

TOSHIBA Transistor Silicon NPN Epitaxial Planar Type

2SC5084

VHF~UHF Band Low Noise Amplifier Applications

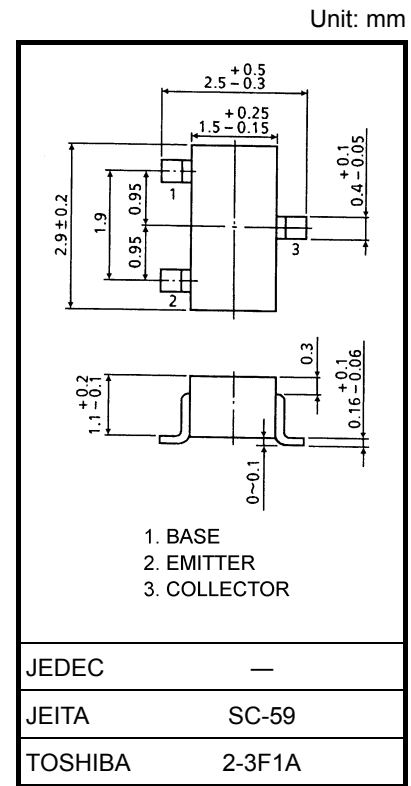
- Low noise figure, high gain.
- $NF = 1.1\text{dB}$, $|S_{21e}|^2 = 11\text{dB}$ ($f = 1\text{GHz}$)

Absolute Maximum Ratings ($T_a = 25^\circ\text{C}$)

| Characteristics | Symbol | Rating | Unit |
|-----------------------------|-----------|---------|------------------|
| Collector-base voltage | V_{CBO} | 20 | V |
| Collector-emitter voltage | V_{CEO} | 12 | V |
| Emitter-base voltage | V_{EBO} | 3 | V |
| Base current | I_B | 40 | mA |
| Collector current | I_C | 80 | mA |
| Collector power dissipation | P_C | 150 | mW |
| Junction temperature | T_j | 125 | $^\circ\text{C}$ |
| Storage temperature range | T_{stg} | -55~125 | $^\circ\text{C}$ |

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).



Weight: 0.012 g (typ.)

Microwave Characteristics ($T_a = 25^\circ\text{C}$)

| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|----------------------|-------------------|---|-----|------|-----|------|
| Transition frequency | f_T | $V_{CE} = 10\text{V}$, $I_C = 20\text{mA}$ | 5 | 7 | — | GHz |
| Insertion gain | $ S_{21e} ^2$ (1) | $V_{CE} = 10\text{V}$, $I_C = 20\text{mA}$, $f = 500\text{MHz}$ | — | 16.5 | — | dB |
| | $ S_{21e} ^2$ (2) | $V_{CE} = 10\text{V}$, $I_C = 20\text{mA}$, $f = 1\text{GHz}$ | 7.5 | 11 | — | |
| Noise figure | NF (1) | $V_{CE} = 10\text{V}$, $I_C = 5\text{mA}$, $f = 500\text{MHz}$ | — | 1 | — | dB |
| | NF (2) | $V_{CE} = 10\text{V}$, $I_C = 5\text{mA}$, $f = 1\text{GHz}$ | — | 1.1 | 2 | |

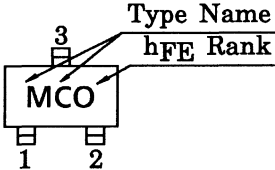
Electrical Characteristics ($T_a = 25^\circ\text{C}$)

