HITACHI

# 2SC4906

**Silicon NPN Bipolar Transistor**

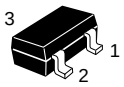
## Application

VHF & UHF wide band amplifire

## Features

- High gain bandwidth product
  $f_T$ = 5.8 GHz typ
- High gain, low noise figure
  PG = 12.0 dB typ,
  NF = 1.6 dB typ at f = 900 MHz

CMPAK




1. Emitter
2. Base
3. Collector

**Table 1 Absolute Maximum Ratings** (Ta = 25°C)

| Item | Symbol | Ratings | Unit |
|---|---|---|---|
| Collector to base voltage | $V_{CBO}$ | 20 | V |
| Collector to emitter voltage | $V_{CEO}$ | 12 | V |
| Emitter to base voltage | $V_{EBO}$ | 2 | V |
| Collector current | $I_C$ | 50 | mA |
| Collector power dissipation | $P_C$ | 100 | mW |
| Junction temperature | $T_j$ | 150 | °C |
| Storage temperature | Tstg | –55 to +150 | °C |

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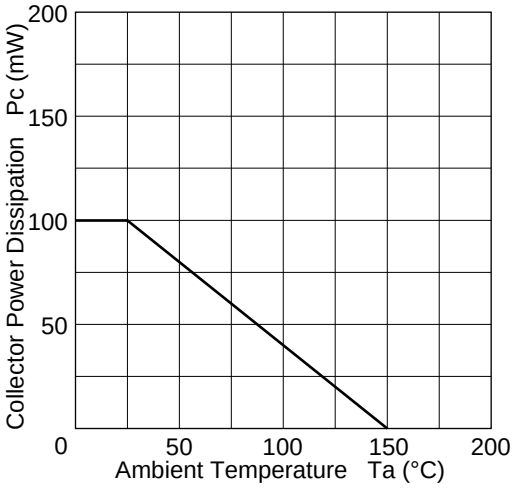
**Table 2 Electrical Characteristics** (Ta = 25°C)

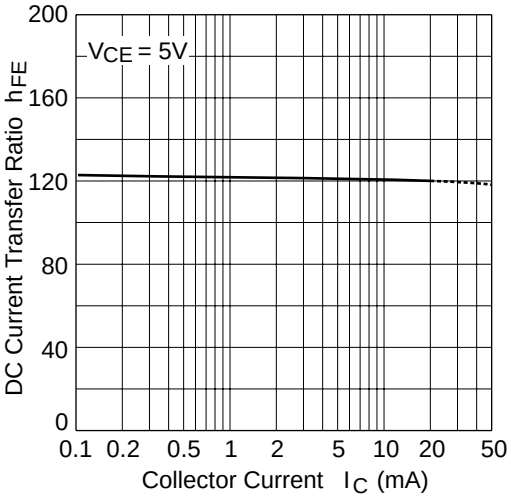
| Item | Symbol | Min | Typ | Max | Unit | Test conditions |
|---|---|---|---|---|---|---|
| Collector to base breakdown voltage | $V_{(BR)CBO}$ | 20 | — | — | V | $I_C$ = 10 µA, $I_E$ = 0 |
| Collector cutoff current | $I_{CBO}$ | — | — | 1 | µA | $V_{CB}$ = 15 V, $I_E$ = 0 |
| | $I_{CEO}$ | — | — | 1 | mA | $V_{CE}$ = 12 V, $R_{BE}$ = ∞ |
| Emitter cutoff current | $I_{EBO}$ | — | — | 10 | µA | $V_{EB}$ = 2 V, $I_C$ = 0 |
| DC current transfer ratio | $h_{FE}$ | 50 | 120 | 250 | | $V_{CE}$ = 5 V, $I_C$ = 20 mA |
| Output capacitance | Cob | — | 0.9 | 1.4 | pF | $V_{CB}$ = 5 V, $I_E$ = 0, f = 1 MHz |
| Gain bandwidth product | $f_T$ | 4 | 5.8 | — | GHz | $V_{CE}$ = 5 V, $I_C$ = 20 mA |
| Power gain | PG | 9.5 | 12.0 | — | dB | $V_{CE}$ = 5 V, $I_C$ = 20 mA, f = 900 MHz |
| Noise figure | NF | — | 1.6 | 3.0 | dB | $V_{CE}$ = 5 V, $I_C$ = 5 mA, f = 900 MHz |

Marking for 2SC4906 is “YN–”.

