

NPN EPITAXIAL SILICON TRANSISTOR
FOR MICROWAVE LOW-NOISE AMPLIFICATION

The 2SC3603 is an NPN epitaxial transistor designed for low-noise amplification at 0.5 to 4.0 GHz. This transistor has low-noise and high-gain characteristics in a wide collector current region, and has a wide dynamic range.

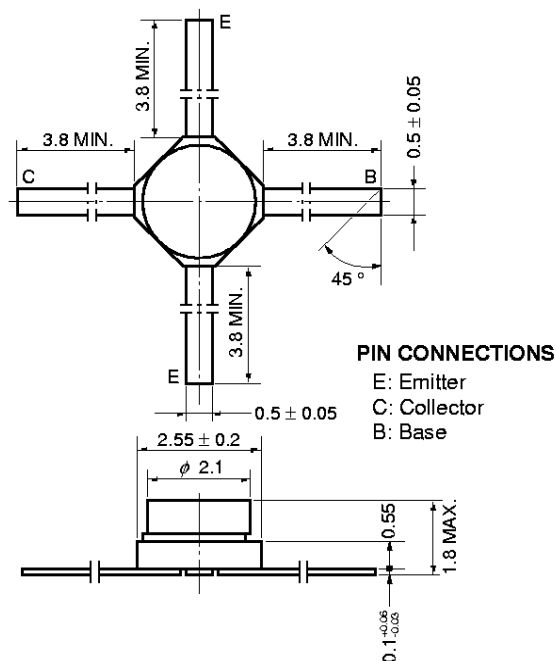
FEATURES

- Low noise : NF = 2.1 dB TYP. @ f = 2.0 GHz
- High power gain : GA = 10 dB TYP. @ f = 2.0 GHz

ABSOLUTE MAXIMUM RATINGS (TA = 25 °C)

| PARAMETER | SYMBOL | RATING | UNIT |
|------------------------------|---|-------------|------|
| Collector to Base Voltage | V _{CB0} | 20 | V |
| Collector to Emitter Voltage | V _{CE0} | 12 | V |
| Emitter to Base Voltage | V _{EB0} | 3 | V |
| Collector Current | I _c | 100 | mA |
| Total Power Dissipation | P _T (T _C = 25 °C) | 580 | mW |
| Junction Temperature | T _j | 200 | °C |
| Storage Temperature | T _{stg} | -65 to +150 | °C |

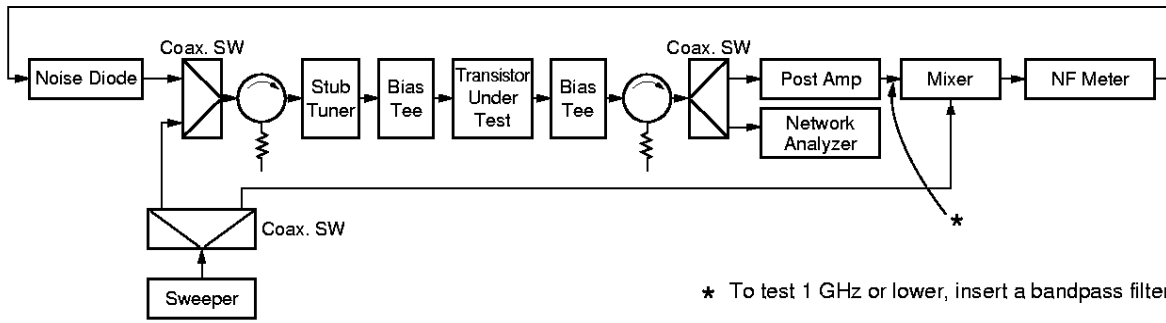
PACKAGE DIMENSIONS (in mm)



ELECTRICAL CHARACTERISTICS (TA = 25 °C)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|------------------------------|---------------------------------|---|------|------|------|------|
| Collector Cut-off Current | I _{cBO} | V _{CB} = 10 V, I _E = 0 | | | 1.0 | μA |
| Emitter Cut-off Current | I _{EB0} | V _{EB} = 1 V, I _C = 0 | | | 1.0 | μA |
| DC Current Gain | h _{FE} | V _{CE} = 10 V, I _C = 20 mA Pulse | 50 | 120 | 300 | |
| Gain Bandwidth Product | f _T | V _{CE} = 10 V, I _C = 20 mA | | 7 | | GHz |
| Reverse Transfer Capacitance | C _{re} | V _{CB} = 10 V, I _E = 0, f = 1 MHz | | 0.5 | 1.0 | pF |
| Noise Figure | NF ^{Note} | V _{CE} = 10 V, I _C = 7 mA, f = 2 GHz | | 2.1 | 3.4 | dB |
| Insertion Gain | S _{21s} ² | V _{CE} = 10 V, I _C = 20 mA, f = 2 GHz | 7.0 | 9.0 | | dB |
| Maximum Available Gain | MAG | V _{CE} = 10 V, I _C = 20 mA, f = 2 GHz | 10.0 | 12.0 | | dB |
| Power Gain | G _A | V _{CE} = 10 V, I _C = 7 mA, f = 2 GHz | | 10 | | dB |