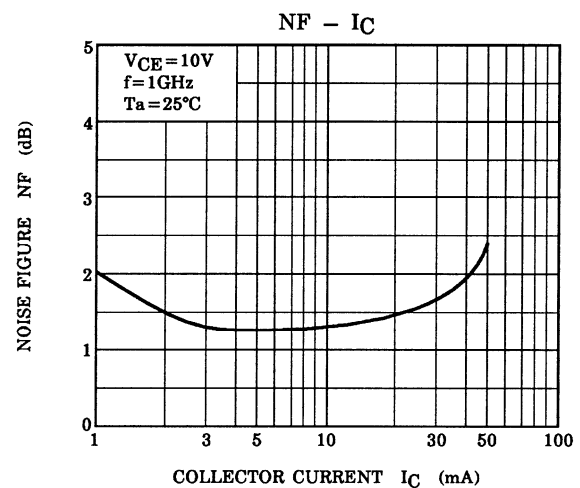
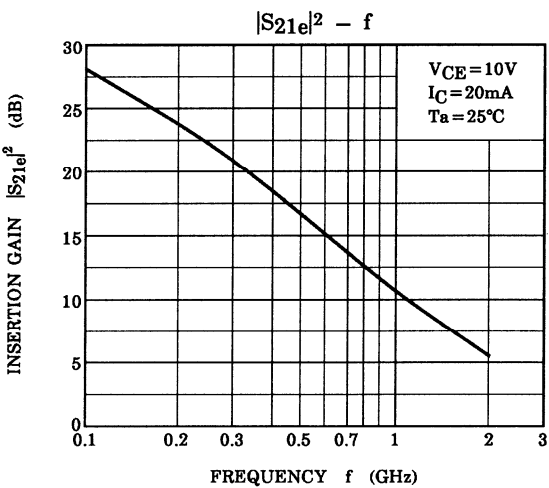
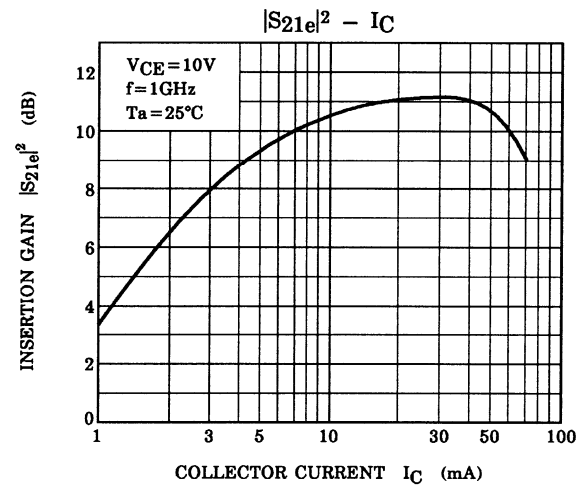
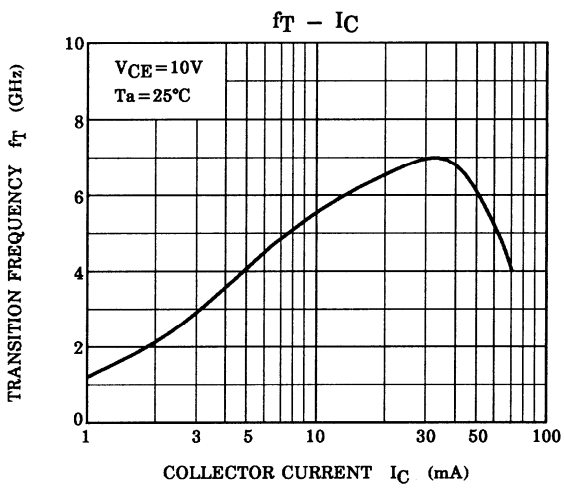
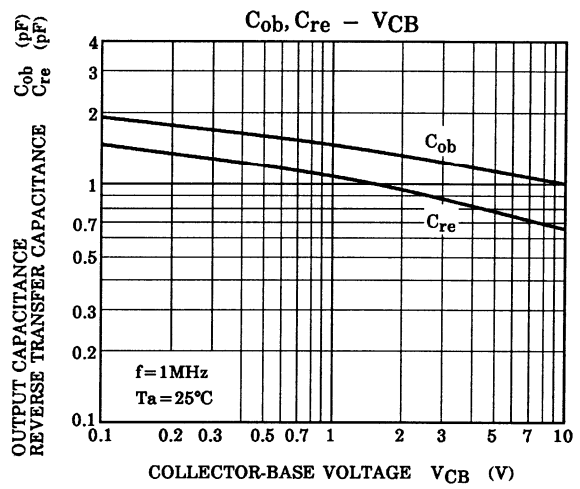
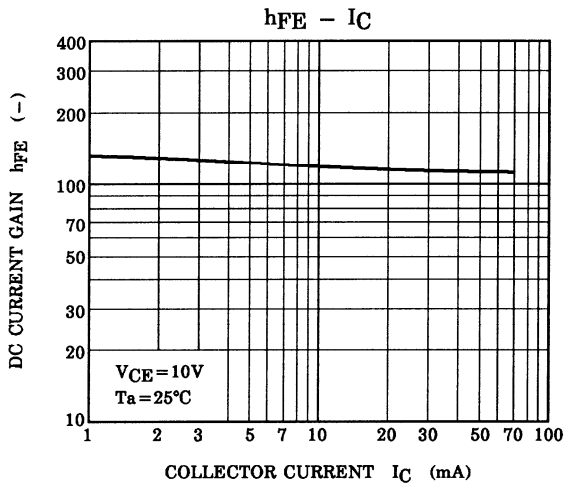
| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|------------------------------|----------------------|--|-----|------|------|---------------|
| Collector cut-off current | I_{CBO} | $V_{CB} = 10\text{V}$, $I_E = 0$ | — | — | 1 | μA |
| Emitter cut-off current | I_{EBO} | $V_{EB} = 1\text{V}$, $I_C = 0$ | — | — | 1 | μA |
| DC current gain | h_{FE} (Note 1) | $V_{CE} = 10\text{V}$, $I_C = 20\text{mA}$ | 80 | — | 240 | |
| Output capacitance | C_{ob} | $V_{CB} = 10\text{V}$, $I_E = 0$, $f = 1\text{MHz}$ (Note 2) | — | 1.0 | — | pF |
| Reverse transfer capacitance | C_{re} | | — | 0.65 | 1.15 | pF |

