

TOSHIBA Transistor Silicon NPN Epitaxial Planar Type

2SC5086

VHF~UHF Band Low Noise Amplifier Applications

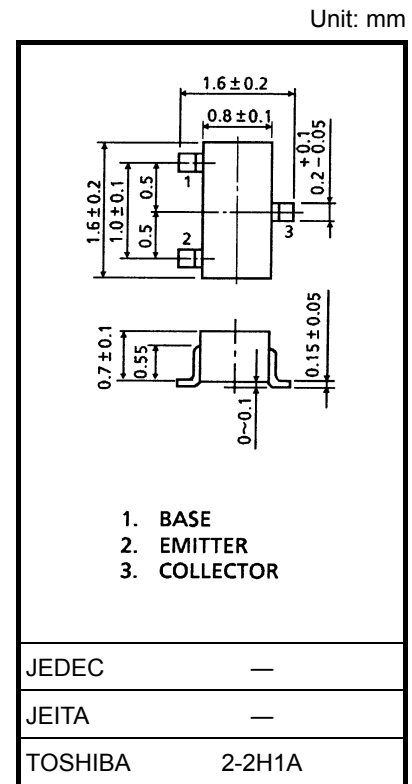
- Low noise figure, high gain.
- $NF = 1.1dB, |S_{21e}|^2 = 11dB (f = 1 GHz)$

Absolute Maximum Ratings (Ta = 25°C)

| Characteristics | Symbol | Rating | Unit |
|-----------------------------|------------------|---------|------|
| Collector-base voltage | V _{CB0} | 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 | 100 | mW |
| Junction temperature | T _j | 125 | °C |
| Storage temperature range | T _{stg} | -55~125 | °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: 2.4 mg (typ.)

Microwave Characteristics (Ta = 25°C)

| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|----------------------|-------------------------------------|---|-----|------|-----|------|
| Transition frequency | f _T | V _{CE} = 10 V, I _C = 20 mA | 5 | 7 | — | GHz |
| Insertion gain | S _{21e} ² (1) | V _{CE} = 10 V, I _C = 20 mA, f = 500 MHz | — | 16.5 | — | dB |
| | S _{21e} ² (2) | V _{CE} = 10 V, I _C = 20 mA, f = 1 GHz | 7.5 | 11 | — | |
| Noise figure | NF (1) | V _{CE} = 10 V, I _C = 5 mA, f = 500 MHz | — | 1 | — | dB |
| | NF (2) | V _{CE} = 10 V, I _C = 5 mA, f = 1 GHz | — | 1.1 | 2 | |

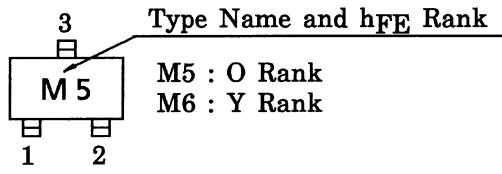
Electrical Characteristics (Ta = 25°C)

