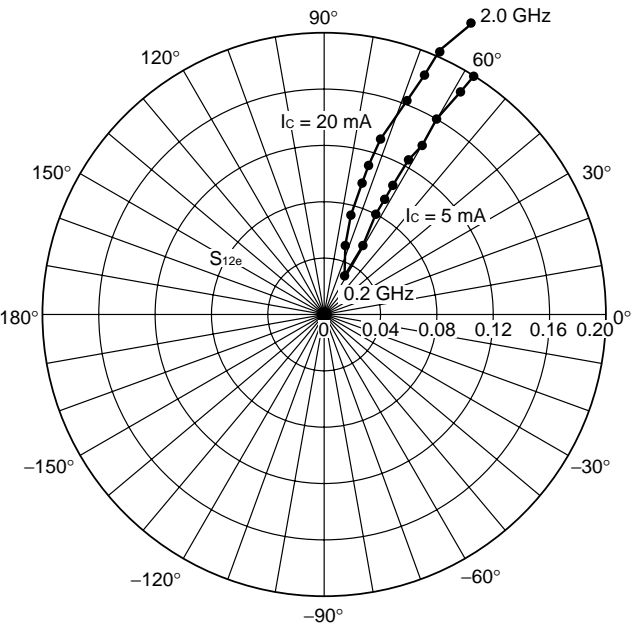
S_{11e}, S_{22e}-FREQUENCY CONDITION V_{CE} = 8 V
200 MHz Step



S_{21e}-FREQUENCY CONDITION V_{CE} = 8 V



S_{12e}-FREQUENCY CONDITION V_{CE} = 8 V



[MEMO]

[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.