

PRELIMINARY DATA SHEET

NEC

Silicon Transistor 2SC5336

NPN EPITAXIAL SILICON TRANSISTOR HIGH FREQUENCY LOW DISTORTION AMPLIFIER

FEATURES

- High gain
|S₂₁|² = 12 dB TYP, @f = 1 GHz, V_{CE} = 10 V, I_C = 20 mA
- New power mini-mold package version of a 4-pin type gain-improved on the 2SC3357

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C)

| Parameter | Symbol | Rating | Unit |
|------------------------------|---------------------------------|-------------|------|
| Collector to Base Voltage | V _{CB0} | 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 ^{Note1} | 1.2 | W |
| Junction Temperature | T _J | 150 | °C |
| Storage Temperature | T _{stg} | -65 to +150 | °C |

Note 1. 0.7 mm × 16 cm² double sided ceramic substrate (Copper plating)

ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

| Parameter | Symbol | Test Conditions | MIN. | TYP. | MAX. | Unit |
|--------------------------|---------------------------------|--|------|------|------|------|
| Collector Cutoff Current | I _{CB0} | V _{CB} = 10 V, I _E = 0 | | | 1.0 | μA |
| Emitter Cutoff Current | I _{EBO} | V _{EB} = 1 V, I _C = 0 | | | 1.0 | μA |
| DC Current Gain | h _{FE} | V _{CE} = 10 V, I _C = 20 mA ^{Note2} | 50 | 120 | 250 | |
| Gain Bandwidth Product | f _T | V _{CE} = 10 V, I _C = 20 mA | | 6.5 | | GHz |
| Feed-back Capacitance | C _{re} | V _{CB} = 10 V, I _E = 0, f = 1.0 MHz ^{Note3} | | 0.5 | 0.8 | pF |
| Insertion Power Gain | S _{21e} ² | V _{CE} = 10 V, I _C = 20 mA, f = 1.0 GHz | | 12.0 | | dB |
| Noise Figure | NF | V _{CE} = 10 V, I _C = 7 mA, f = 1.0 GHz | | 1.1 | | dB |
| Noise Figure | NF | V _{CE} = 10 V, I _C = 40 mA, f = 1.0 GHz | | 1.8 | 3.0 | dB |

Notes 2. Pulse measurement : PW ≤ 350 μS, Duty Cycle ≤ 2 %

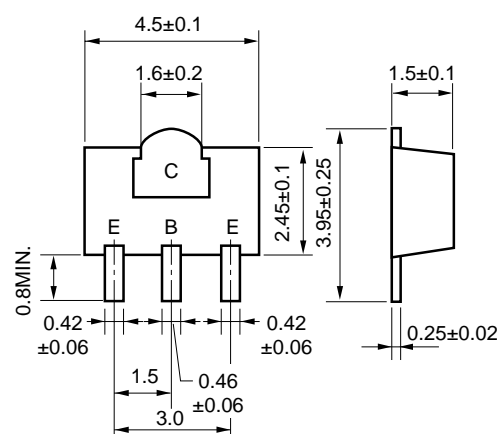
3. Measured by a 3-terminal bridge. Emitter and Case should be connected to the guard terminal.

h_{FE} Classification

| Rank | RH | RF | RE |
|-----------------|-----------|-----------|------------|
| Marking | RH | RF | RE |
| h _{FE} | 50 to 100 | 80 to 160 | 125 to 250 |

PACKAGE DIMENSIONS

(in millimeters)