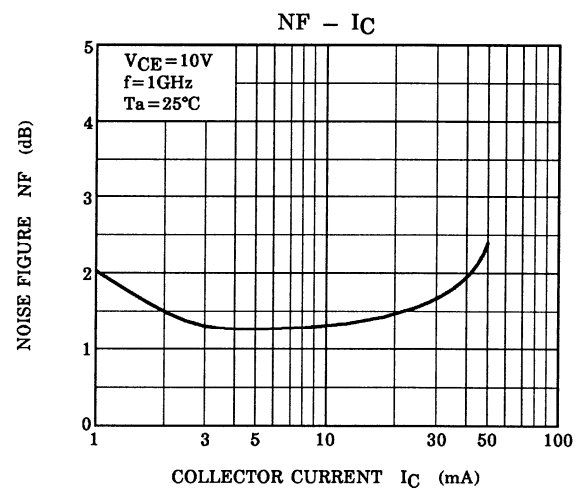
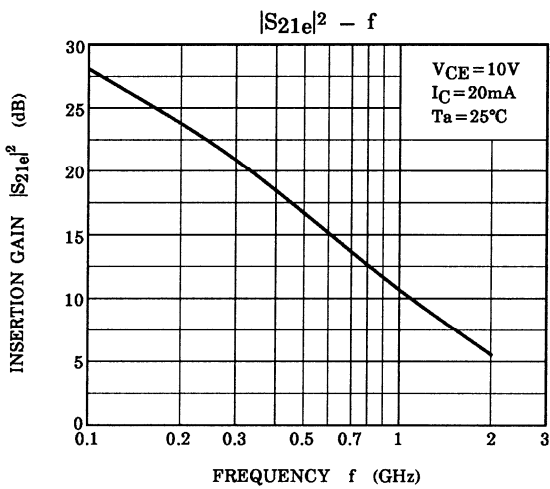
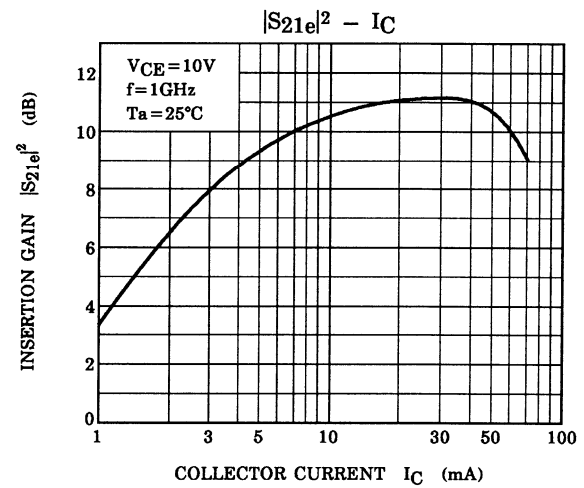
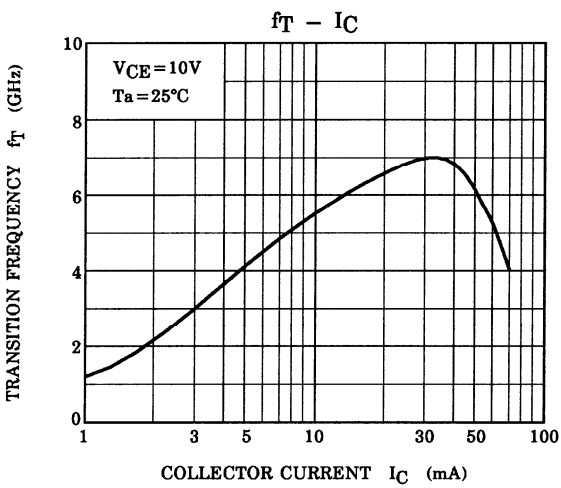
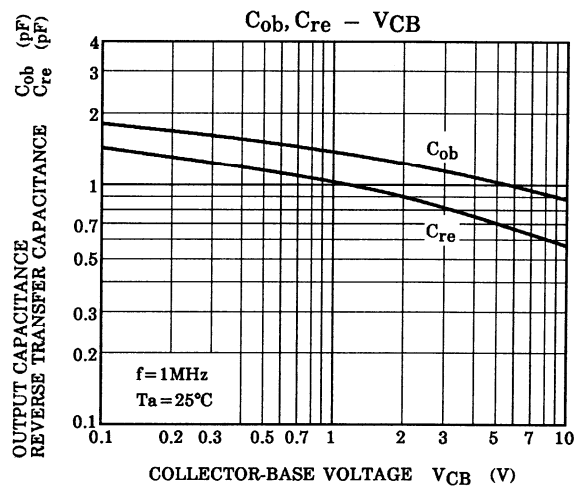
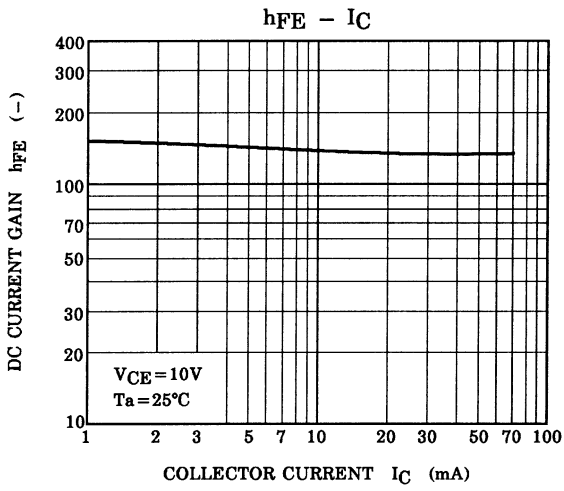
| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|------------------------------|-----------------------------|--|-----|------|------|------|
| Collector cut-off current | I _{CBO} | V _{CB} = 10 V, I _E = 0 | — | — | 1 | μA |
| Emitter cut-off current | I _{EBO} | V _{EB} = 1 V, I _C = 0 | — | — | 1 | μA |
| DC current gain | h _{FE} (Note 1) | V _{CE} = 10 V, I _C = 20 mA | 80 | — | 240 | |
| Output capacitance | C _{ob} | V _{CB} = 10 V, I _E = 0, f = 1 MHz (Note 2) | — | 1.0 | — | pF |
| Reverse transfer capacitance | C _{re} | | — | 0.65 | 1.15 | pF |

