

## MICROWAVE LOW NOISE AMPLIFIER

## NPN SILICON EPITAXIAL TRANSISTOR

### DESCRIPTION

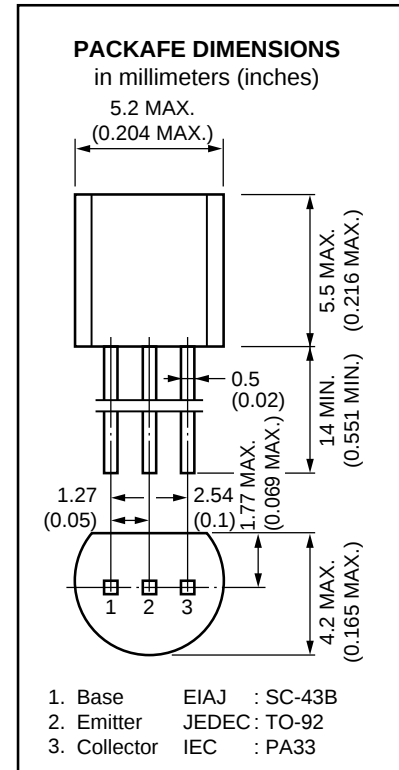
The 2SC3582 is an NPN epitaxial silicon transistor designed for use in low-noise and small signal amplifiers from VHF band to UHF band. Low-noise figure, high gain, and high current capability achieve a very wide dynamic range and excellent linearity. This is achieved by direct nitride passivated base surface process (DNP process) which is an NEC proprietary new fabrication technique.

### FEATURES

- NF 1.2 dB TYP. @f = 1.0 GHz
- Ga 12 dB TYP. @f = 1.0 GHz

### 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>   | 600         | mW |
| Junction Temperature         | T <sub>j</sub>   | 150         | °C |
| Storage Temperature          | T <sub>stg</sub> | -65 to +150 | °C |



