

MICROWAVE LOW NOISE AMPLIFIER
NPN SILICON EPITAXIAL TRANSISTOR

DESCRIPTION

The 2SC3356 is an NPN silicon epitaxial transistor designed for low noise amplifier at VHF, UHF and CATV band.

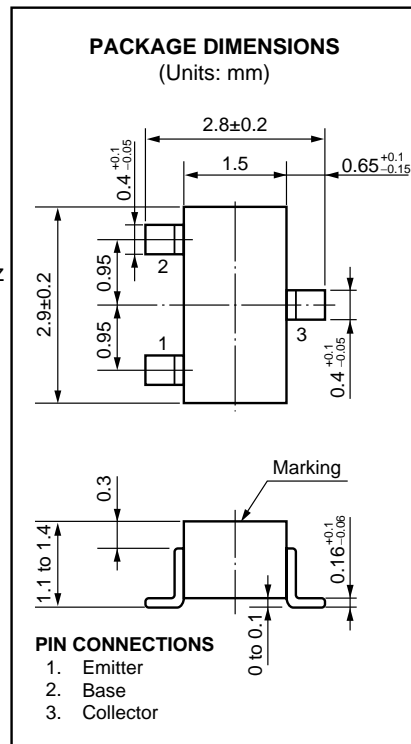
It has dynamic range and good current characteristic.

FEATURES

- Low Noise and High Gain
NF = 1.1 dB TYP., $G_a = 11$ dB TYP. @ $V_{CE} = 10$ V, $I_c = 7$ mA, $f = 1.0$ GHz
- High Power Gain
MAG = 13 dB TYP. @ $V_{CE} = 10$ V, $I_c = 20$ mA, $f = 1.0$ GHz

ABSOLUTE MAXIMUM RATINGS ($T_A = 25$ °C)

| | | | |
|------------------------------|-----------|-------------|----|
| Collector to Base Voltage | V_{CBO} | 20 | V |
| Collector to Emitter Voltage | V_{CEO} | 12 | V |
| Emitter to Base Voltage | V_{EBO} | 3.0 | V |
| Collector Current | I_c | 100 | 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 | $V_{EB} = 1.0$ V, $I_c = 0$ |
| DC Current Gain | h_{FE}^* | 50 | 120 | 300 | | $V_{CE} = 10$ V, $I_c = 20$ mA |
| Gain Bandwidth Product | f_T | | 7 | | GHz | $V_{CE} = 10$ V, $I_c = 20$ mA |
| Feed-Back Capacitance | C_{re}^{**} | | 0.55 | 1.0 | pF | $V_{CB} = 10$ V, $I_E = 0$, $f = 1.0$ MHz |
| Insertion Power Gain | $ S_{21e} ^2$ | | 11.5 | | dB | $V_{CE} = 10$ V, $I_c = 20$ mA, $f = 1.0$ GHz |
| Noise Figure | NF | | 1.1 | 2.0 | dB | $V_{CE} = 10$ V, $I_c = 7$ mA, $f = 1.0$ GHz |

