

**2SC5229**

## VHF to UHF Wide-Band Low-Noise Amplifier Applications

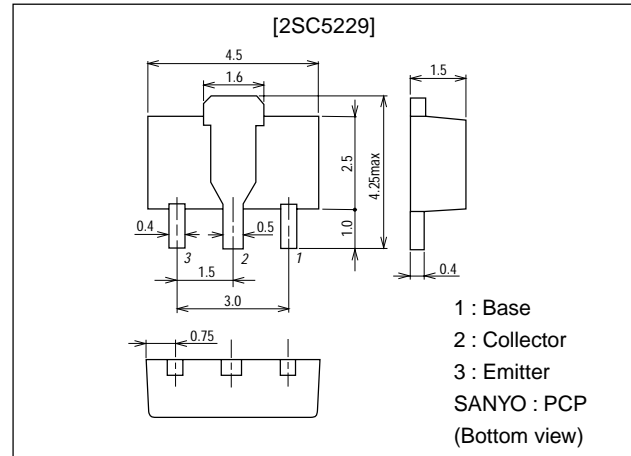
### Features

- Low noise :  $NF=1.0\text{dB}$  typ ( $f=1\text{GHz}$ ).
- High gain :  $|S_{21e}|^2=10.5\text{dB}$  typ ( $f=1\text{GHz}$ ).
- High cutoff frequency :  $f_T=6.5\text{GHz}$  typ.
- Medium power operation :  $NF=1.7\text{dB}$  typ ( $f=1\text{GHz}$ ),  
( $V_{CE}=8\text{V}$ ,  $I_C=40\text{mA}$ ) :  $|S_{21e}|^2=11\text{dB}$  typ  
( $f=1\text{GHz}$ ).

### Package Dimensions

unit:mm

2038A



### Specifications

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

| Parameter                    | Symbol    | Conditions   | Ratings     | Unit             |
|------------------------------|-----------|--|-------------|------------------|
| Collector-to-Base Voltage    | $V_{CB0}$ |  | 20          | V                |
| Collector-to-Emitter Voltage | $V_{CE0}$ |  | 10          | V                |
| Emitter-to-Base Voltage      | $V_{EB0}$ |  | 2           | V                |
| Collector Current            | $I_C$     |  | 70          | mA               |
| Collector Dissipation        | $P_C$     | Mounted on ceramic board (250mm <sup>2</sup> ×0.8mm) | 700         | 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     | $I_{CB0}$ | $V_{CB}=10\text{V}$ , $I_E=0$          |         |      | 1.0  | $\mu\text{A}$ |
| Emitter Cutoff Current       | $I_{EB0}$ | $V_{EB}=1\text{V}$ , $I_C=0$           |         |      | 10   | $\mu\text{A}$ |
| DC Current Gain              | $h_{FE}$  | $V_{CE}=5\text{V}$ , $I_C=20\text{mA}$ | 60*     |      | 270* |               |
| Gain-Bandwidth Product       | $f_T$     | $V_{CE}=5\text{V}$ , $I_C=20\text{mA}$ | 4.5     | 6.5  |      | GHz           |
| Output Capacitance           | $C_{ob}$  | $V_{CB}=10\text{V}$ , $f=1\text{MHz}$  |         | 0.85 | 1.3  | pF            |
| Reverse Transfer Capacitance | $C_{re}$  | $V_{CB}=10\text{V}$ , $f=1\text{MHz}$  |         | 0.55 |      | pF            |

\* : The 2SC5229 is classified by 20mA  $h_{FE}$  as follows :

|    |   |     |    |   |     |     |   |     |
|----|---|-----|----|---|-----|-----|---|-----|
| 60 | D | 120 | 90 | E | 180 | 135 | F | 270 |
|----|---|-----|----|---|-----|-----|---|-----|