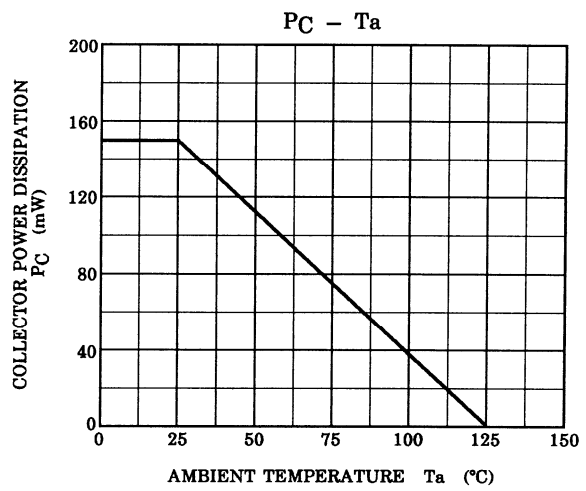
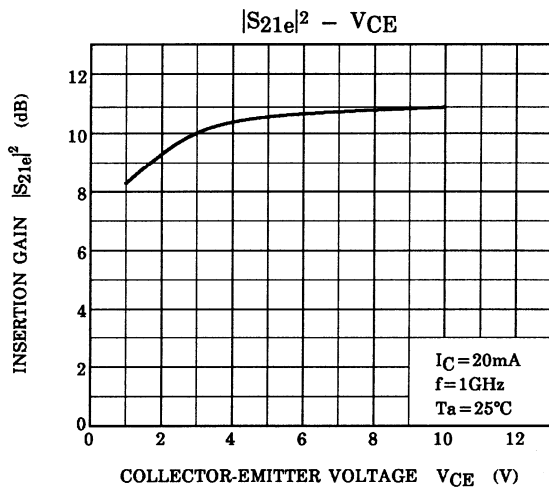
Note 1: h_{FE} classification O: 80~160, Y: 120~240

Note 2: C_{re} is measured by 3 terminal method with capacitance bridge.

Marking







S-Parameter $Z_O = 50 \Omega, T_a = 25^\circ\text{C}$

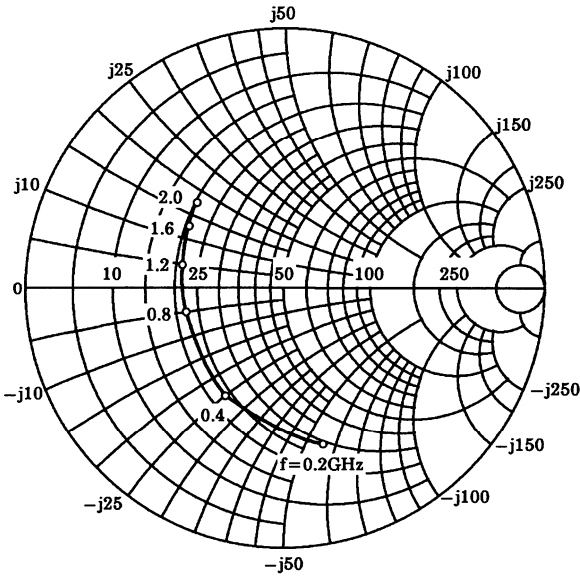
$V_{CE} = 10 \text{ V}, I_C = 5 \text{ mA}$