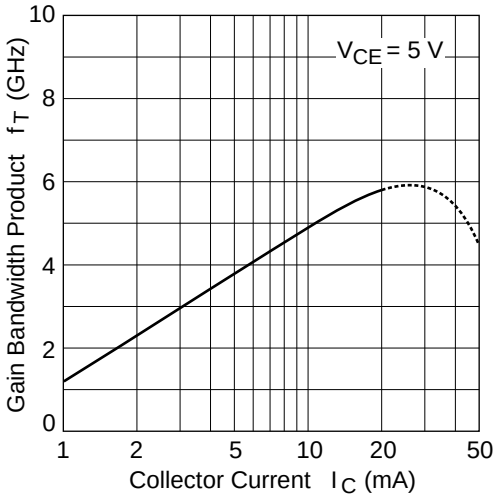
Maximum collector power dissipation curve



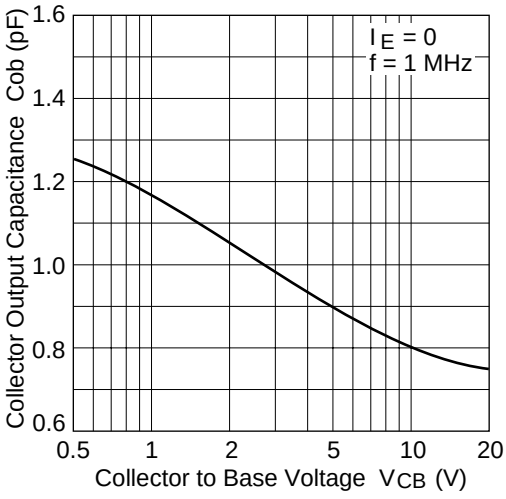

DC current transfer ratio
vs. collector current




Gain bandwidth product vs. collector current




Collector output capacitance
vs. collector to base voltage



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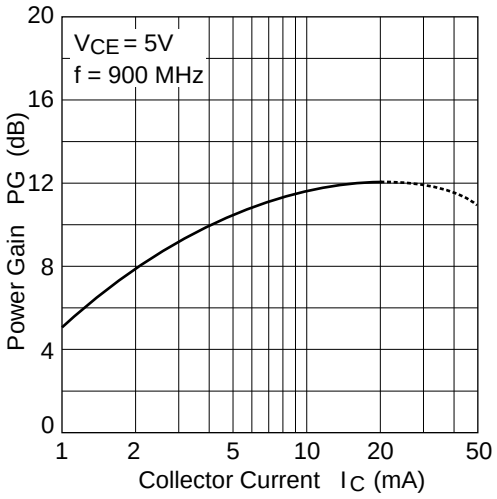
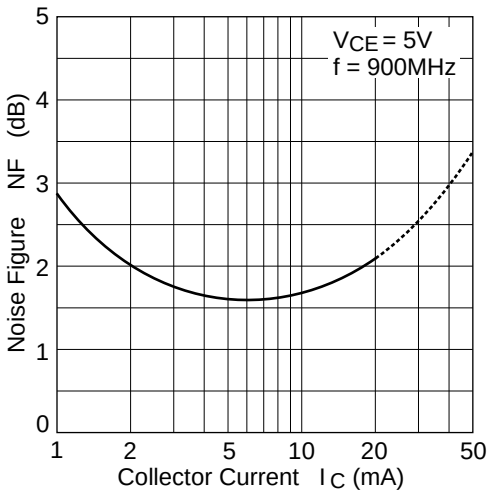
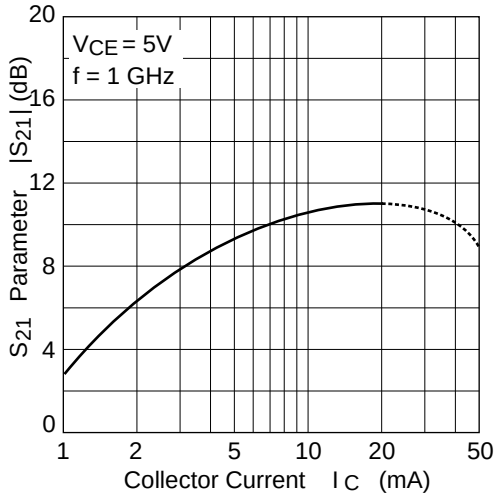
Power gain vs. collector current