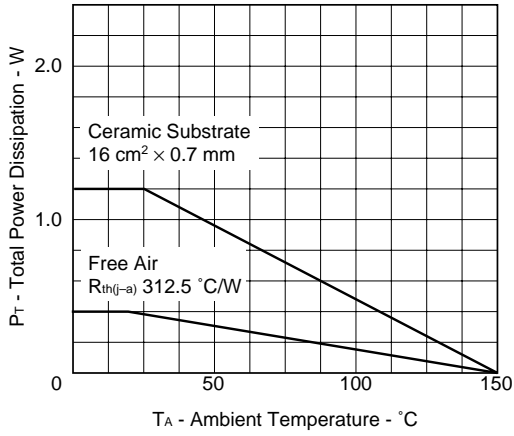


PIN CONNECTIONS

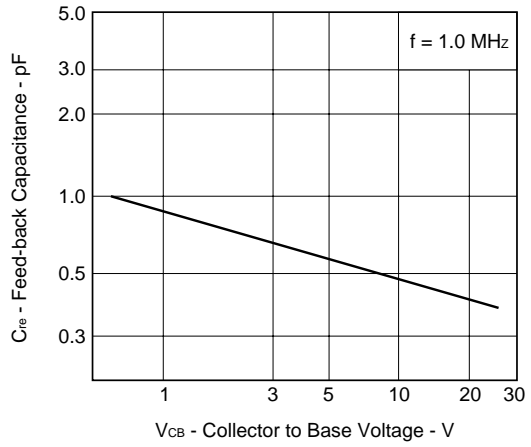
E: Emitter
C: Collector
B: Base

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

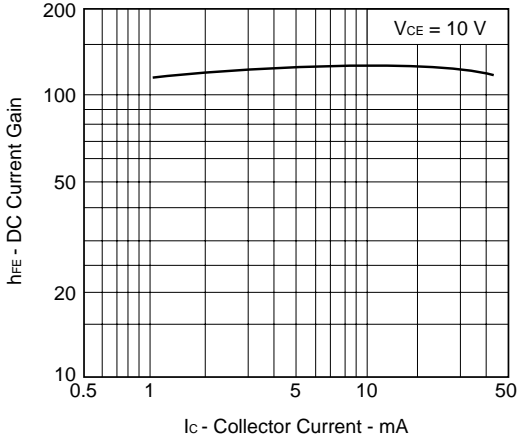
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



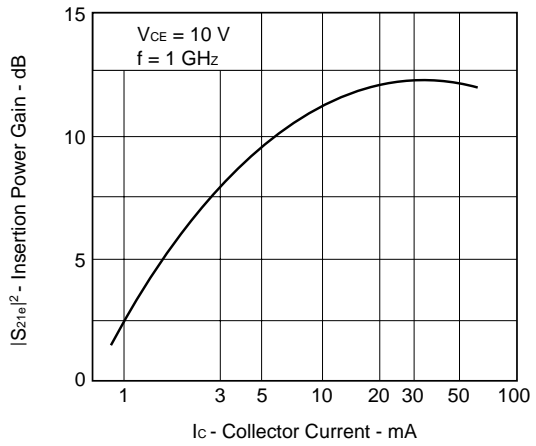
FEED BACK CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



