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Renesas Technology Corp.
Customer Support Dept.
April 1, 2003

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2SC5812

Silicon NPN Epitaxial
VHF/UHF wide band amplifier

RENESAS

ADE-208-1468(Z)

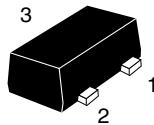
Rev.0
Nov. 2001

Features

- High power gain, Low noise figure at low power operation:
 $|S_{21}|^2 = 17 \text{ dB typ}$, $NF = 1.0 \text{ dB typ}$ ($V_{CE} = 1 \text{ V}$, $I_C = 5 \text{ mA}$, $f = 900 \text{ MHz}$)

Outline

MFPAK



1. Emitter
2. Base
3. Collector

Note: Marking is "WG-".

Absolute Maximum Ratings

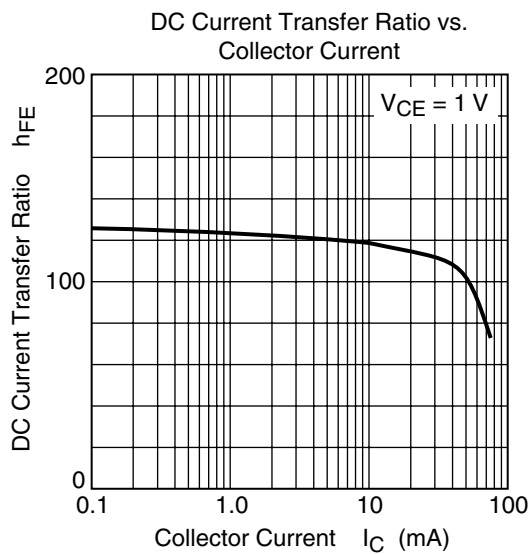
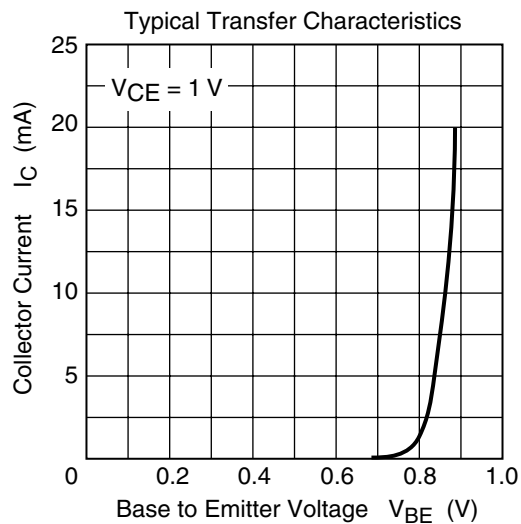
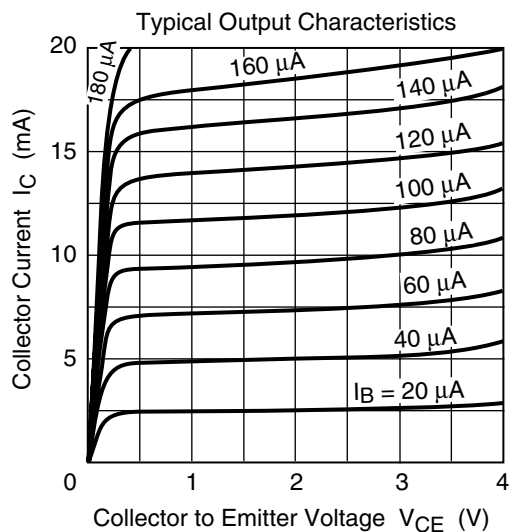
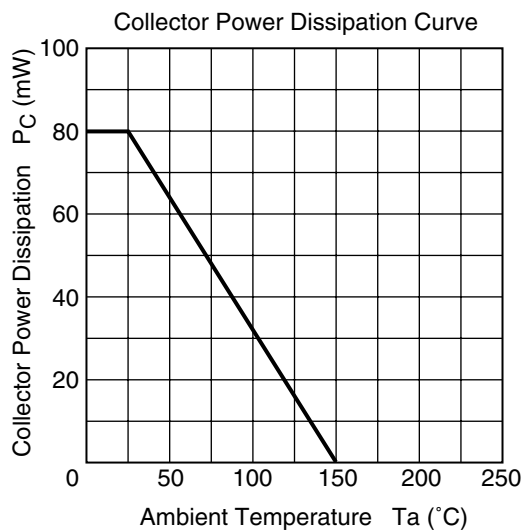
(Ta = 25°C)

