

Ordering number:EN5186

NPN Epitaxial Planar Silicon Transistor



2SC5276

UHF to S Band Low-Noise Amplifier, OSC Applications

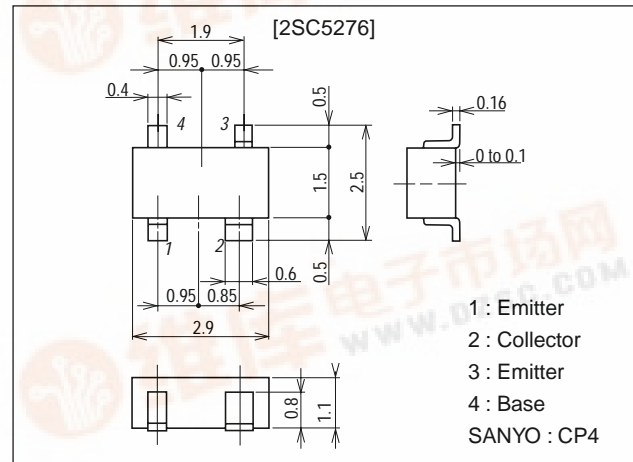
Features

- Low noise : NF=0.9dB typ (f=1GHz).
: NF=1.4dB typ (f=1.5GHz).
- High gain : $|S_{21e}|^2=11\text{dB}$ typ (f=1.5GHz).
- High cutoff frequency : $f_T=11\text{GHz}$ typ.
- Low-voltage, low-current operation ($V_{CE}=1\text{V}$, $I_C=1\text{mA}$)
: $f_T=7\text{GHz}$ type.
: $|S_{21e}|^2=6\text{dB}$ typ (f=1.5GHz).

Package Dimensions

unit:mm

2110A



Specifications

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

| Parameter | Symbol | Conditions | Ratings | Unit |
|------------------------------|-----------|------------|-------------|------------------|
| Collector-to-Base Voltage | V_{CBO} | | 20 | V |
| Collector-to-Emitter Voltage | V_{CEO} | | 10 | V |
| Emitter-to-Base Voltage | V_{EBO} | | 1.5 | V |
| Collector Current | I_C | | 30 | mA |
| Collector Dissipation | P_C | | 200 | mW |
| Junction Temperature | T_j | | 150 | $^\circ\text{C}$ |
| Storage Temperature | T_{stg} | | -55 to +150 | $^\circ\text{C}$ |

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

| Parameter | Symbol | Conditions | Ratings | | | Unit |
|------------------------------|-----------|--|---------|------|------|---------------|
| | | | min | typ | max | |
| Collector Cutoff Current | I_{CBO} | $V_{CB}=10\text{V}$, $I_E=0$ | | | 1.0 | μA |
| Emitter Cutoff Current | I_{EBO} | $V_{EB}=1\text{V}$, $I_C=0$ | | | 10 | μA |
| DC Current Gain | h_{FE} | $V_{CE}=5\text{V}$, $I_C=10\text{mA}$ | 60* | | 270* | |
| Gain-Bandwidth Product | f_{T1} | $V_{CE}=5\text{V}$, $I_C=10\text{mA}$ | 8 | 11 | | GHz |
| | f_{T2} | $V_{CE}=1\text{V}$, $I_C=1\text{mA}$ | | 7 | | GHz |
| Output Capacitance | C_{ob} | $V_{CB}=10\text{V}$, $f=1\text{MHz}$ | | 0.45 | 0.7 | pF |
| Reverse Transfer Capacitance | C_{re} | $V_{CB}=10\text{V}$, $f=1\text{MHz}$ | | 0.25 | | pF |

* : The 2SC5276 is classified by 10mA h_{FE} as follows :

| | | | | | | | | |
|----|---|-----|----|---|-----|-----|---|-----|
| 60 | 3 | 120 | 90 | 4 | 180 | 135 | 5 | 270 |
|----|---|-----|----|---|-----|-----|---|-----|