Marking : CY

 $h_{FE}$  rank : D, E, F

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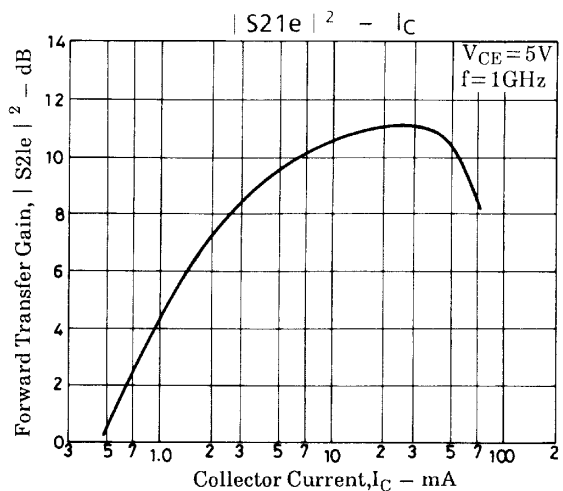
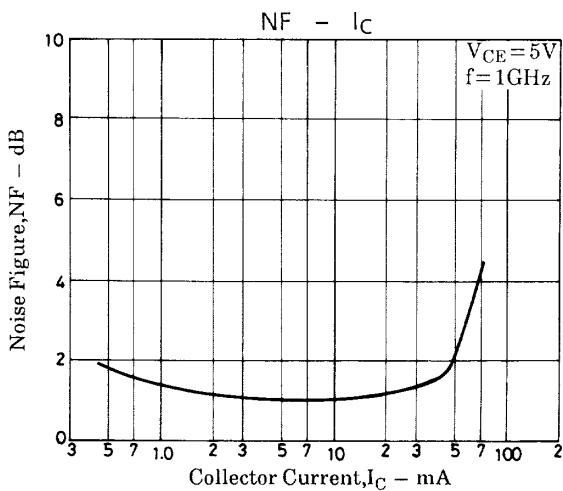
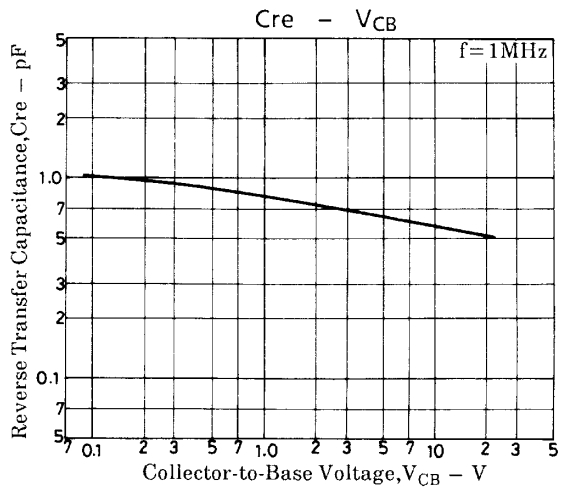
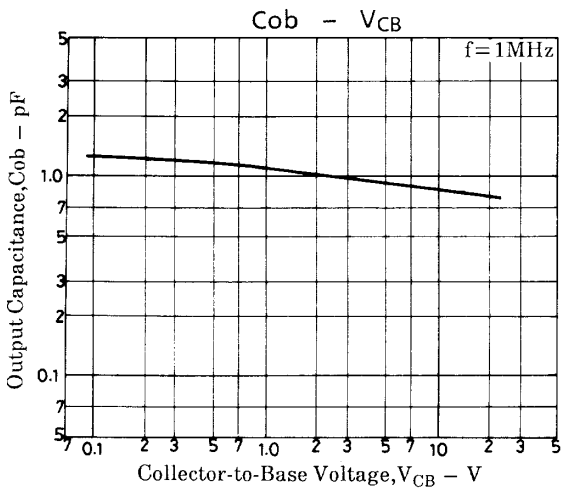
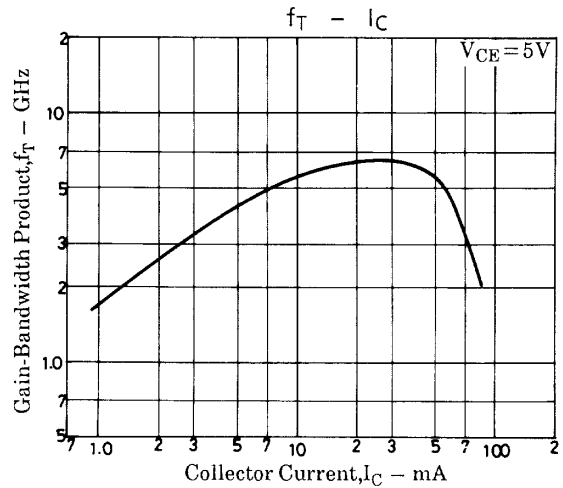
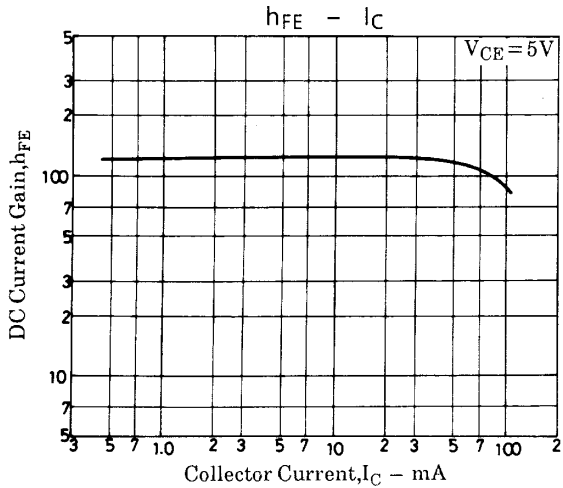
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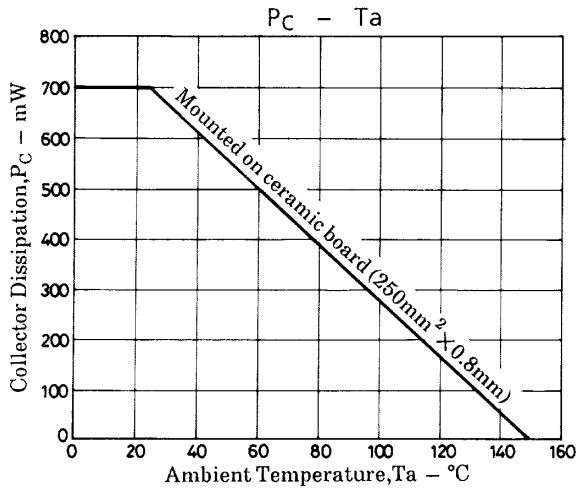
# 2SC5229