| Frequency (MHz) | S11 | | S21 | | S12 | | S22 | |
|--------------------|-------|--------|-------|-------|-------|------|-------|-------|
| | Mag. | Ang. | Mag. | Ang. | Mag. | Ang. | Mag. | Ang. |
| 200 | 0.628 | -77.1 | 9.254 | 126.5 | 0.051 | 53.3 | 0.695 | -31.0 |
| 400 | 0.471 | -122.1 | 6.027 | 103.3 | 0.067 | 48.4 | 0.509 | -34.9 |
| 600 | 0.417 | -149.1 | 4.341 | 90.3 | 0.077 | 51.9 | 0.441 | -35.2 |
| 800 | 0.404 | -167.3 | 3.381 | 81.2 | 0.090 | 56.9 | 0.412 | -36.0 |
| 1000 | 0.402 | 178.1 | 2.798 | 73.3 | 0.104 | 62.0 | 0.398 | -37.7 |
| 1200 | 0.412 | 166.6 | 2.393 | 66.7 | 0.122 | 66.4 | 0.390 | -40.3 |
| 1400 | 0.427 | 156.6 | 2.108 | 60.4 | 0.145 | 69.1 | 0.385 | -44.3 |
| 1600 | 0.440 | 147.3 | 1.881 | 54.8 | 0.170 | 69.8 | 0.376 | -48.8 |
| 1800 | 0.455 | 140.0 | 1.713 | 49.4 | 0.194 | 70.2 | 0.373 | -54.3 |
| 2000 | 0.482 | 132.6 | 1.586 | 44.6 | 0.223 | 71.3 | 0.367 | -60.0 |

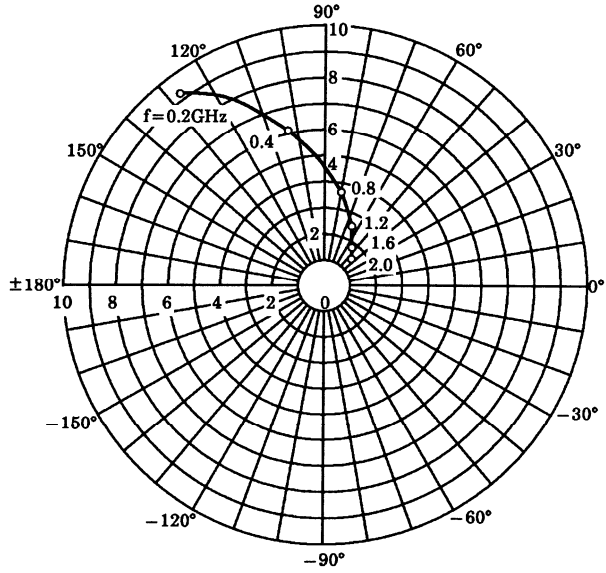
$V_{CE} = 10 \text{ V}, I_C = 20 \text{ mA}$

| Frequency (MHz) | S11 | | S21 | | S12 | | S22 | |
|--------------------|-------|--------|--------|-------|-------|------|-------|-------|
| | Mag. | Ang. | Mag. | Ang. | Mag. | Ang. | Mag. | Ang. |
| 200 | 0.340 | -122.7 | 15.443 | 107.4 | 0.034 | 62.7 | 0.415 | -40.5 |
| 400 | 0.299 | -158.7 | 8.266 | 92.4 | 0.056 | 69.3 | 0.293 | -34.2 |
| 600 | 0.293 | -178.0 | 5.664 | 84.0 | 0.080 | 71.7 | 0.265 | -30.4 |
| 800 | 0.294 | 169.0 | 4.334 | 77.3 | 0.104 | 72.1 | 0.255 | -29.9 |
| 1000 | 0.299 | 157.9 | 3.528 | 71.2 | 0.129 | 72.0 | 0.252 | -30.6 |
| 1200 | 0.310 | 149.5 | 3.002 | 66.0 | 0.155 | 71.4 | 0.254 | -32.5 |
| 1400 | 0.321 | 142.0 | 2.629 | 61.0 | 0.183 | 69.7 | 0.255 | -36.1 |
| 1600 | 0.332 | 134.9 | 2.336 | 56.3 | 0.209 | 67.6 | 0.248 | -40.6 |
| 1800 | 0.341 | 129.5 | 2.121 | 51.7 | 0.234 | 65.6 | 0.242 | -45.9 |
| 2000 | 0.366 | 124.3 | 1.958 | 47.3 | 0.260 | 64.6 | 0.236 | -51.7 |