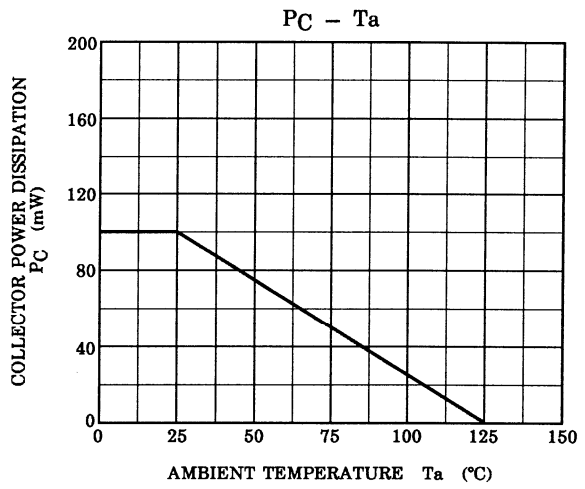
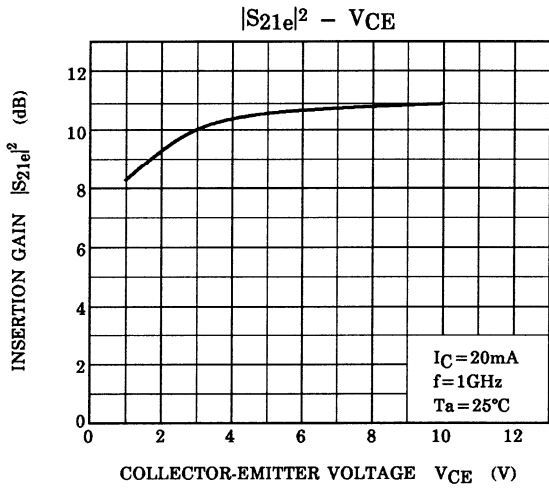
Note 1: h_{FE} classification O: 80~160, Y: 120~240

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

Marking







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

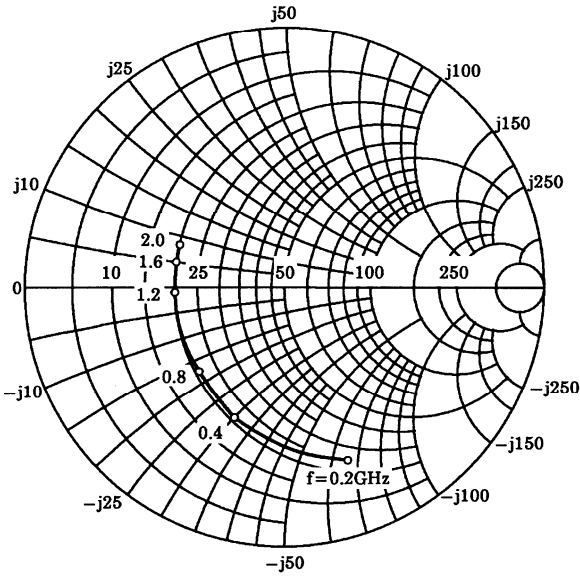
$V_{CE} = 10 \text{ V}, I_C = 5 \text{ mA}$