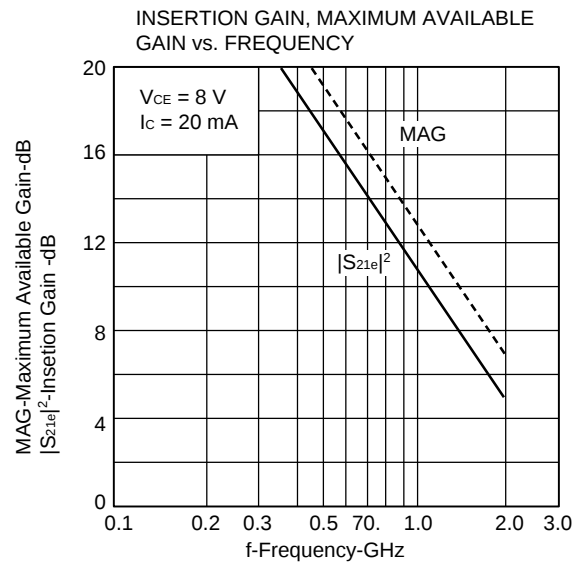
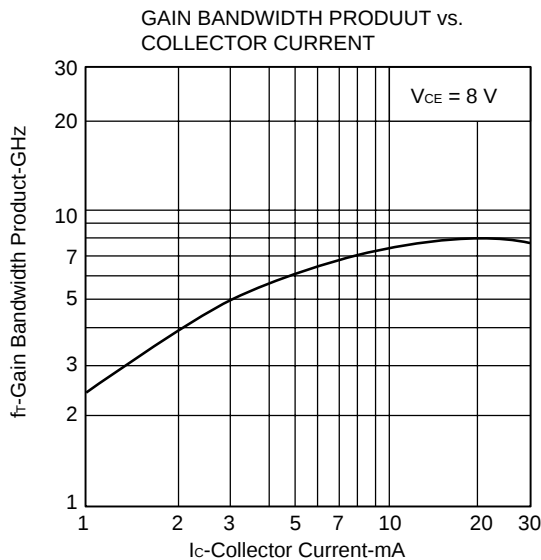
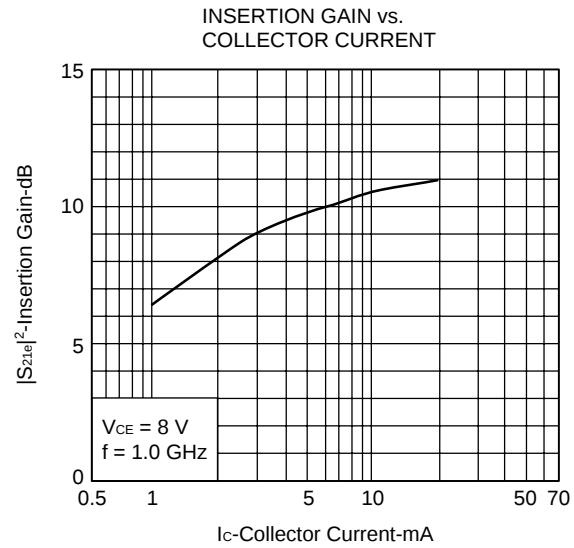
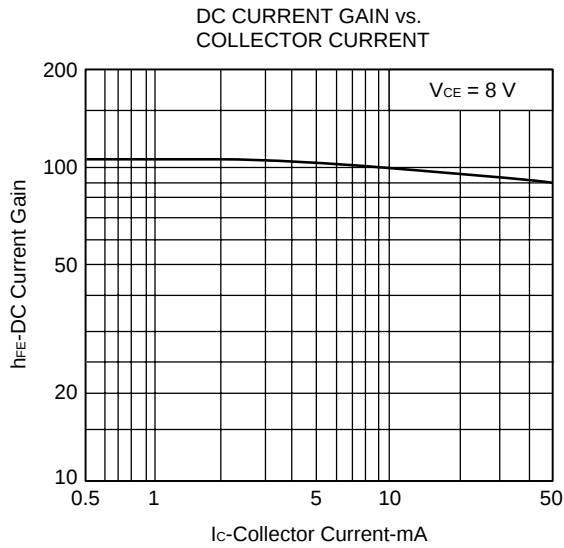
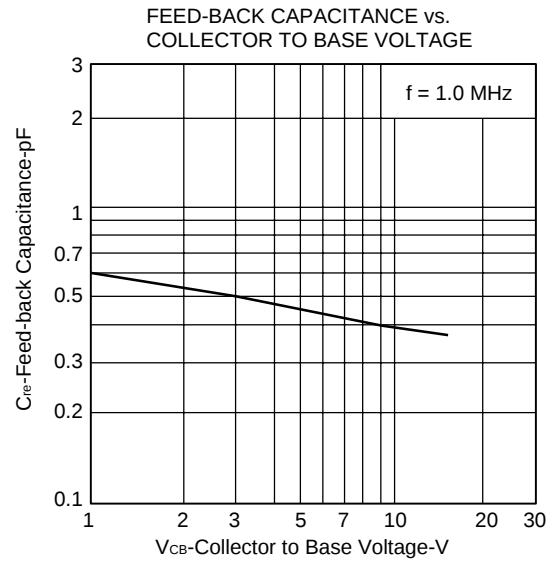
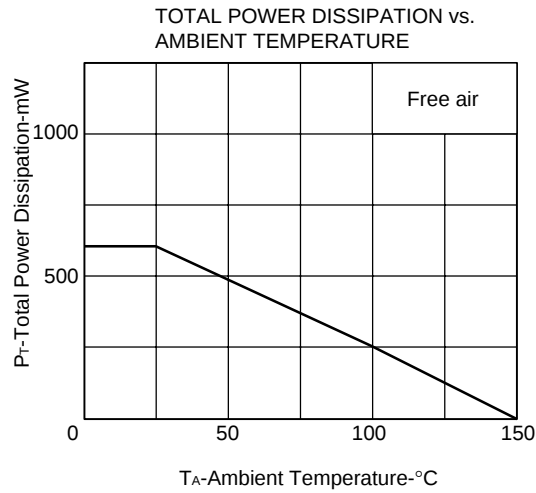
### ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C)

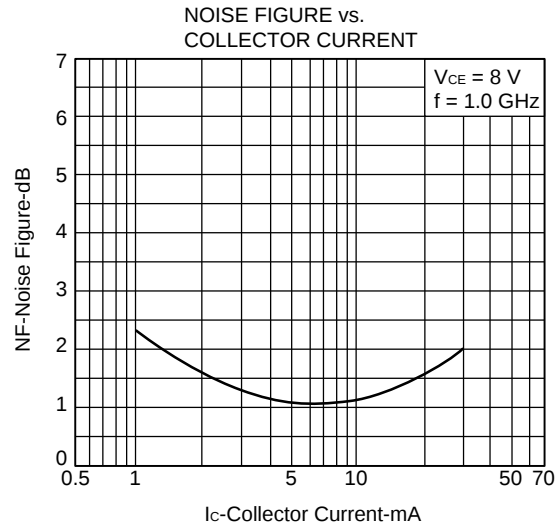
| CHARACTERISTIC           | SYMBOL                          | MIN. | TYP. | MAX. | UNIT | TEST CONDITIONS                                            |
|--------------------------|---------------------------------|------|------|------|------|------------------------------------------------------------|
| Collector Cutoff Current | I <sub>CBO</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   | 100  | 250  |      | V <sub>CE</sub> = 8 V, I <sub>C</sub> = 20 mA              |
| Gain Bandwidth Product   | f <sub>T</sub>                  |      | 8    |      | GHz  | V <sub>CE</sub> = 8 V, I <sub>C</sub> = 20 mA              |
| Feed-Back Capacitance    | C <sub>re</sub>                 |      | 0.4  | 0.9  | 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> | 9    | 11   |      | dB   | V <sub>CE</sub> = 8 V, I <sub>C</sub> = 20 mA, f = 1.0 GHz |
| Maximum Available Gain   | MAG                             |      | 13   |      | dB   | V <sub>CE</sub> = 8 V, I <sub>C</sub> = 20 mA, f = 1.0 GHz |
| Noise Figure             | NF                              |      | 1.2  | 2.5  | dB   | V <sub>CE</sub> = 8 V, I <sub>E</sub> = 7 mA, f = 1.0 GHz  |