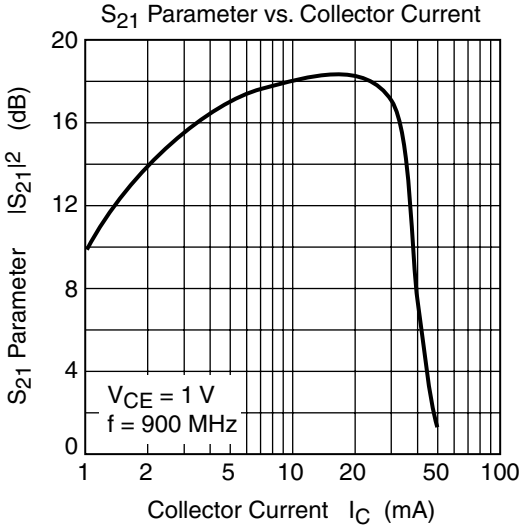
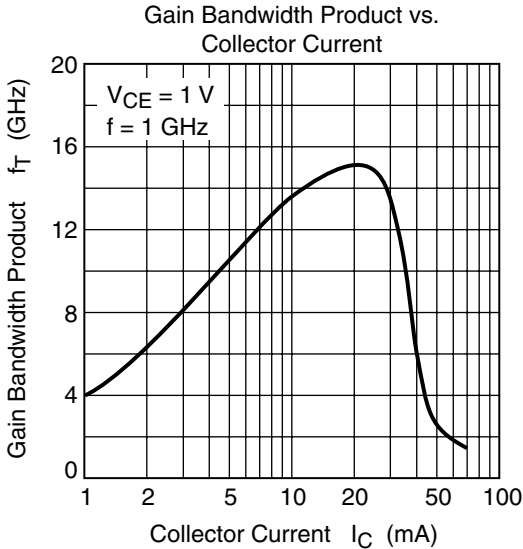
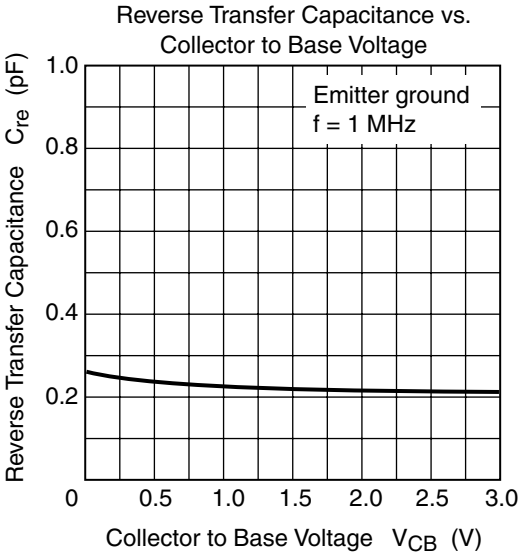
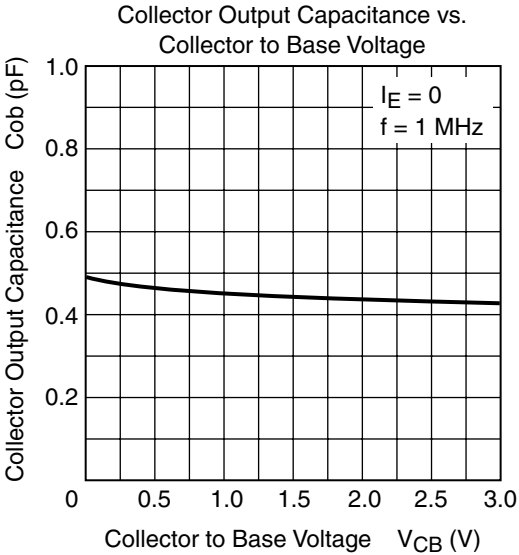
| Item | Symbol | Ratings | Unit |
|------------------------------|-----------|-------------|------|
| Collector to base voltage | V_{CBO} | 15 | V |
| Collector to emitter voltage | V_{CEO} | 4 | V |
| Emitter to base voltage | V_{EBO} | 1.5 | V |
| Collector current | I_C | 50 | mA |
| Collector power dissipation | P_C | 80 | mW |
| Junction temperature | T_j | 150 | °C |
| Storage temperature | T_{stg} | -55 to +150 | °C |