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

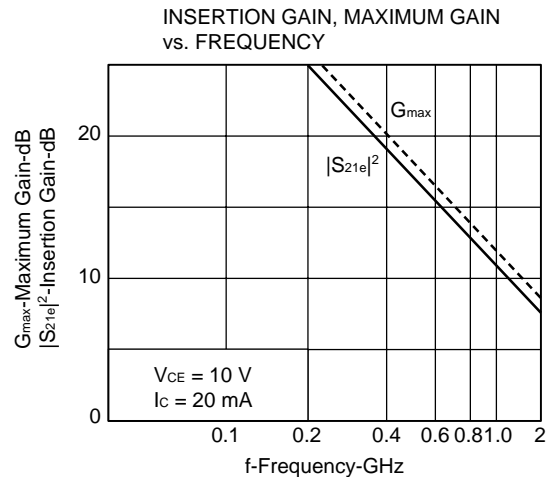
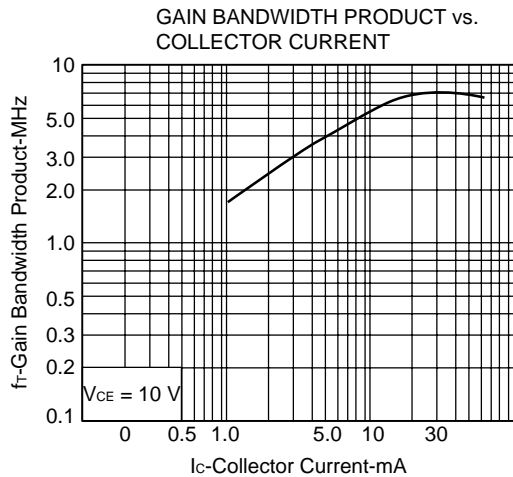
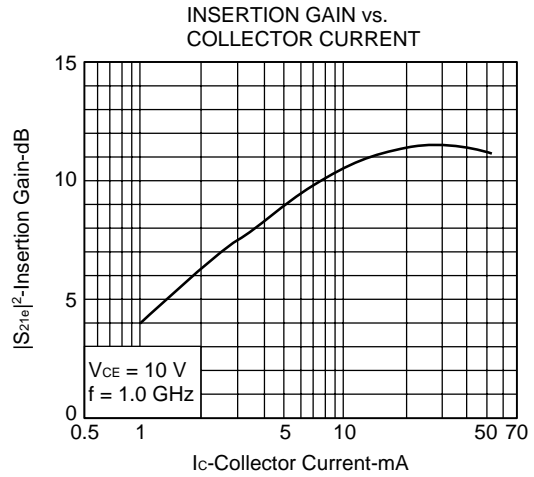
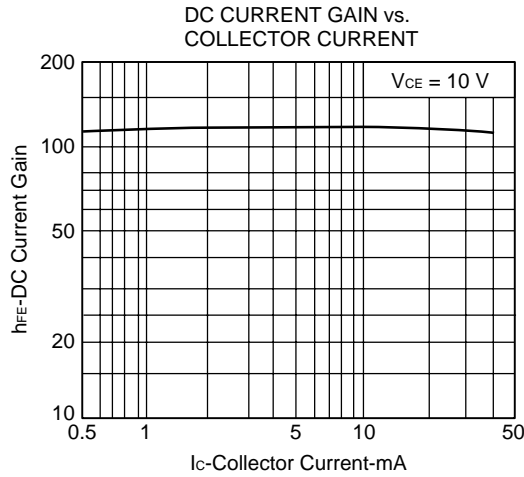
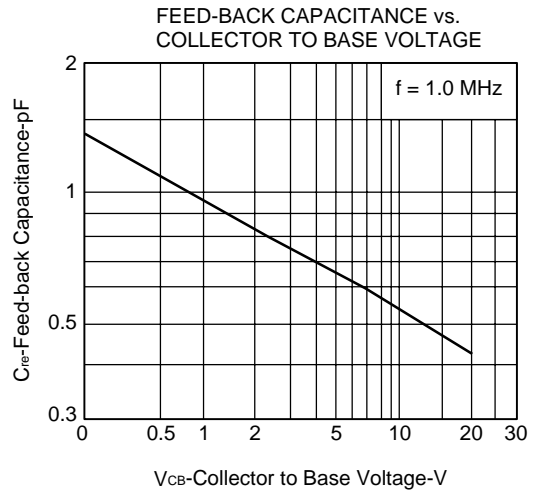
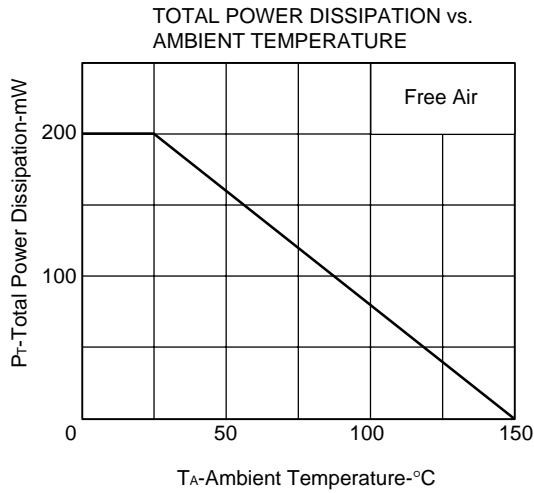
** The emitter terminal and the case shall be connected to the guard terminal of the three-terminal capacitance bridge.