| Frequency (MHz) | S11 | | S21 | | S12 | | S22 | |
|--------------------|-------|--------|-------|-------|-------|------|-------|-------|
| | Mag. | Ang. | Mag. | Ang. | Mag. | Ang. | Mag. | Ang. |
| 200 | 0.715 | -69.3 | 9.495 | 132.1 | 0.051 | 55.2 | 0.747 | -29.0 |
| 400 | 0.542 | -112.4 | 6.482 | 108.5 | 0.068 | 46.8 | 0.555 | -35.1 |
| 600 | 0.476 | -137.7 | 4.717 | 95.8 | 0.077 | 47.9 | 0.478 | -36.2 |
| 800 | 0.447 | -154.4 | 3.691 | 87.1 | 0.086 | 51.6 | 0.442 | -37.1 |
| 1000 | 0.435 | -166.8 | 3.049 | 79.9 | 0.096 | 55.9 | 0.424 | -38.9 |
| 1200 | 0.433 | -176.6 | 2.611 | 73.9 | 0.108 | 60.4 | 0.418 | -41.8 |
| 1400 | 0.435 | 174.8 | 2.294 | 68.3 | 0.123 | 64.2 | 0.411 | -45.0 |
| 1600 | 0.439 | 167.3 | 2.050 | 63.2 | 0.140 | 66.9 | 0.407 | -49.0 |
| 1800 | 0.444 | 160.6 | 1.860 | 58.7 | 0.159 | 68.7 | 0.406 | -53.6 |
| 2000 | 0.454 | 154.2 | 1.713 | 53.9 | 0.180 | 70.5 | 0.404 | -57.8 |

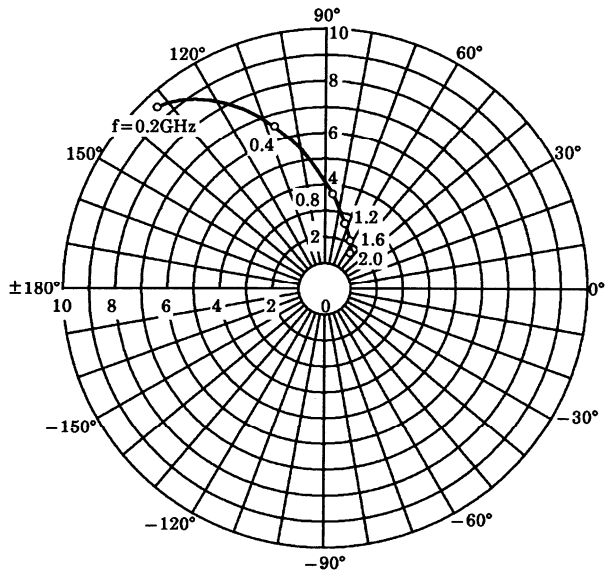
$V_{CE} = 10 \text{ V}, I_C = 20 \text{ mA}$

| Frequency (MHz) | S11 | | S21 | | S12 | | S22 | |
|--------------------|-------|--------|--------|-------|-------|------|-------|-------|
| | Mag. | Ang. | Mag. | Ang. | Mag. | Ang. | Mag. | Ang. |
| 200 | 0.465 | -107.8 | 16.512 | 113.2 | 0.035 | 56.7 | 0.484 | -40.9 |
| 400 | 0.375 | -145.6 | 9.090 | 96.5 | 0.052 | 62.2 | 0.331 | -37.8 |
| 600 | 0.351 | -164.4 | 6.252 | 88.1 | 0.070 | 66.5 | 0.291 | -34.1 |
| 800 | 0.343 | -176.7 | 4.762 | 81.9 | 0.089 | 68.9 | 0.277 | -33.3 |
| 1000 | 0.338 | 174.8 | 3.875 | 76.6 | 0.109 | 70.2 | 0.273 | -34.0 |
| 1200 | 0.337 | 167.9 | 3.285 | 71.8 | 0.130 | 70.8 | 0.274 | -36.2 |
| 1400 | 0.343 | 161.6 | 2.874 | 67.2 | 0.152 | 70.6 | 0.274 | -39.3 |
| 1600 | 0.343 | 156.2 | 2.553 | 62.9 | 0.173 | 69.8 | 0.274 | -43.4 |
| 1800 | 0.348 | 151.2 | 2.317 | 58.8 | 0.195 | 68.9 | 0.273 | -47.8 |
| 2000 | 0.354 | 146.2 | 2.113 | 55.0 | 0.218 | 68.2 | 0.272 | -52.1 |