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

|                 |           |
|-----------------|-----------|
| Class           | K         |
| Marking         | K         |
| h <sub>FE</sub> | 50 to 250 |

TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ )





### S-PARAMETER

V<sub>CE</sub> = 8.0 V, I<sub>C</sub> = 5.0 mA, Z<sub>O</sub> = 50 Ω

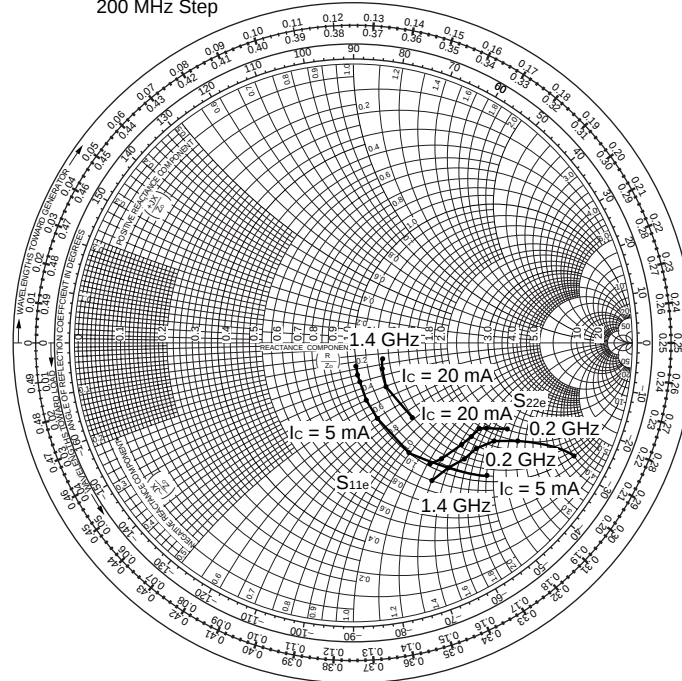
| f (MHz) | S <sub>11</sub> | ∠ S <sub>11</sub> | S <sub>21</sub> | ∠ S <sub>21</sub> | S <sub>12</sub> | ∠ S <sub>12</sub> | S <sub>22</sub> | ∠ S <sub>22</sub> |
|---------|-----------------|-------------------|-----------------|-------------------|-----------------|-------------------|-----------------|-------------------|
| 200     | 0.668           | -45.8             | 11.385          | 128.9             | 0.049           | 83.5              | 0.833           | -26.9             |
| 400     | 0.425           | -61.5             | 7.014           | 103.7             | 0.063           | 76.3              | 0.681           | -31.1             |
| 600     | 0.294           | -73.2             | 5.189           | 88.6              | 0.088           | 68.5              | 0.620           | -36.0             |
| 800     | 0.214           | -79.4             | 3.967           | 75.4              | 0.103           | 64.5              | 0.580           | -40.8             |
| 1000    | 0.167           | -79.5             | 3.485           | 64.7              | 0.123           | 60.8              | 0.561           | -46.3             |
| 1200    | 0.132           | -79.8             | 2.831           | 57.0              | 0.147           | 55.9              | 0.549           | -53.4             |
| 1400    | 0.098           | -75.2             | 2.604           | 48.5              | 0.175           | 50.7              | 0.561           | -60.3             |
| 1600    | 0.073           | -72.0             | 2.182           | 39.1              | 0.192           | 47.9              | 0.573           | -69.1             |
| 1800    | 0.071           | -63.7             | 2.135           | 31.0              | 0.215           | 44.2              | 0.595           | -71.8             |
| 2000    | 0.070           | -60.6             | 1.879           | 21.6              | 0.221           | 38.0              | 0.617           | -78.0             |