Marking : MN

h_{FE} rank : 3, 4, 5

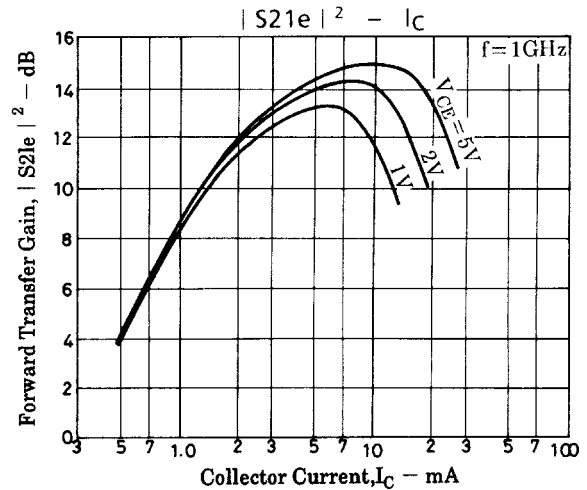
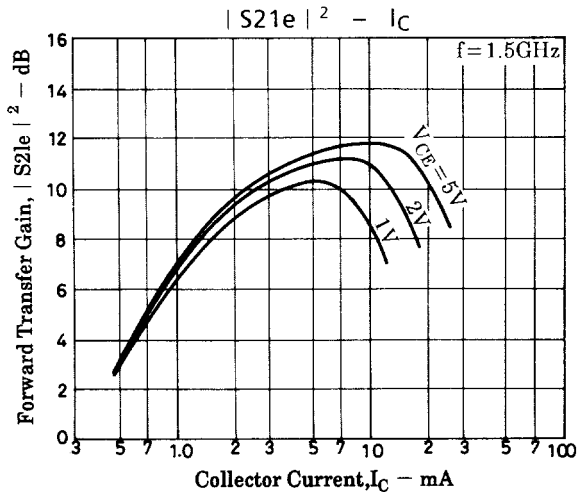
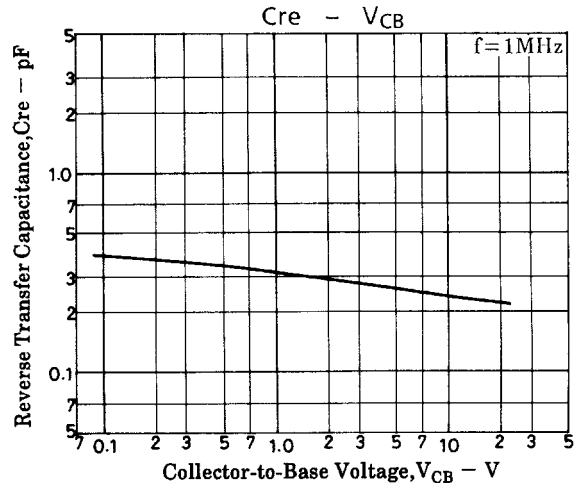
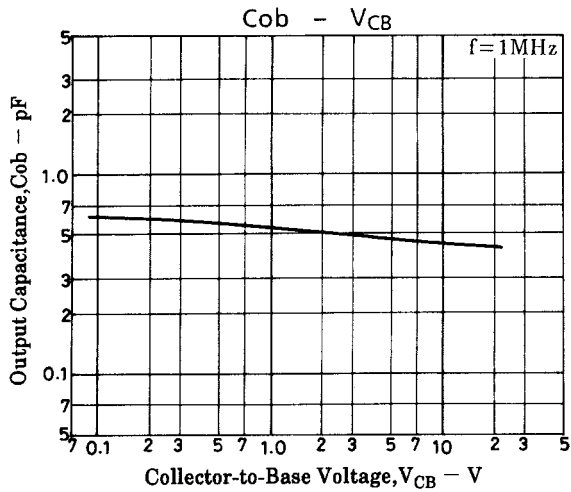
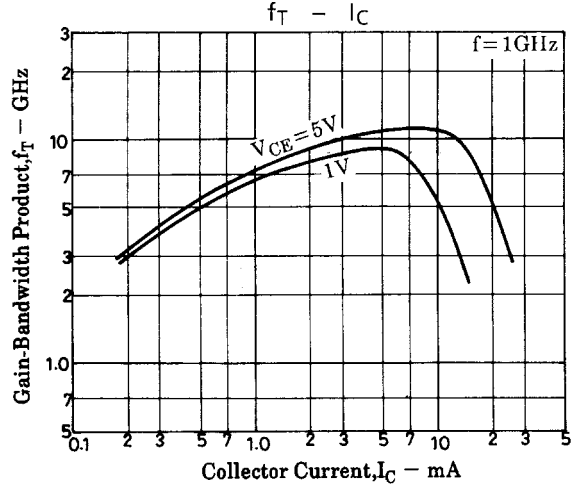
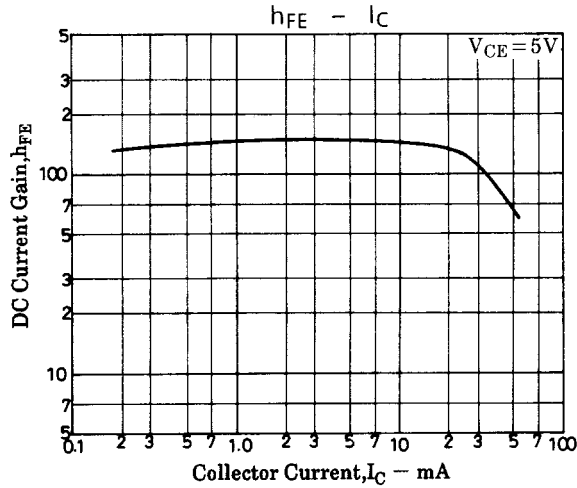
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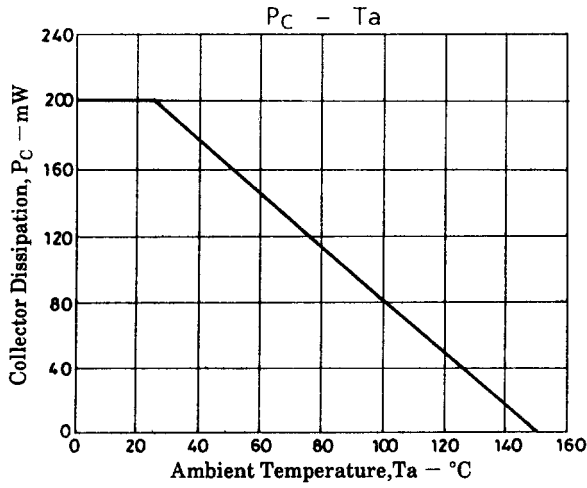
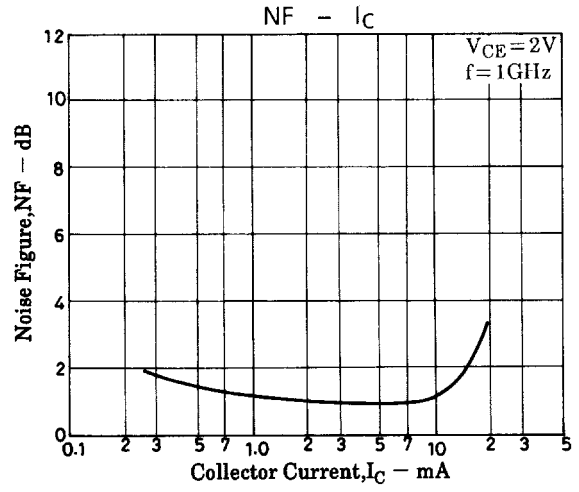
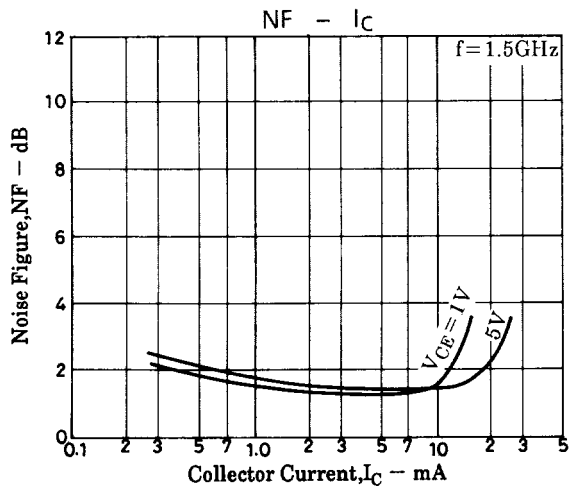
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| Parameter | Symbol | Conditions | Ratings | | | Unit |
|-----------------------|-----------------|---------------------------------|---------|-----|-----|------|
| | | | min | typ | max | |
| Forward Transfer Gain | $ S_{21e} ^2$ 1 | $V_{CE}=5V, I_C=10mA, f=1.5GHz$ | 9 | 11 | | dB |
| | $ S_{21e} ^2$ 2 | $V_{CE}=1V, I_C=1mA, f=1.5GHz$ | | 6 | | dB |
| Noise Figure | NF1 | $V_{CE}=5V, I_C=5mA, f=1.5GHz$ | | 1.4 | 3.0 | dB |
| | NF2 | $V_{CE}=2V, I_C=3mA, f=1GHz$ | | 0.9 | | dB |