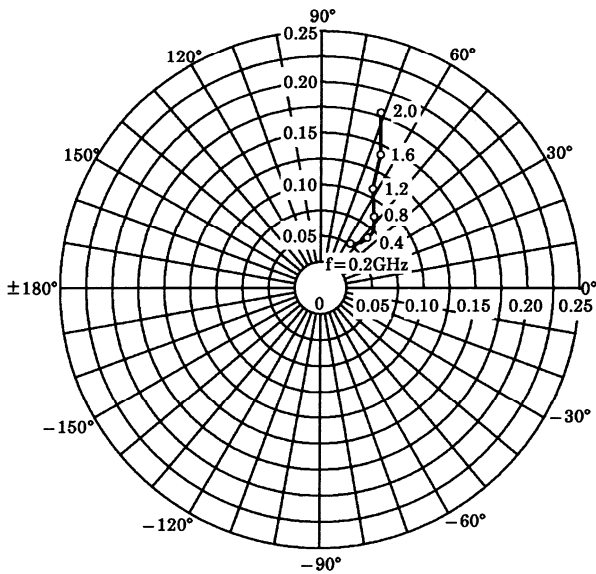
S11e
 VCE=10V
 IC=5mA
 Ta=25°C
 (UNIT : Ω)



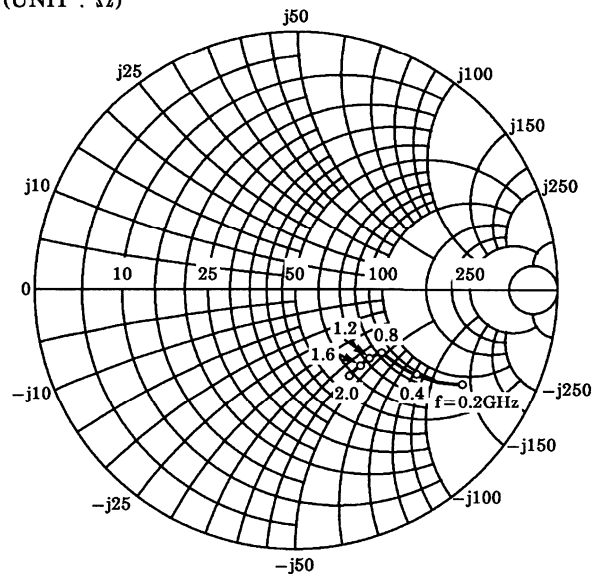
S21e
 VCE=10V
 IC=5mA
 Ta=25°C



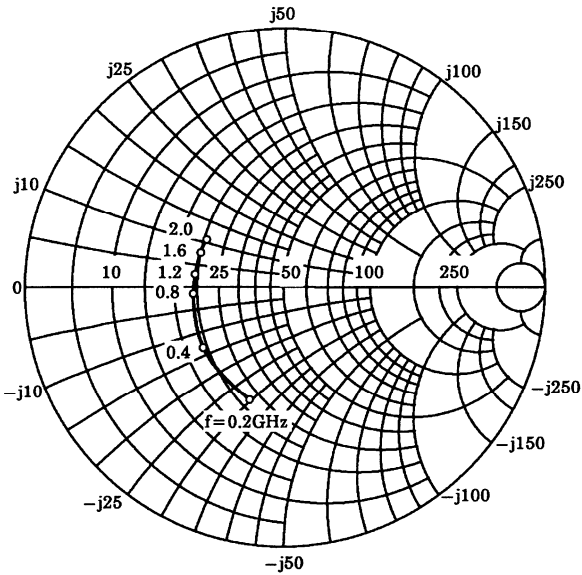
S12e
 VCE=10V
 IC=5mA
 Ta=25°C



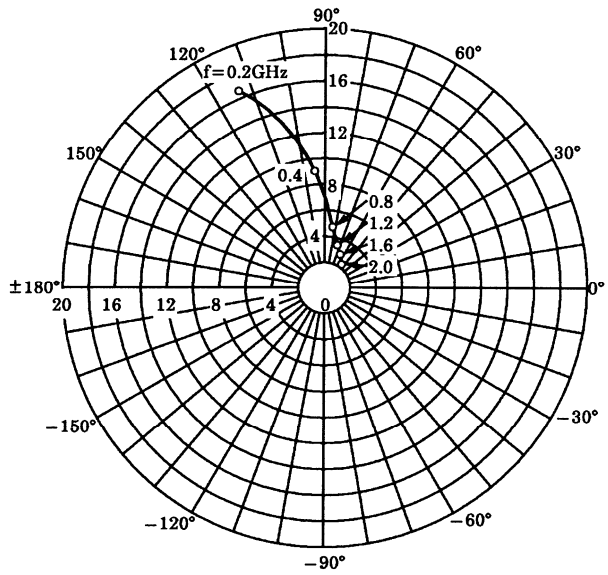
S22e
 VCE=10V
 IC=5mA
 Ta=25°C
 (UNIT : Ω)