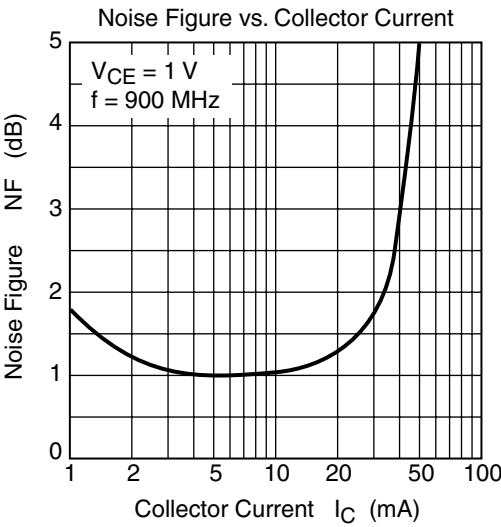
Electrical Characteristics

(Ta = 25°C)

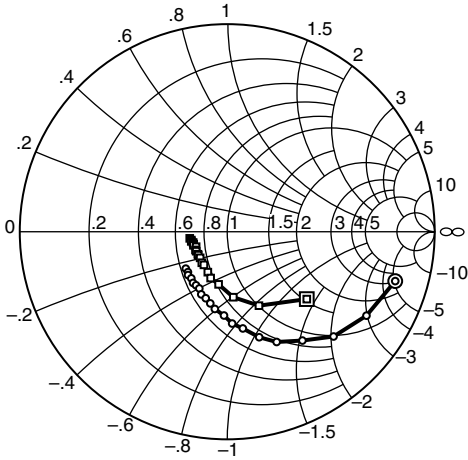
| Item | Symbol | Min | Typ | Max | Unit | Test conditions |
|-------------------------------------|---------------|-----|-----|-----|---------|---|
| Collector to base breakdown voltage | $V_{(BR)CBO}$ | 15 | — | — | V | $I_C = 10 \mu A$, $I_E = 0$ |
| Collector cutoff current | I_{CBO} | — | — | 0.1 | μA | $V_{CB} = 15 V$, $I_E = 0$ |
| Collector cutoff current | I_{CEO} | — | — | 1 | μA | $V_{CE} = 4 V$, $R_{BE} = \text{Infinite}$ |
| Emitter cutoff current | I_{EBO} | — | — | 0.1 | μA | $V_{EB} = 0.8 V$, $I_C = 0$ |
| DC current transfer ratio | h_{FE} | 100 | 120 | 150 | — | $V_{CE} = 1 V$, $I_C = 5 mA$ |
| Reverse transfer capacitance | C_{re} | — | 0.2 | — | pF | $V_{CE} = 1 V$, Emitter ground, $f = 1 MHz$ |
| Collector output capacitance | C_{ob} | — | 0.4 | 0.7 | pF | $V_{CB} = 1 V$, $I_E = 0$, $f = 1 MHz$ |
| Gain bandwidth product | $f_T(1)$ | 8 | 11 | — | GHz | $V_{CE} = 1 V$, $I_C = 5 mA$ |
| Gain bandwidth product | $f_T(2)$ | — | 15 | — | GHz | $V_{CE} = 1 V$, $I_C = 20 mA$ |
| Forward transmission coefficient | $ S_{21} ^2$ | 14 | 17 | — | dB | $V_{CE} = 1 V$, $I_C = 5 mA$, $f = 900 MHz$ |
| Noise figure | NF | — | 1.0 | 1.7 | dB | $V_{CE} = 1 V$, $I_C = 5 mA$, $f = 900 MHz$, $\Gamma_S = \Gamma_L = 50 \Omega$ |