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| Parameter             | Symbol          | Conditions                    | Ratings |      |     | Unit |
|-----------------------|-----------------|-------------------------------|---------|------|-----|------|
|                       |                 |                               | min     | typ  | max |      |
| Forward Transfer Gain | $ S_{21e} ^2_1$ | $V_{CE}=5V, I_C=20mA, f=1GHz$ | 8       | 10.5 |     | dB   |
|                       | $ S_{21e} ^2_2$ | $V_{CE}=8V, I_C=40mA, f=1GHz$ |         | 11   |     | dB   |
| Noise Figure          | NF1             | $V_{CE}=5V, I_C=7mA, f=1GHz$  |         | 1.0  | 1.8 | dB   |
|                       | NF2             | $V_{CE}=8V, I_C=40mA, f=1GHz$ |         | 1.7  |     | dB   |

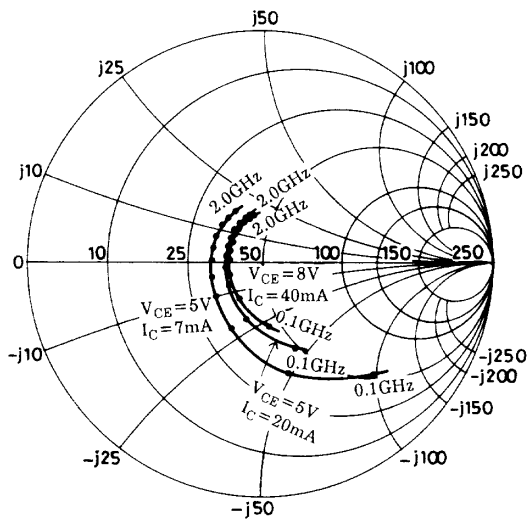


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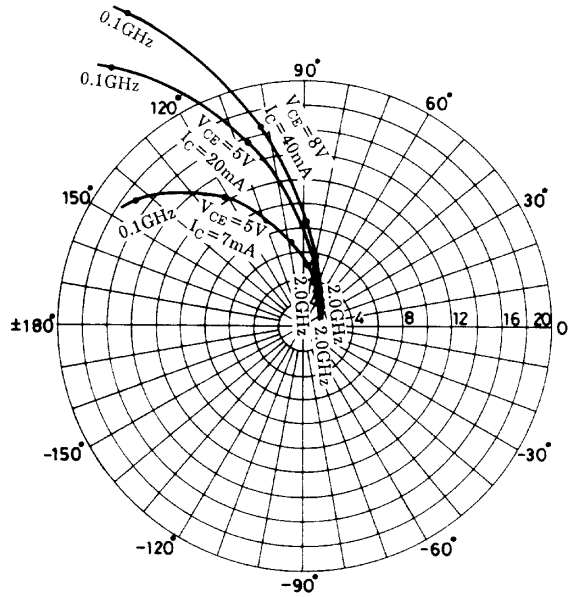


## S Parameters

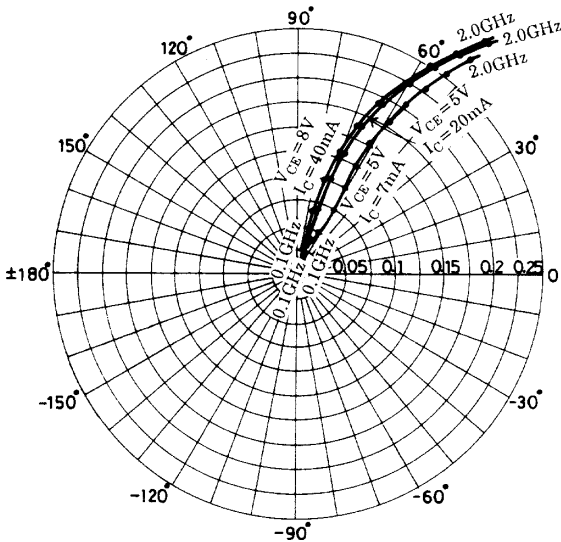
$f = 100\text{MHz}, 200 \text{ to } 2000\text{MHz} (200\text{MHz step})$