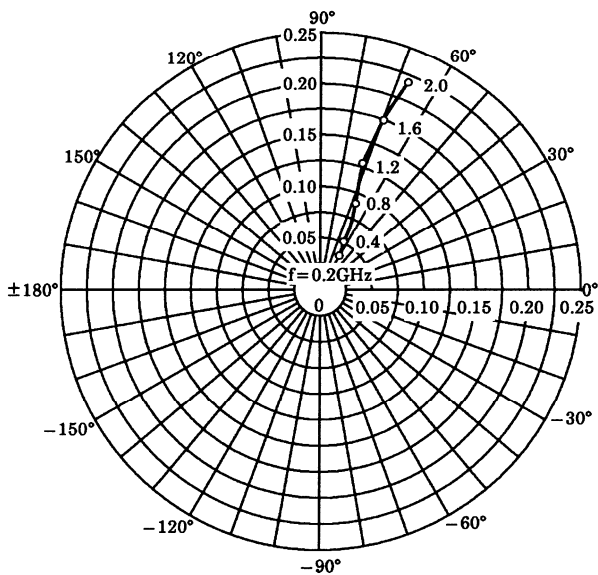
S11e
 VCE=10V
 IC=20mA
 Ta=25°C
 (UNIT : Ω)



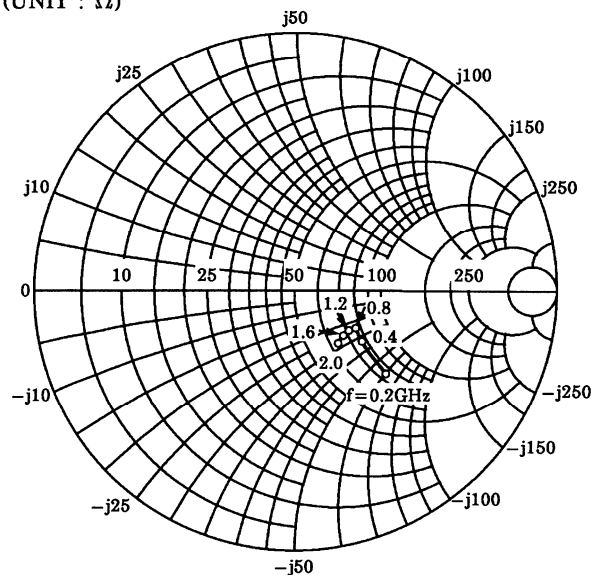
S21e
 VCE=10V
 IC=20mA
 Ta=25°C



S12e
 VCE=10V
 IC=20mA
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S22e
 VCE=10V
 IC=20mA
 Ta=25°C
 (UNIT : Ω)



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