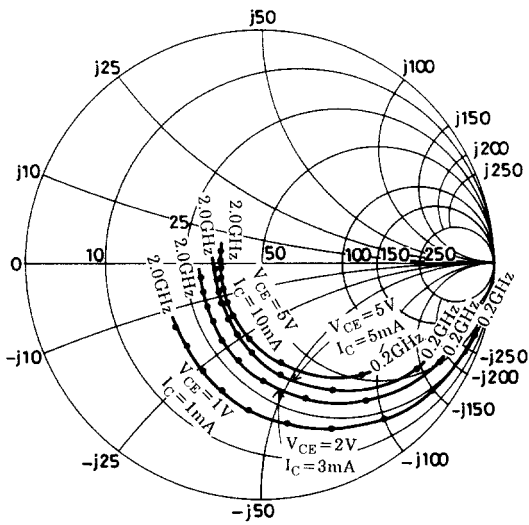


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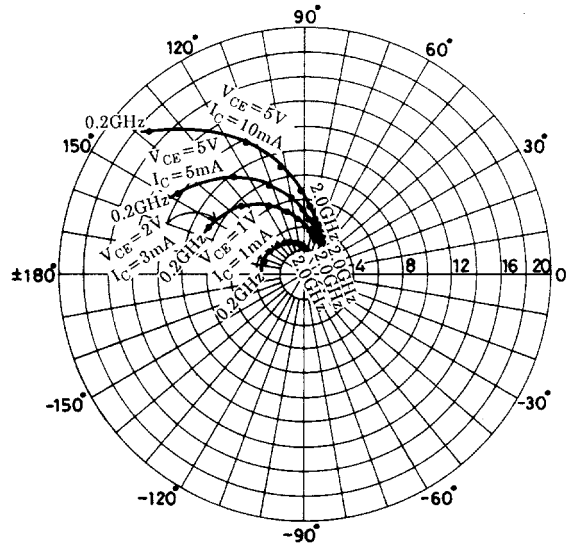


S Parameters

S11e : $f = 200$ to 2000 MHz (200MHz step)

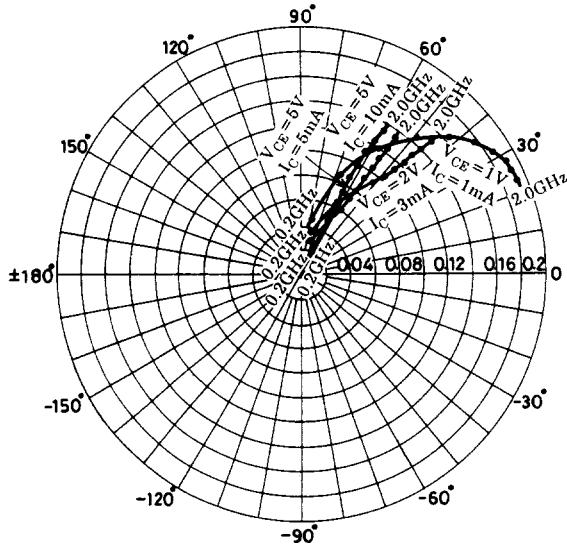


S21e : $f = 200$ to 2000 MHz (200MHz step)