V<sub>CE</sub> = 8.0 V, I<sub>C</sub> = 20 mA, Z<sub>O</sub> = 50 Ω

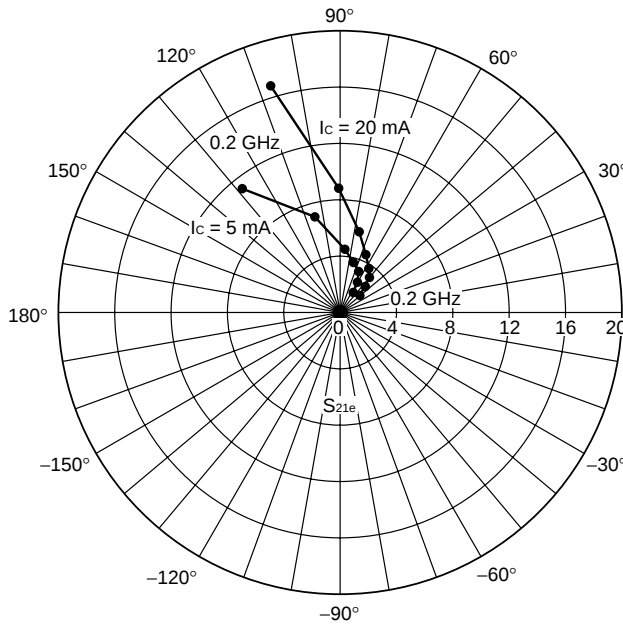
| f (MHz) | S <sub>11</sub> | ∠ S <sub>11</sub> | S <sub>21</sub> | ∠ S <sub>21</sub> | S <sub>12</sub> | ∠ S <sub>12</sub> | S <sub>22</sub> | ∠ S <sub>22</sub> |
|---------|-----------------|-------------------|-----------------|-------------------|-----------------|-------------------|-----------------|-------------------|
| 200     | 0.333           | -51.4             | 17.197          | 107.7             | 0.053           | 97.5              | 0.638           | -29.7             |
| 400     | 0.195           | -49.2             | 8.729           | 89.7              | 0.064           | 90.1              | 0.585           | -31.8             |
| 600     | 0.158           | -44.3             | 6.149           | 78.8              | 0.078           | 80.3              | 0.573           | -35.0             |
| 800     | 0.156           | -41.0             | 4.603           | 68.7              | 0.111           | 70.0              | 0.549           | -38.2             |
| 1000    | 0.146           | -35.8             | 3.997           | 60.4              | 0.136           | 64.2              | 0.537           | -42.4             |
| 1200    | 0.143           | -30.7             | 3.205           | 54.1              | 0.168           | 58.1              | 0.524           | -57.1             |
| 1400    | 0.134           | -25.8             | 2.939           | 46.7              | 0.185           | 53.2              | 0.524           | -55.4             |
| 1600    | 0.132           | -22.3             | 2.463           | 38.1              | 0.218           | 47.3              | 0.524           | -62.0             |
| 1800    | 0.131           | -20.0             | 2.396           | 30.7              | 0.234           | 41.3              | 0.557           | -68.5             |
| 2000    | 0.130           | -17.8             | 2.107           | 22.1              | 0.238           | 36.5              | 0.579           | -74.8             |

# S-PARAMETER

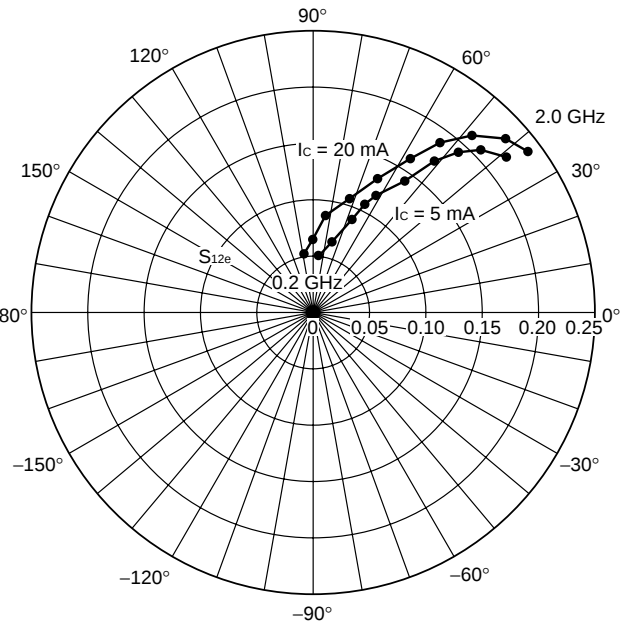
$S_{11e}$ ,  $S_{22e}$ -FREQUENCY CONDITION  $V_{CE} = 8\text{ V}$   
200 MHz Step



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



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



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Anti-radioactive design is not implemented in this product.