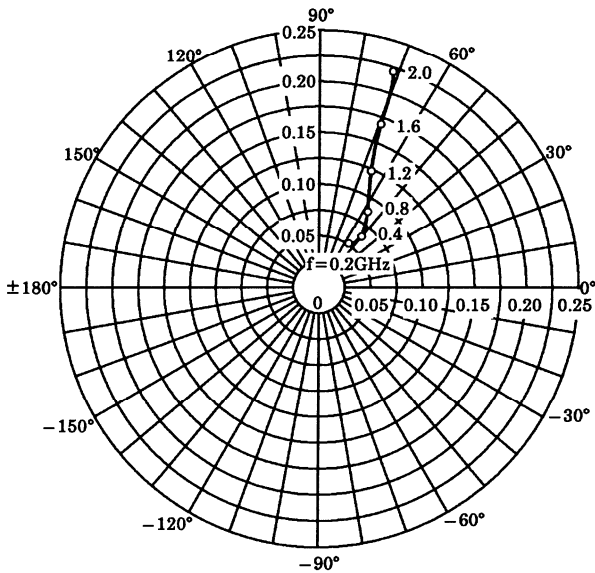
S_{11e}
 V_{CE} = 10V
 I_C = 5mA
 T_a = 25°C
 (UNIT : Ω)



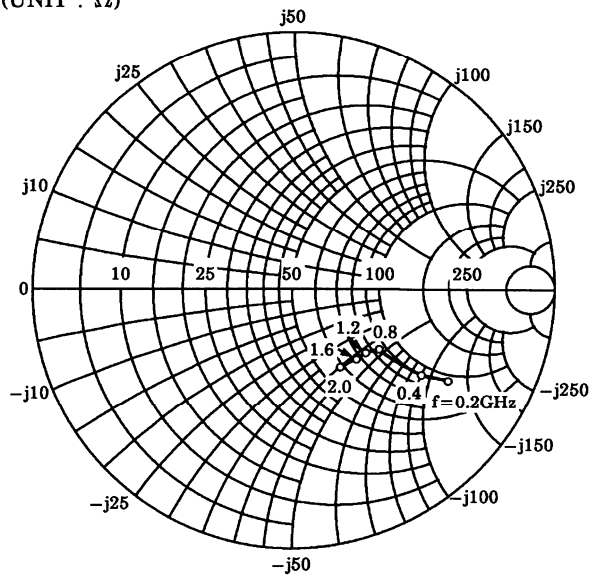
S_{21e}
 V_{CE} = 10V
 I_C = 5mA
 T_a = 25°C



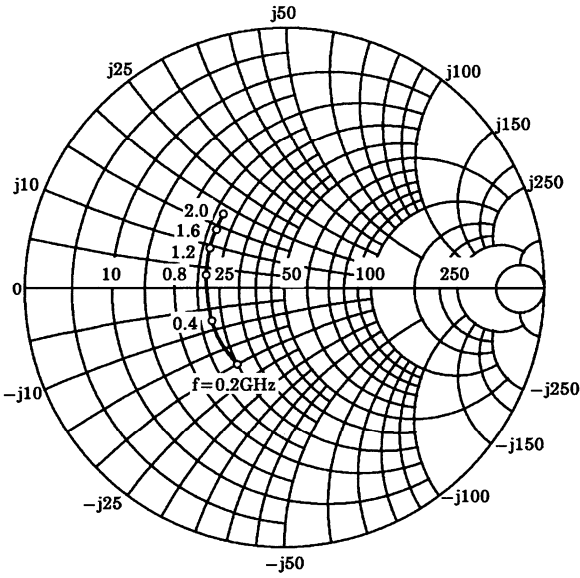
S_{12e}
 V_{CE} = 10V
 I_C = 5mA
 T_a = 25°C