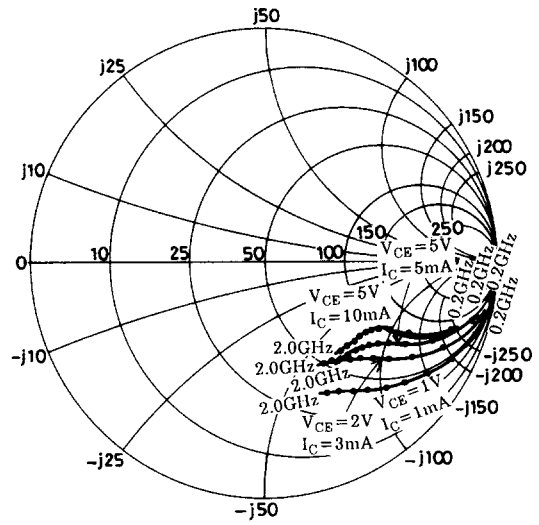


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S12e : f= 200 to 2000MHz (200MHz step)



S22e : f= 200 to 2000MHz (200MHz step)



S parameters (Common emitter)

V_{CE}=5V, I_C=5mA, Z_O=50Ω

| Freq (MHz) | S ₁₁ | ∠S ₁₁ | S ₂₁ | ∠S ₂₁ | S ₁₂ | ∠S ₁₂ | S ₂₂ | ∠S ₂₂ |
|------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|
| 200 | 0.789 | -34.0 | 12.209 | 148.5 | 0.029 | 72.3 | 0.914 | -16.3 |
| 400 | 0.610 | -60.1 | 9.707 | 125.8 | 0.048 | 62.4 | 0.785 | -25.6 |
| 600 | 0.474 | -79.5 | 7.653 | 110.7 | 0.061 | 58.2 | 0.692 | -25.6 |
| 800 | 0.372 | -95.6 | 6.212 | 99.2 | 0.072 | 56.6 | 0.632 | -33.6 |
| 1000 | 0.311 | -108.2 | 5.172 | 90.8 | 0.082 | 56.1 | 0.594 | -36.1 |
| 1200 | 0.264 | -122.2 | 4.459 | 83.0 | 0.093 | 55.9 | 0.570 | -38.6 |
| 1400 | 0.225 | -135.5 | 3.905 | 76.3 | 0.103 | 55.5 | 0.553 | -41.5 |
| 1600 | 0.204 | -147.9 | 3.464 | 70.7 | 0.113 | 55.5 | 0.539 | -44.5 |
| 1800 | 0.188 | -161.6 | 3.121 | 64.9 | 0.124 | 54.7 | 0.528 | -48.2 |
| 2000 | 0.184 | -175.1 | 2.855 | 59.7 | 0.135 | 54.2 | 0.527 | -51.6 |

V_{CE}=5V, I_C=10mA, Z_O=50Ω

| Freq (MHz) | S ₁₁ | ∠S ₁₁ | S ₂₁ | ∠S ₂₁ | S ₁₂ | ∠S ₁₂ | S ₂₂ | ∠S ₂₂ |
|------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|
| 200 | 0.629 | -47.8 | 17.118 | 137.6 | 0.025 | 69.4 | 0.839 | -20.3 |
| 400 | 0.421 | -77.9 | 11.829 | 114.0 | 0.040 | 63.6 | 0.681 | -26.7 |
| 600 | 0.316 | -98.0 | 8.649 | 101.1 | 0.052 | 62.7 | 0.605 | -28.9 |
| 800 | 0.245 | -117.5 | 6.785 | 91.2 | 0.064 | 62.8 | 0.562 | -30.7 |
| 1000 | 0.209 | -130.0 | 5.536 | 84.4 | 0.075 | 63.0 | 0.540 | -32.9 |
| 1200 | 0.183 | -147.2 | 4.719 | 77.6 | 0.088 | 62.9 | 0.528 | -35.2 |
| 1400 | 0.168 | -161.6 | 4.103 | 72.0 | 0.100 | 62.5 | 0.517 | -37.9 |
| 1600 | 0.162 | -174.0 | 3.626 | 66.7 | 0.112 | 61.9 | 0.510 | -41.4 |
| 1800 | 0.164 | 173.1 | 3.255 | 61.7 | 0.124 | 60.5 | 0.503 | -45.4 |
| 2000 | 0.170 | 160.6 | 2.962 | 56.8 | 0.135 | 59.3 | 0.502 | -49.1 |