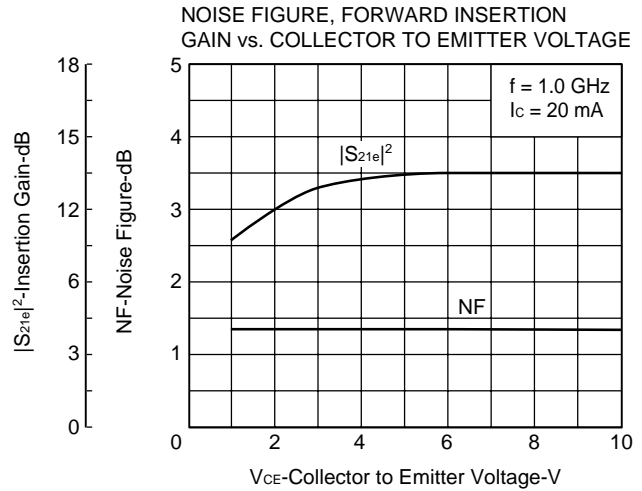
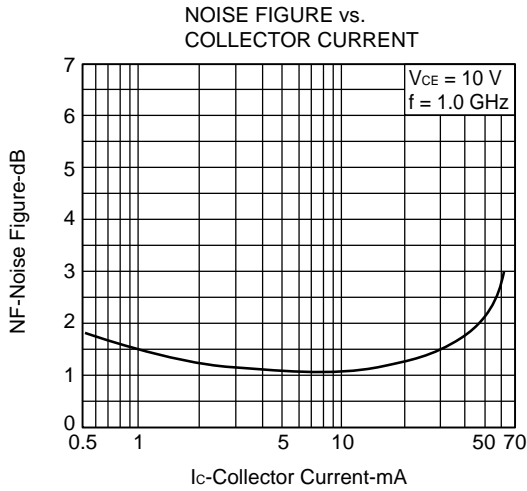
h_{FE} Classification

| Class | R23/Q * | R24/R * | R25/S * |
|----------|-----------|-----------|------------|
| Marking | R23 | R24 | R25 |
| h_{FE} | 50 to 100 | 80 to 160 | 125 to 250 |

* Old Specification / New Specification

TYPICAL CHARACTERISTICS (T_A = 25 °C)





S-PARAMETER

$V_{CE} = 10\text{ V}$, $I_c = 5\text{ mA}$, $Z_o = 50\ \Omega$

| f (MHz) | $ S_{11} $ | $\angle S_{11}$ | $ S_{21} $ | $\angle S_{21}$ | $ S_{12} $ | $\angle S_{12}$ | $ S_{22} $ | $\angle S_{22}$ |
|---------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 200 | 0.651 | -69.3 | 10.616 | 129.3 | 0.051 | 59.2 | 0.735 | -28.1 |
| 400 | 0.467 | -113.3 | 6.856 | 104.4 | 0.071 | 54.4 | 0.550 | -34.1 |
| 600 | 0.391 | -139.3 | 4.852 | 90.9 | 0.086 | 56.0 | 0.468 | -33.9 |
| 800 | 0.360 | -159.2 | 3.802 | 81.2 | 0.101 | 59.1 | 0.426 | -33.6 |
| 1000 | 0.360 | -176.9 | 3.098 | 72.9 | 0.118 | 61.0 | 0.397 | -35.7 |
| 1200 | 0.361 | 172.7 | 2.646 | 67.3 | 0.137 | 63.5 | 0.373 | -38.3 |
| 1400 | 0.381 | 160.3 | 2.298 | 59.3 | 0.157 | 63.3 | 0.360 | -43.0 |
| 1600 | 0.398 | 152.2 | 2.071 | 55.2 | 0.180 | 64.1 | 0.337 | -45.9 |
| 1800 | 0.423 | 143.3 | 1.836 | 49.0 | 0.203 | 63.7 | 0.320 | -52.3 |
| 2000 | 0.445 | 137.6 | 1.689 | 46.2 | 0.220 | 64.7 | 0.302 | -52.2 |

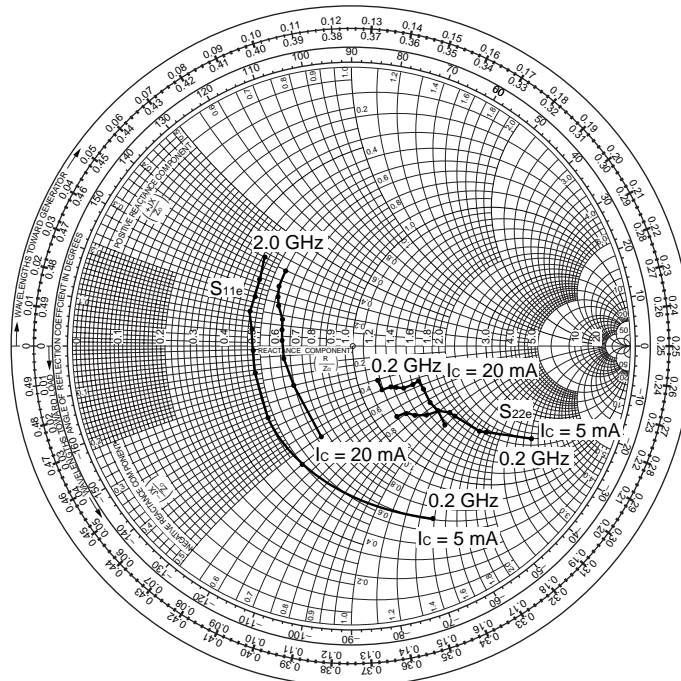
$V_{CE} = 10\text{ V}$, $I_c = 5\text{ mA}$, $Z_o = 50\ \Omega$