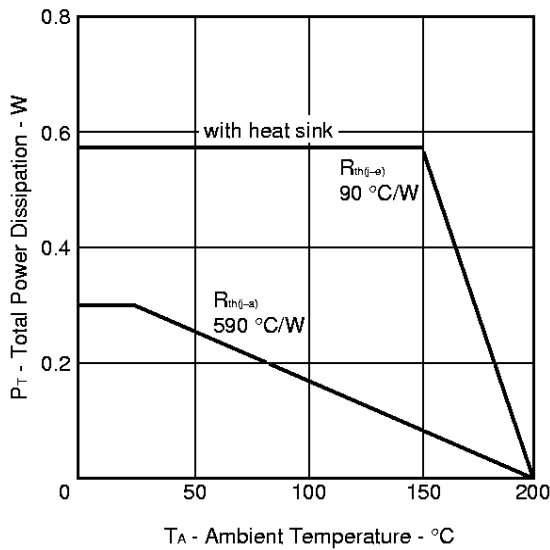
Note Test block diagram



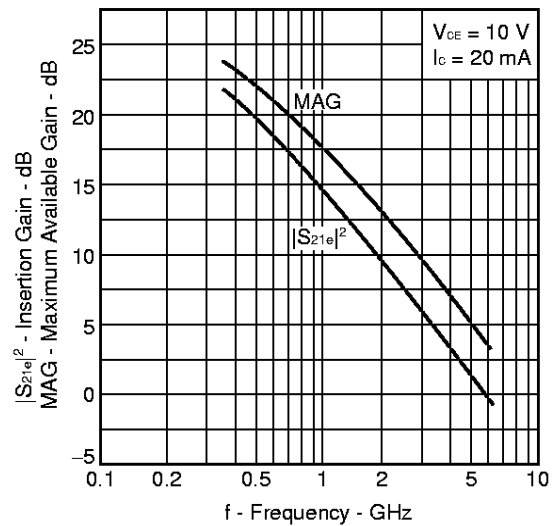
* To test 1 GHz or lower, insert a bandpass filter.

TYPICAL CHARACTERISTICS (T_A = 25 °C)

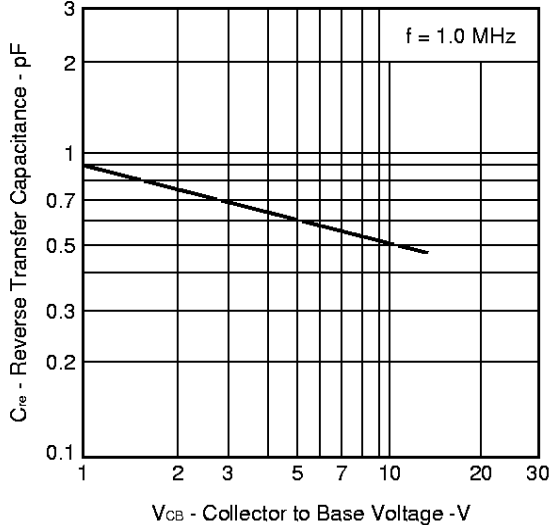
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