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$V_{CE}=2V, I_C=3mA, Z_O=50\Omega$

| Freq (MHz) | $ S_{11} $ | $\angle S_{11}$ | $ S_{21} $ | $\angle S_{21}$ | $ S_{12} $ | $\angle S_{12}$ | $ S_{22} $ | $\angle S_{22}$ |
|------------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 200 | 0.860 | -28.3 | 8.645 | 154.3 | 0.036 | 73.8 | 0.943 | -15.2 |
| 400 | 0.725 | -52.2 | 7.452 | 133.4 | 0.063 | 62.5 | 0.839 | -26.1 |
| 600 | 0.598 | -71.6 | 6.200 | 117.7 | 0.081 | 55.4 | 0.744 | -33.3 |
| 800 | 0.490 | -88.6 | 5.210 | 105.1 | 0.094 | 51.1 | 0.667 | -38.4 |
| 1000 | 0.417 | -102.6 | 4.458 | 95.5 | 0.104 | 48.9 | 0.615 | -42.3 |
| 1200 | 0.358 | -116.9 | 3.901 | 86.7 | 0.114 | 47.5 | 0.579 | -45.5 |
| 1400 | 0.311 | -129.4 | 3.452 | 79.3 | 0.124 | 46.4 | 0.552 | -48.6 |
| 1600 | 0.285 | -141.5 | 3.072 | 72.8 | 0.132 | 46.3 | 0.531 | -51.9 |
| 1800 | 0.262 | -154.3 | 2.783 | 66.4 | 0.141 | 45.6 | 0.513 | -55.7 |
| 2000 | 0.252 | -167.3 | 2.551 | 60.9 | 0.150 | 44.5 | 0.505 | -59.0 |

$V_{CE}=1V, I_C=1mA, Z_O=50\Omega$

| Freq (MHz) | $ S_{11} $ | $\angle S_{11}$ | $ S_{21} $ | $\angle S_{21}$ | $ S_{12} $ | $\angle S_{12}$ | $ S_{22} $ | $\angle S_{22}$ |
|------------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 200 | 0.952 | -18.3 | 3.431 | 163.0 | 0.045 | 78.1 | 0.983 | -10.2 |
| 400 | 0.896 | -36.0 | 3.331 | 145.5 | 0.086 | 67.4 | 0.945 | -19.6 |
| 600 | 0.830 | -51.8 | 3.020 | 132.9 | 0.119 | 57.6 | 0.892 | -27.7 |
| 800 | 0.753 | -67.1 | 2.756 | 119.8 | 0.145 | 49.5 | 0.837 | -34.9 |
| 1000 | 0.681 | -80.9 | 2.543 | 108.6 | 0.163 | 42.6 | 0.782 | -41.5 |
| 1200 | 0.617 | -92.9 | 2.373 | 97.8 | 0.177 | 37.0 | 0.743 | -46.4 |
| 1400 | 0.557 | -107.1 | 2.184 | 88.4 | 0.185 | 32.1 | 0.699 | -51.5 |
| 1600 | 0.509 | -118.6 | 2.011 | 79.8 | 0.191 | 28.1 | 0.666 | -55.9 |
| 1800 | 0.461 | -132.1 | 1.888 | 71.6 | 0.191 | 25.5 | 0.640 | -60.6 |
| 2000 | 0.440 | -144.0 | 1.737 | 64.5 | 0.191 | 23.0 | 0.618 | -64.5 |

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