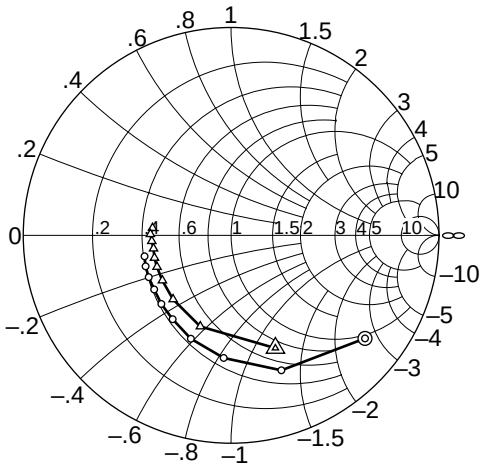

Noise figure vs. collector current




S21 parameter vs. collector current

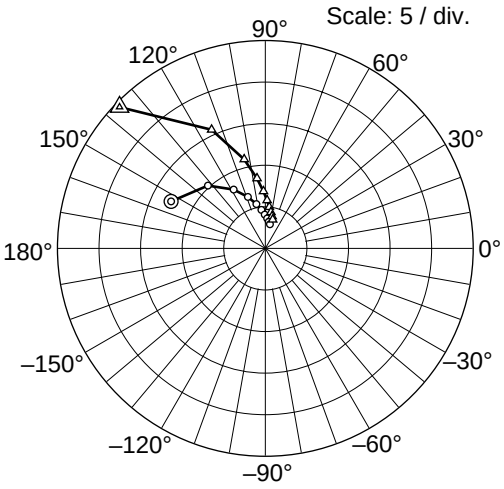


S11 parameter vs. frequency



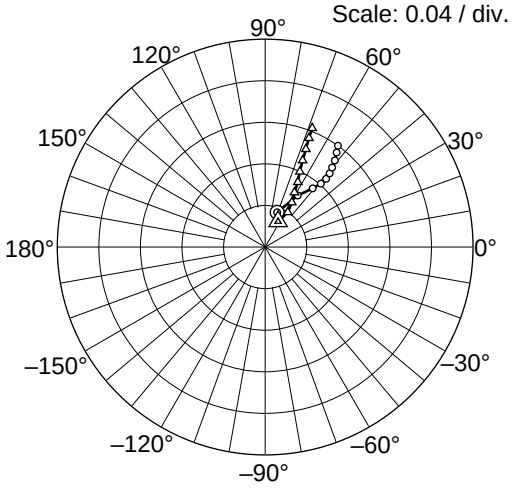

Condition: $V_{CE}$ = 5 V , Zo = 50 Ω
100 to 1000 MHz (100 MHz step)
(I C = 5 mA)
(I C = 20 mA)

S21 parameter vs. frequency



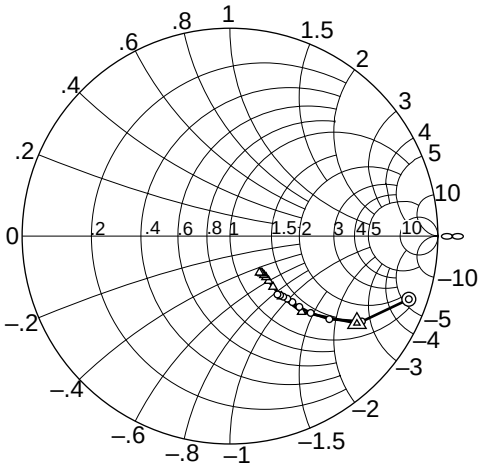

Condition: $V_{CE}$= 5 V , Zo = 50 Ω
100 to 1000 MHz (100 MHz step)
(I C = 5 mA)
(I C = 20 mA)