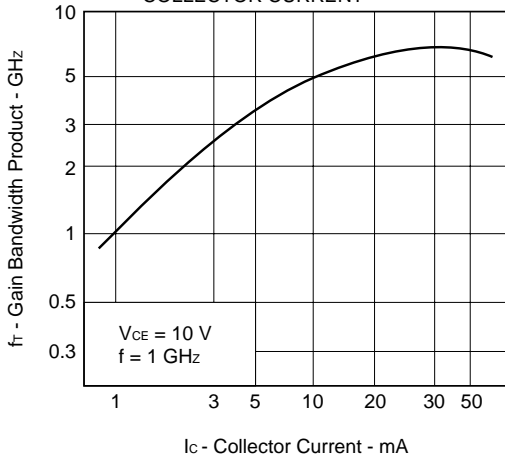
DC CURRENT GAIN vs. COLLECTOR CURRENT



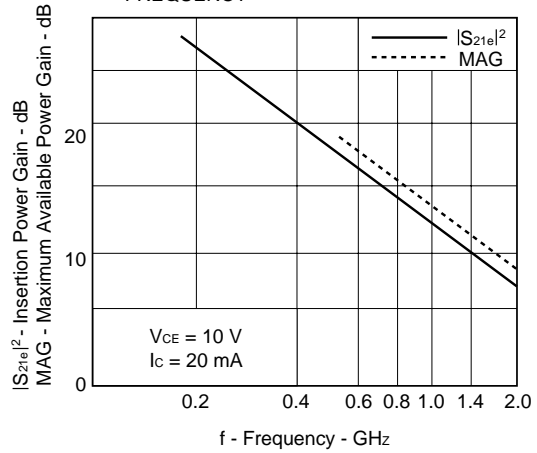
INSERTION GAIN vs. COLLECTOR CURRENT



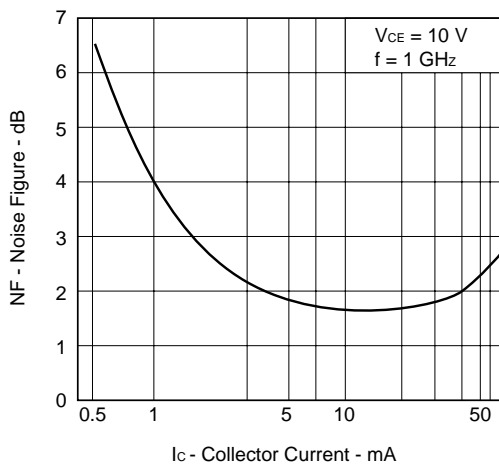
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



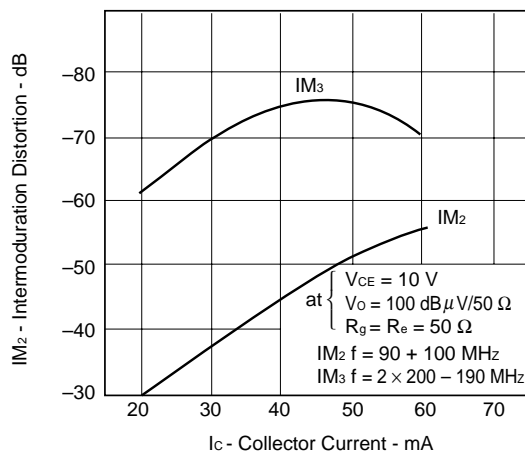
INSERTION GAIN .MAXIMUM GAIN vs. FREQUENCY



NOISE FIGURE vs. COLLECTOR CURRENT



INTERMODULATION DISTORTION vs. COLLECTOR CURRENT



S-PARAMETER

V_{CE} = 10 V, I_C = 20 mA

| f (MHz) | S ₁₁ | | S ₂₁ | | S ₁₂ | | S ₂₂ | |
|---------|-----------------|---------|-----------------|-------|-----------------|------|-----------------|--------|
| | MAG | ANG | MAG | ANG | MAG | ANG | MAG | ANG |
| 100 | .519 | - 74.5 | 30.931 | 131.9 | .017 | 60.6 | .752 | - 30.2 |
| 200 | .413 | - 112.9 | 18.965 | 111.5 | .031 | 61.9 | .570 | - 39.7 |
| 300 | .413 | - 133.4 | 13.324 | 101.9 | .038 | 65.1 | .465 | - 39.8 |
| 400 | .345 | - 145.7 | 10.164 | 95.9 | .045 | 69.8 | .428 | - 40.1 |
| 500 | .331 | - 153.8 | 8.177 | 91.8 | .055 | 71.8 | .436 | - 41.1 |
| 600 | .320 | - 159.6 | 6.834 | 89.1 | .064 | 70.9 | .438 | - 43.5 |
| 700 | .302 | - 166.8 | 5.832 | 86.7 | .074 | 73.9 | .434 | - 47.5 |
| 800 | .296 | - 169.2 | 5.107 | 84.3 | .077 | 74.4 | .429 | - 47.8 |
| 900 | .283 | - 173.2 | 4.600 | 83.1 | .088 | 71.2 | .436 | - 46.5 |
| 1000 | .285 | - 179.8 | 4.200 | 82.3 | .097 | 74.5 | .455 | - 47.8 |
| 1100 | .265 | 175.2 | 3.930 | 80.8 | .100 | 76.3 | .467 | - 46.8 |
| 1200 | .260 | 174.1 | 3.979 | 78.5 | .109 | 75.9 | .529 | - 47.4 |
| 1300 | .263 | 166.0 | 3.741 | 68.6 | .114 | 76.8 | .551 | - 55.8 |
| 1400 | .242 | 163.0 | 3.115 | 66.6 | .119 | 78.3 | .509 | - 55.8 |
| 1500 | .252 | 160.1 | 2.844 | 65.7 | .133 | 82.0 | .510 | - 58.5 |
| 1600 | .253 | 154.0 | 2.595 | 64.1 | .140 | 81.0 | .496 | - 55.2 |
| 1700 | .253 | 149.9 | 2.420 | 63.7 | .158 | 80.9 | .515 | - 54.8 |
| 1800 | .257 | 147.2 | 2.305 | 63.0 | .165 | 82.2 | .518 | - 56.5 |
| 1900 | .262 | 143.0 | 2.171 | 62.6 | .172 | 80.5 | .536 | - 58.6 |
| 2000 | .273 | 141.5 | 2.049 | 61.2 | .177 | 78.3 | .524 | - 61.5 |