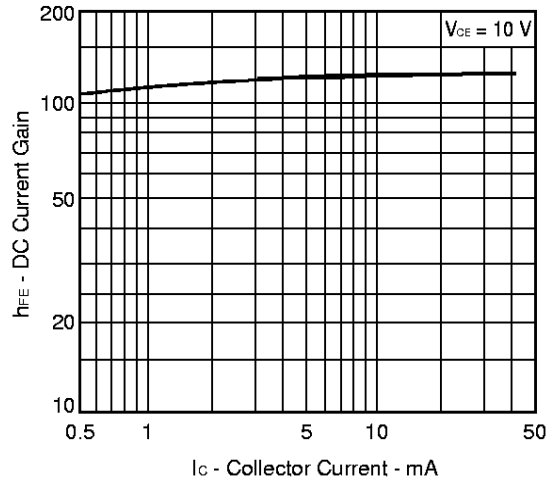
MAG AND INSERTION GAIN vs. FREQUENCY

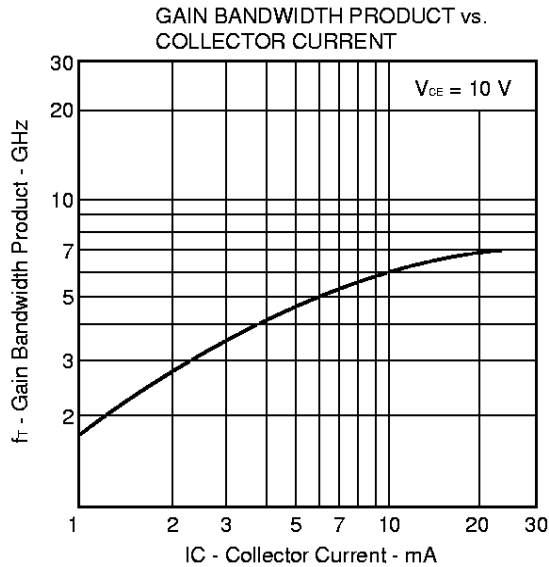
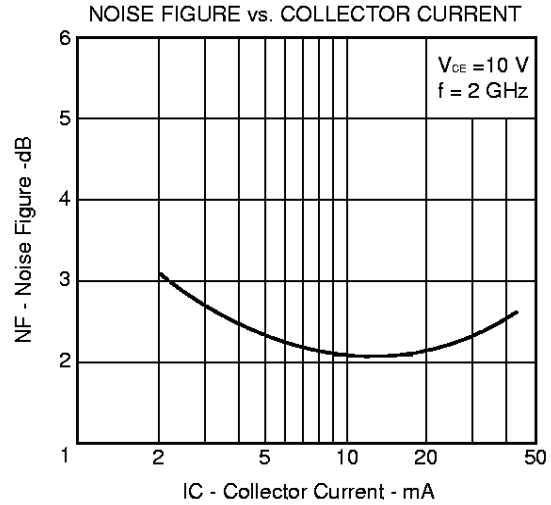
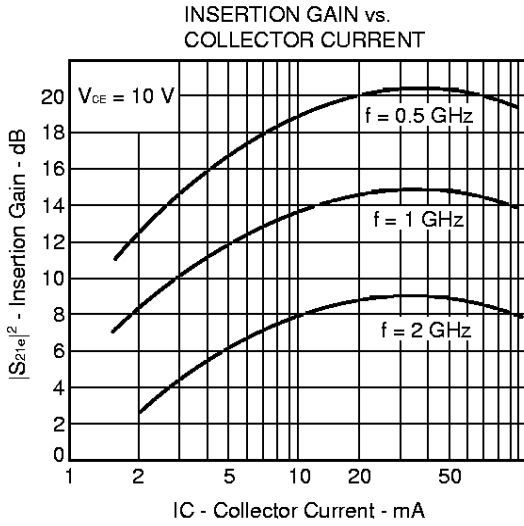


REVERSE TRANSFER CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



DC CURRENT GAIN vs. COLLECTOR CURRENT





S PARAMETER

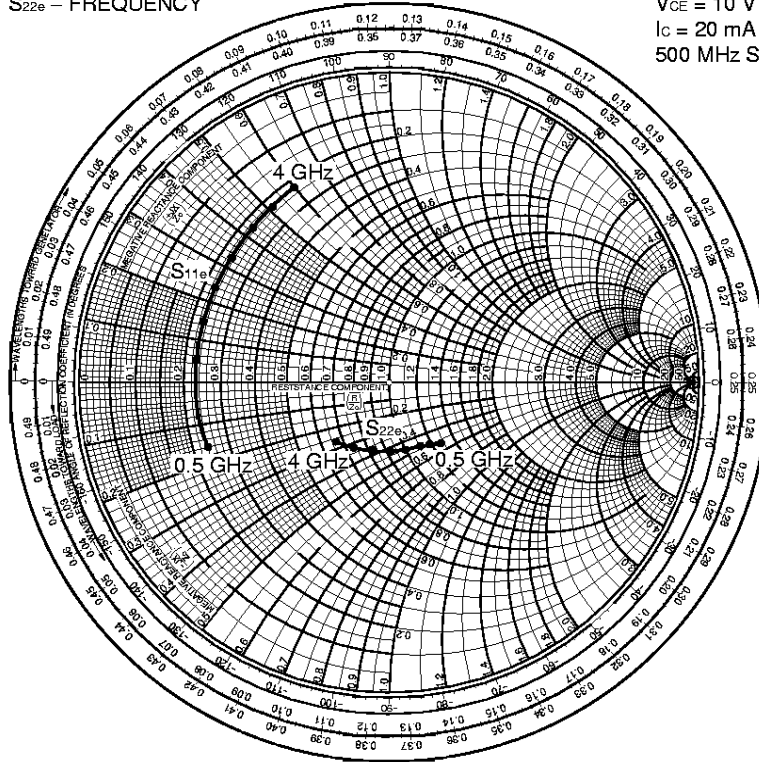
$V_{CE} = 10\text{ V}$, $I_C = 20\text{ mA}$, $Z_O = 50\ \Omega$