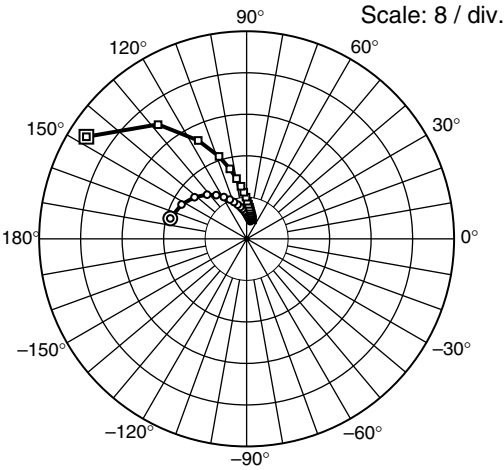


S₁₁ Parameter vs. Frequency



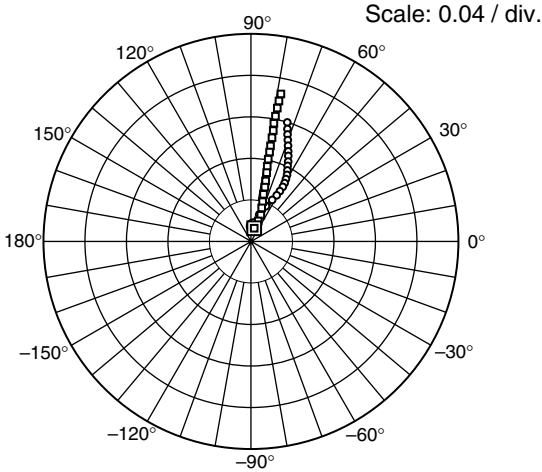
Test conditions: $V_{CE} = 1\text{ V}$, $Z_O = 50\ \Omega$
100 to 2000 MHz (100 MHz step)
⊙—○ ($I_C = 5\text{ mA}$)
⊠—□ ($I_C = 20\text{ mA}$)

S₂₁ Parameter vs. Frequency



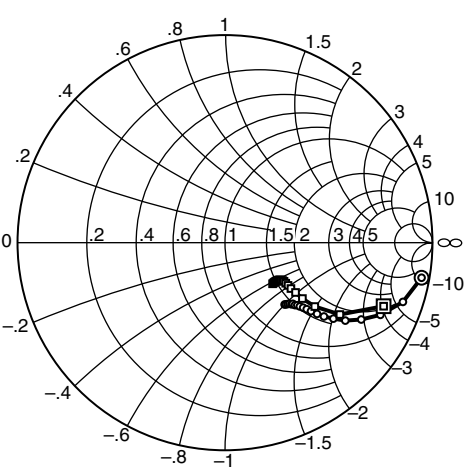
Test conditions: $V_{CE} = 1\text{ V}$, $Z_O = 50\ \Omega$
100 to 2000 MHz (100 MHz step)
⊙—○ ($I_C = 5\text{ mA}$)
⊠—□ ($I_C = 20\text{ mA}$)