S-PARAMETER

V_{CE} = 10 V, I_C = 40 mA

| f (MHz) | S ₁₁ | | S ₂₁ | | S ₁₂ | | S ₂₂ | |
|---------|-----------------|---------|-----------------|-------|-----------------|------|-----------------|--------|
| | MAG | ANG | MAG | ANG | MAG | ANG | MAG | ANG |
| 100 | .378 | - 97.1 | 32.908 | 123.3 | .017 | 71.1 | .665 | - 34.7 |
| 200 | .317 | - 131.8 | 18.819 | 106.0 | .027 | 71.2 | .487 | - 38.7 |
| 300 | .308 | - 150.1 | 12.955 | 97.5 | .035 | 71.8 | .398 | - 38.5 |
| 400 | .299 | - 158.7 | 9.775 | 93.1 | .042 | 78.1 | .393 | - 36.9 |
| 500 | .297 | - 165.5 | 7.899 | 89.8 | .052 | 78.5 | .399 | - 37.6 |
| 600 | .288 | - 169.2 | 6.586 | 87.6 | .061 | 79.1 | .407 | - 39.9 |
| 700 | .274 | - 173.7 | 5.607 | 85.2 | .071 | 77.4 | .400 | - 44.6 |
| 800 | .261 | - 177.3 | 4.879 | 83.5 | .081 | 76.4 | .415 | - 47.4 |
| 900 | .255 | 178.9 | 4.435 | 82.2 | .092 | 76.5 | .399 | - 46.2 |
| 1000 | .260 | 173.0 | 4.024 | 81.4 | .095 | 77.6 | .440 | - 44.3 |
| 1100 | .243 | 169.4 | 3.801 | 80.6 | .098 | 77.1 | .441 | - 45.2 |
| 1200 | .239 | 169.3 | 3.827 | 78.2 | .109 | 78.3 | .494 | - 46.2 |
| 1300 | .245 | 160.3 | 3.587 | 68.4 | .117 | 78.0 | .517 | - 55.4 |
| 1400 | .216 | 157.8 | 2.980 | 66.0 | .125 | 80.3 | .486 | - 54.5 |
| 1500 | .235 | 155.3 | 2.726 | 66.1 | .137 | 86.5 | .500 | - 59.0 |
| 1600 | .243 | 148.8 | 2.537 | 64.0 | .143 | 80.6 | .474 | - 53.7 |
| 1700 | .233 | 146.0 | 2.348 | 64.2 | .159 | 81.2 | .496 | - 56.8 |
| 1800 | .242 | 144.6 | 2.200 | 63.5 | .163 | 80.4 | .491 | - 53.6 |
| 1900 | .249 | 141.9 | 2.073 | 63.3 | .171 | 81.7 | .534 | - 58.0 |
| 2000 | .260 | 140.4 | 1.986 | 61.7 | .184 | 77.5 | .535 | - 61.3 |

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