| f (MHz) | S ₁₁ | ∠S ₁₁ | S ₂₁ | ∠S ₂₁ | S ₁₂ | ∠S ₁₂ | S ₂₂ | ∠S ₂₂ |
|---------|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|
| 500 | .629 | -160.8 | 10.100 | 92.6 | .040 | 41.5 | .256 | -49.0 |
| 1000 | .631 | 175.8 | 5.411 | 75.1 | .048 | 51.4 | .244 | -57.2 |
| 1500 | .628 | 162.5 | 3.565 | 60.6 | .070 | 59.2 | .232 | -66.8 |
| 2000 | .646 | 152.2 | 2.720 | 48.4 | .086 | 56.0 | .22 | -77.4 |
| 2500 | .659 | 142.1 | 2.161 | 38.8 | .105 | 52.2 | .213 | -89.1 |
| 3000 | .677 | 132.0 | 1.916 | 25.7 | .127 | 45.1 | .217 | -103.1 |
| 3500 | .695 | 123.8 | 1.585 | 14.3 | .151 | 39.7 | .232 | -119.5 |
| 4000 | .713 | 116.5 | 1.392 | 5.3 | .168 | 34.8 | .254 | -134.0 |

S PARAMETER

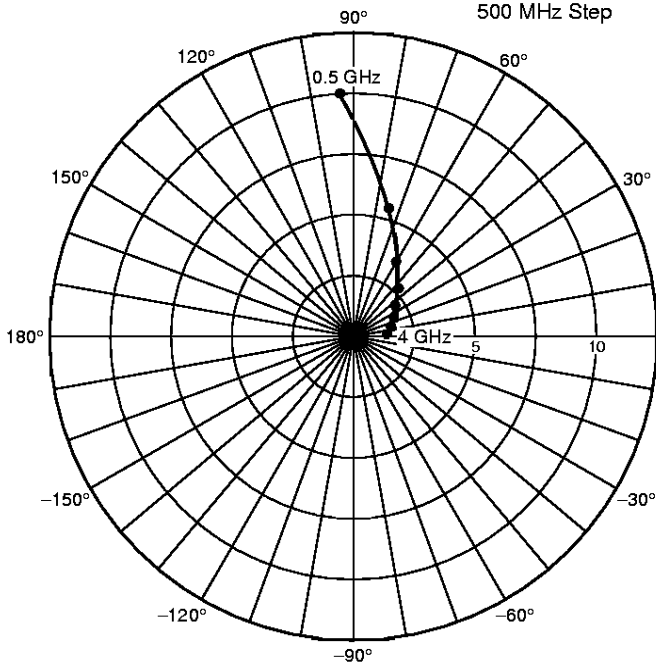
S_{11e}, S_{22e} - FREQUENCY

$V_{CE} = 10\text{ V}$
 $I_C = 20\text{ mA}$
 500 MHz Step



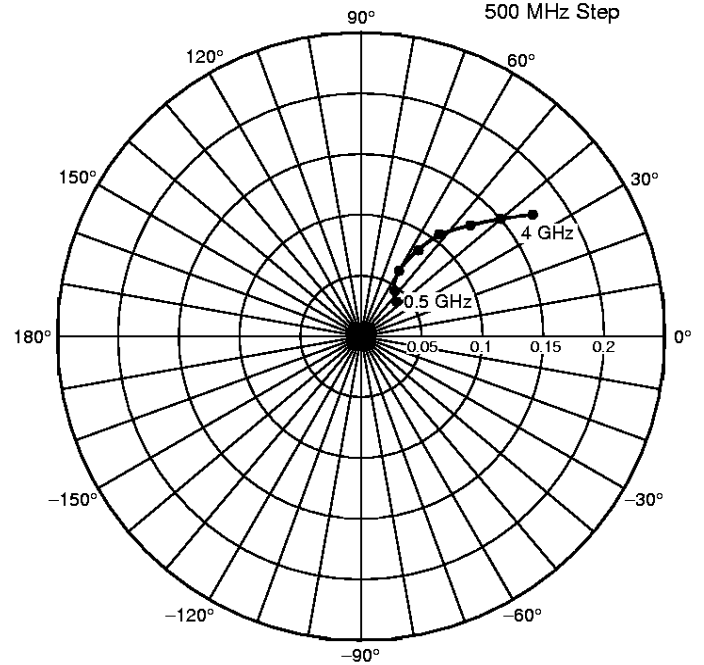
S_{21} - FREQUENCY

$V_{CC} = 10\text{ V}$
 $I_C = 20\text{ mA}$
 500 MHz Step



S_{12} - FREQUENCY

$V_{CE} = 10\text{ V}$
 $I_C = 20\text{ mA}$
 500 MHz Step



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Anti-radioactive design is not implemented in this product.