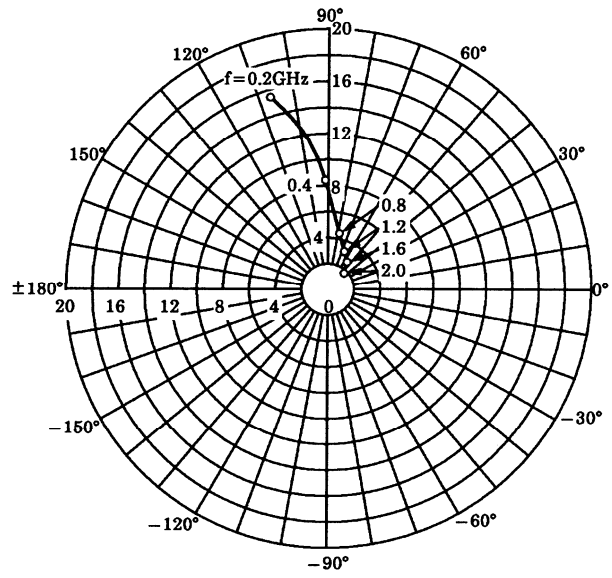
S_{22e}
 V_{CE} = 10V
 I_C = 5mA
 T_a = 25°C
 (UNIT : Ω)



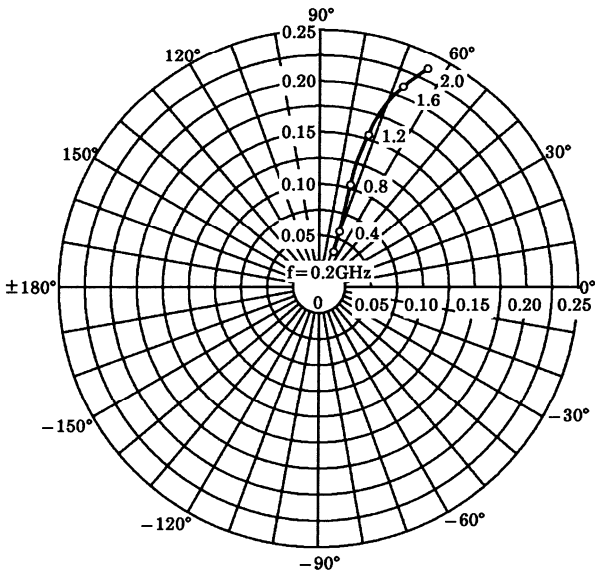
S11e
 VCE = 10V
 IC = 20mA
 Ta = 25°C
 (UNIT : Ω)



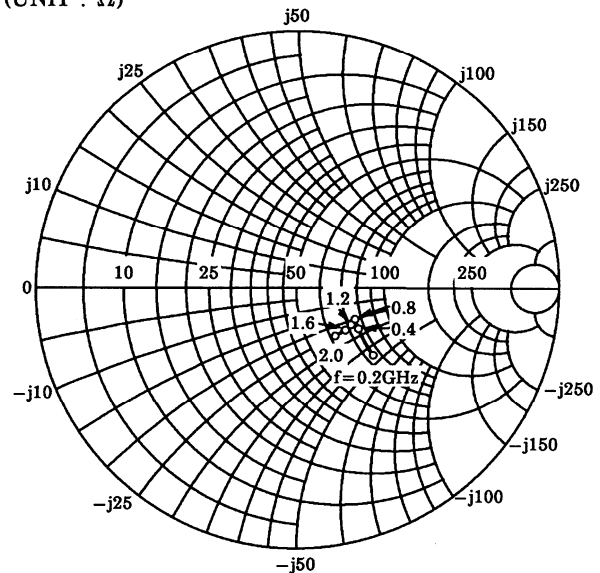
S21e
 VCE = 10V
 IC = 20mA
 Ta = 25°C



S12e
 VCE = 10V
 IC = 20mA
 Ta = 25°C



S22e
 VCE = 10V
 IC = 20mA
 Ta = 25°C
 (UNIT : Ω)



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