| f (MHz) | $ S_{11} $ | $\angle S_{11}$ | $ S_{21} $ | $\angle S_{21}$ | $ S_{12} $ | $\angle S_{12}$ | $ S_{22} $ | $\angle S_{22}$ |
|---------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 200 | 0.339 | -107.0 | 16.516 | 108.7 | 0.035 | 66.1 | 0.459 | -36.6 |
| 400 | 0.258 | -147.3 | 8.928 | 92.1 | 0.060 | 71.0 | 0.343 | -32.9 |
| 600 | 0.243 | -167.7 | 6.022 | 83.0 | 0.085 | 71.9 | 0.305 | -29.9 |
| 800 | 0.242 | 177.0 | 4.633 | 76.2 | 0.109 | 72.2 | 0.284 | -29.4 |
| 1000 | 0.260 | 164.5 | 3.744 | 69.9 | 0.136 | 70.4 | 0.266 | -31.7 |
| 1200 | 0.269 | 157.6 | 3.193 | 65.7 | 0.160 | 69.9 | 0.246 | -35.0 |
| 1400 | 0.294 | 148.7 | 2.750 | 58.8 | 0.187 | 66.7 | 0.233 | -40.4 |
| 1600 | 0.314 | 143.1 | 2.479 | 55.5 | 0.212 | 65.2 | 0.208 | -43.6 |
| 1800 | 0.343 | 136.5 | 2.185 | 50.1 | 0.238 | 62.4 | 0.190 | -50.5 |
| 2000 | 0.367 | 131.4 | 2.016 | 47.8 | 0.254 | 61.6 | 0.173 | -48.3 |

S-PARAMETER

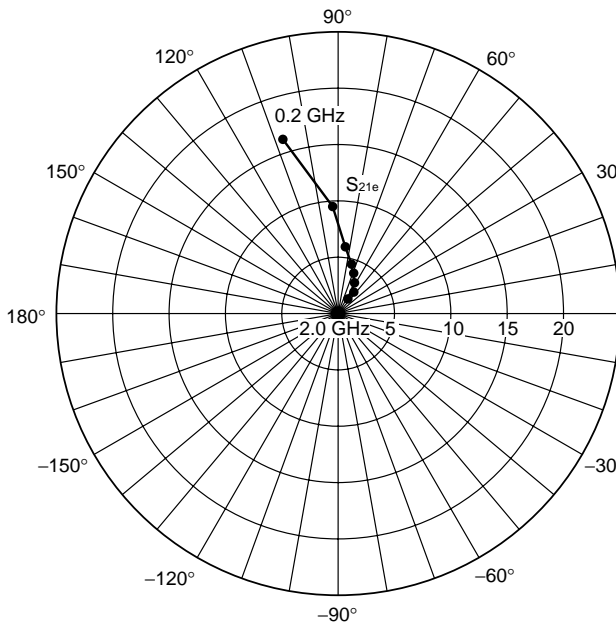
S_{11e}, S_{22e}-FREQUENCY

CONDITION V_{CE} = 10 V
200 MHz Step



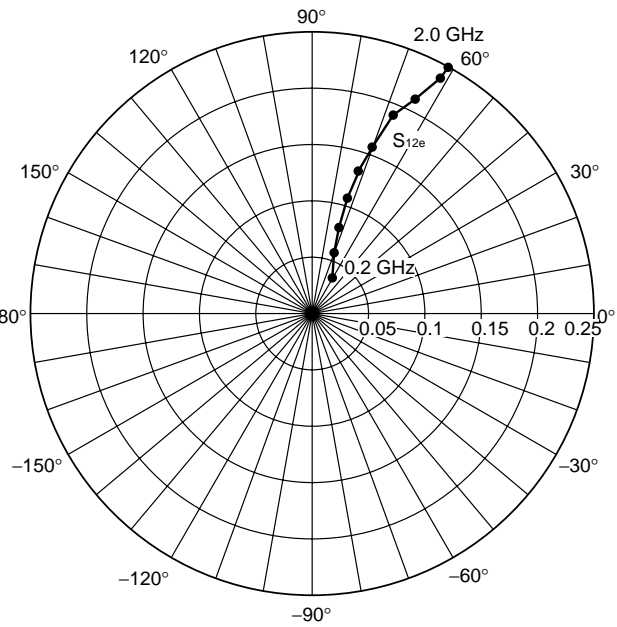
S_{21e}-FREQUENCY

CONDITION V_{CE} = 10 V
I_c = 20 mA



S_{12e}-FREQUENCY

CONDITION V_{CE} = 10 V
I_c = 20 mA



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Anti-radioactive design is not implemented in this product.