S₁₂ Parameter vs. Frequency



Test conditions: $V_{CE} = 1\text{ V}$, $Z_O = 50\ \Omega$
100 to 2000 MHz (100 MHz step)
⊙—○ ($I_C = 5\text{ mA}$)
⊠—□ ($I_C = 20\text{ mA}$)

S₂₂ Parameter vs. Frequency



Test conditions: $V_{CE} = 1\text{ V}$, $Z_O = 50\ \Omega$
100 to 2000 MHz (100 MHz step)
⊙—○ ($I_C = 5\text{ mA}$)
⊠—□ ($I_C = 20\text{ mA}$)

S Parameter

(V_{CE} = 1 V, I_C = 5 mA, Z_o = 50 Ω)

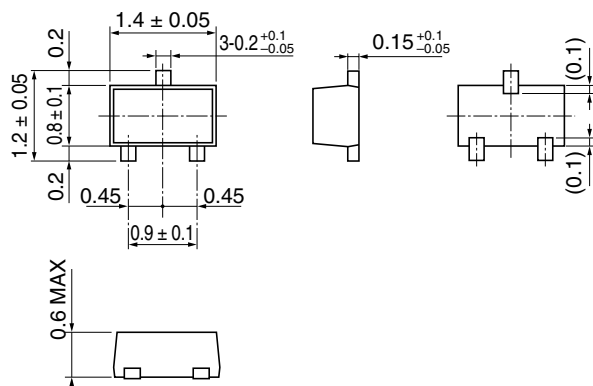
| f (MHz) | S11 | | S21 | | S12 | | S22 | |
|---------|-------|--------|-------|-------|-------|------|-------|-------|
| | MAG | ANG | MAG | ANG | MAG | ANG | MAG | ANG |
| 100 | 0.842 | -16.3 | 15.23 | 164.9 | 0.015 | 80.2 | 0.963 | -10.1 |
| 200 | 0.783 | -31.7 | 14.17 | 152.2 | 0.027 | 72.9 | 0.904 | -18.4 |
| 300 | 0.719 | -44.6 | 12.84 | 141.4 | 0.037 | 66.8 | 0.826 | -24.9 |
| 400 | 0.637 | -55.4 | 11.41 | 131.8 | 0.045 | 62.9 | 0.754 | -29.4 |
| 500 | 0.582 | -65.9 | 10.25 | 124.8 | 0.051 | 60.8 | 0.691 | -32.9 |
| 600 | 0.531 | -73.2 | 9.16 | 118.6 | 0.056 | 60.1 | 0.638 | -35.0 |
| 700 | 0.472 | -80.9 | 8.22 | 113.1 | 0.061 | 59.7 | 0.595 | -36.7 |
| 800 | 0.443 | -87.0 | 7.49 | 108.9 | 0.065 | 60.0 | 0.561 | -37.7 |
| 900 | 0.404 | -92.3 | 6.80 | 104.6 | 0.069 | 60.7 | 0.530 | -38.5 |
| 1000 | 0.377 | -99.2 | 6.26 | 101.0 | 0.073 | 61.5 | 0.508 | -39.1 |
| 1100 | 0.355 | -103.4 | 5.80 | 98.1 | 0.077 | 62.8 | 0.490 | -39.7 |
| 1200 | 0.337 | -108.0 | 5.38 | 94.8 | 0.081 | 64.1 | 0.474 | -40.4 |
| 1300 | 0.327 | -112.6 | 5.04 | 92.4 | 0.085 | 65.0 | 0.461 | -40.8 |
| 1400 | 0.305 | -116.3 | 4.71 | 90.1 | 0.090 | 66.4 | 0.452 | -41.7 |
| 1500 | 0.299 | -120.3 | 4.45 | 87.7 | 0.094 | 67.5 | 0.440 | -42.0 |
| 1600 | 0.297 | -123.8 | 4.20 | 86.0 | 0.099 | 68.5 | 0.437 | -42.8 |
| 1700 | 0.284 | -127.7 | 3.98 | 83.6 | 0.104 | 70.0 | 0.428 | -43.4 |
| 1800 | 0.282 | -132.2 | 3.80 | 81.7 | 0.109 | 71.1 | 0.423 | -44.3 |
| 1900 | 0.272 | -134.3 | 3.62 | 79.8 | 0.114 | 72.0 | 0.418 | -45.3 |
| 2000 | 0.268 | -138.4 | 3.47 | 77.9 | 0.120 | 73.0 | 0.414 | -46.0 |