S12 parameter vs. frequency




Condition: $V_{CE}$ = 5 V , Zo = 50 Ω
100 to 1000 MHz (100 MHz step)
(I C = 5 mA)
(I C = 20 mA)

S22 parameter vs. frequency




Condition: $V_{CE}$ = 5 V , Zo = 50 Ω
100 to 1000 MHz (100 MHz step)
($I_C$ = 5 mA)
($I_C$ = 20 mA)

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**Table 3 S Parameter** ($V_{CE}$ = 5 V, $I_C$ = 5 mA, $Z_O$ = 50 Ω, Emitter common)

| | S11 | | S21 | | S12 | | S22 | |
|---|---|---|---|---|---|---|---|---|
| f (MHz) | MAG | ANG | MAG | ANG | MAG | ANG | MAG | ANG |
| 100 | 0.813 | –37.6 | 12.67 | 153.5 | 0.0354 | 71.0 | 0.912 | –19.4 |
| 200 | 0.693 | –69.6 | 10.22 | 132.5 | 0.0587 | 57.7 | 0.756 | –32.9 |
| 300 | 0.591 | –93.5 | 8.04 | 118.3 | 0.0727 | 51.0 | 0.623 | –39.9 |
| 400 | 0.534 | –111.3 | 6.54 | 108.7 | 0.0812 | 48.7 | 0.536 | –43.6 |
| 500 | 0.492 | –124.9 | 5.44 | 101.4 | 0.0880 | 48.2 | 0.477 | –45.6 |
| 600 | 0.471 | –135.5 | 4.66 | 95.8 | 0.0943 | 48.8 | 0.437 | –46.6 |
| 700 | 0.453 | –144.9 | 4.07 | 91.0 | 0.100 | 49.9 | 0.408 | –47.5 |
| 800 | 0.445 | –153.1 | 3.61 | 86.5 | 0.107 | 51.2 | 0.388 | –48.7 |
| 900 | 0.438 | –160.1 | 3.25 | 82.6 | 0.114 | 52.9 | 0.373 | –49.7 |
| 1000 | 0.429 | –166.4 | 2.96 | 79.2 | 0.120 | 54.3 | 0.362 | –50.9 |

**Table 4 S Parameter** ($V_{CE}$ = 5 V, $I_C$ = 20 mA, $Z_O$ = 50 Ω, Emitter common)

| | S11 | | S21 | | S12 | | S22 | |
|---|---|---|---|---|---|---|---|---|
| f (MHz) | MAG | ANG | MAG | ANG | MAG | ANG | MAG | ANG |
| 100 | 0.583 | –68.6 | 24.42 | 135.9 | 0.0274 | 63.1 | 0.741 | –34.5 |
| 200 | 0.463 | –108.7 | 15.65 | 114.4 | 0.0399 | 57.0 | 0.502 | –46.7 |
| 300 | 0.416 | –132.2 | 10.99 | 103.4 | 0.0500 | 59.1 | 0.382 | –49.6 |
| 400 | 0.396 | –147.6 | 8.46 | 96.8 | 0.0596 | 61.8 | 0.320 | –49.8 |
| 500 | 0.388 | –156.9 | 6.85 | 91.9 | 0.0699 | 63.3 | 0.285 | –49.3 |
| 600 | 0.385 | –163.6 | 5.77 | 87.9 | 0.0798 | 65.3 | 0.263 | –48.9 |
| 700 | 0.379 | –170.3 | 4.97 | 84.5 | 0.0908 | 66.6 | 0.249 | –49.1 |
| 800 | 0.383 | –175.8 | 4.37 | 81.2 | 0.102 | 67.4 | 0.238 | –49.2 |
| 900 | 0.389 | 179.2 | 3.92 | 78.1 | 0.113 | 68.1 | 0.231 | –49.8 |
| 1000 | 0.380 | 174.7 | 3.55 | 75.6 | 0.123 | 68.4 | 0.226 | –51.2 |