($V_{CE} = 1\text{ V}$, $I_C = 20\text{ mA}$, $Z_o = 50\ \Omega$)

| f (MHz) | S11 | | S21 | | S12 | | S22 | |
|---------|-------|--------|-------|-------|-------|------|-------|-------|
| | MAG | ANG | MAG | ANG | MAG | ANG | MAG | ANG |
| 100 | 0.502 | −40.3 | 36.64 | 147.5 | 0.013 | 76.3 | 0.824 | −21.8 |
| 200 | 0.388 | −66.7 | 27.85 | 127.8 | 0.021 | 70.3 | 0.653 | −32.0 |
| 300 | 0.317 | −84.6 | 21.13 | 116.2 | 0.027 | 69.3 | 0.531 | −35.4 |
| 400 | 0.257 | −99.2 | 16.75 | 108.5 | 0.034 | 72.2 | 0.460 | −35.8 |
| 500 | 0.237 | −109.6 | 13.87 | 103.5 | 0.040 | 73.6 | 0.416 | −35.2 |
| 600 | 0.216 | −115.5 | 11.77 | 99.5 | 0.047 | 75.0 | 0.387 | −34.8 |
| 700 | 0.195 | −125.0 | 10.19 | 96.1 | 0.054 | 75.6 | 0.367 | −34.1 |
| 800 | 0.193 | −129.2 | 9.00 | 93.5 | 0.060 | 76.3 | 0.352 | −33.7 |
| 900 | 0.181 | −135.9 | 8.03 | 90.8 | 0.068 | 77.1 | 0.340 | −33.2 |
| 1000 | 0.179 | −141.0 | 7.26 | 88.8 | 0.074 | 77.7 | 0.333 | −33.3 |
| 1100 | 0.178 | −142.4 | 6.66 | 86.8 | 0.081 | 78.1 | 0.326 | −33.7 |
| 1200 | 0.176 | −147.8 | 6.12 | 84.7 | 0.088 | 78.2 | 0.321 | −34.0 |
| 1300 | 0.176 | −150.0 | 5.68 | 83.2 | 0.094 | 78.4 | 0.317 | −34.5 |
| 1400 | 0.166 | −154.2 | 5.32 | 81.7 | 0.102 | 78.5 | 0.314 | −35.1 |
| 1500 | 0.175 | −158.0 | 4.97 | 80.0 | 0.109 | 78.6 | 0.311 | −36.0 |
| 1600 | 0.172 | −159.7 | 4.70 | 78.7 | 0.116 | 79.0 | 0.309 | −36.8 |
| 1700 | 0.172 | −162.4 | 4.43 | 77.0 | 0.123 | 78.9 | 0.307 | −37.6 |
| 1800 | 0.179 | −164.9 | 4.21 | 75.7 | 0.131 | 78.8 | 0.305 | −38.6 |
| 1900 | 0.177 | −166.8 | 4.01 | 74.3 | 0.138 | 78.7 | 0.304 | −39.7 |
| 2000 | 0.183 | −169.9 | 3.83 | 72.8 | 0.145 | 78.5 | 0.303 | −40.8 |

Package Dimensions

As of July, 2001
Unit: mm



| | |
|------------------------|----------|
| Hitachi Code | MFPAK |
| JEDEC | — |
| JEITA | — |
| Mass (reference value) | 0.0016 g |

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