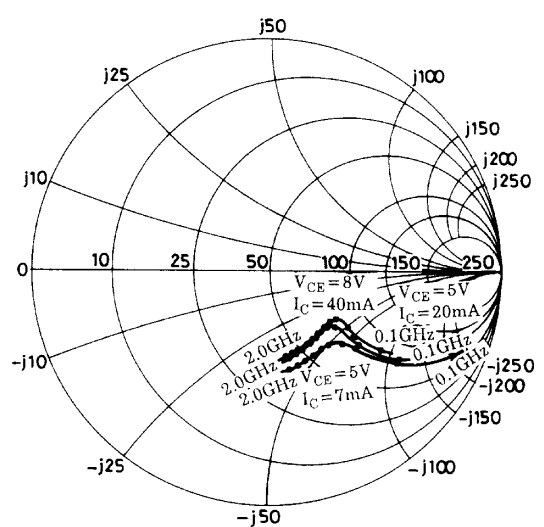
$f = 100\text{MHz}, 200 \text{ to } 2000\text{MHz} (200\text{MHz step})$



$f = 100\text{MHz}, 200 \text{ to } 2000\text{MHz} (200\text{MHz step})$



$f = 100\text{MHz}, 200 \text{ to } 2000\text{MHz} (200\text{MHz step})$



## 2SC5229

### S parameters (Common emitter)

$V_{CE}=5V, I_C=7mA, Z_O=50\Omega$

| Freq (MHz) | $ S_{11} $ | $\angle S_{11}$ | $ S_{21} $ | $\angle S_{21}$ | $ S_{12} $ | $\angle S_{12}$ | $ S_{22} $ | $\angle S_{22}$ |
|------------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 100        | 0.682      | -44.8           | 16.999     | 143.0           | 0.032      | 69.4            | 0.848      | -24.7           |
| 200        | 0.496      | -75.3           | 12.278     | 120.6           | 0.050      | 61.3            | 0.663      | -36.3           |
| 400        | 0.311      | -113.7          | 7.273      | 98.2            | 0.076      | 60.0            | 0.492      | -43.2           |
| 600        | 0.234      | -142.0          | 5.064      | 85.4            | 0.100      | 61.2            | 0.435      | -46.6           |
| 800        | 0.210      | -164.2          | 3.912      | 76.2            | 0.125      | 61.5            | 0.413      | -50.2           |
| 1000       | 0.201      | 177.1           | 3.210      | 68.5            | 0.152      | 61.1            | 0.408      | -54.1           |
| 1200       | 0.204      | 160.1           | 2.736      | 60.8            | 0.179      | 59.6            | 0.411      | -58.6           |
| 1400       | 0.213      | 146.2           | 2.388      | 53.9            | 0.205      | 57.6            | 0.416      | -63.6           |
| 1600       | 0.226      | 132.4           | 2.108      | 47.3            | 0.231      | 55.7            | 0.423      | -68.8           |
| 1800       | 0.232      | 123.1           | 1.902      | 41.7            | 0.256      | 53.6            | 0.431      | -73.3           |
| 2000       | 0.242      | 113.6           | 1.725      | 36.5            | 0.283      | 51.3            | 0.438      | -77.3           |

$V_{CE}=5V, I_C=20mA, Z_O=50\Omega$

| Freq (MHz) | $ S_{11} $ | $\angle S_{11}$ | $ S_{21} $ | $\angle S_{21}$ | $ S_{12} $ | $\angle S_{12}$ | $ S_{22} $ | $\angle S_{22}$ |
|------------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 100        | 0.399      | -68.1           | 26.168     | 127.2           | 0.024      | 69.1            | 0.663      | -35.1           |
| 200        | 0.249      | -103.2          | 15.690     | 106.6           | 0.040      | 69.4            | 0.468      | -41.0           |
| 400        | 0.163      | -144.3          | 8.404      | 90.2            | 0.071      | 71.4            | 0.362      | -42.1           |
| 600        | 0.143      | -173.4          | 5.707      | 80.5            | 0.102      | 70.5            | 0.337      | -45.2           |
| 800        | 0.144      | 166.1           | 4.343      | 73.5            | 0.133      | 68.5            | 0.330      | -49.5           |
| 1000       | 0.150      | 151.3           | 3.559      | 66.8            | 0.165      | 66.1            | 0.337      | -54.1           |
| 1200       | 0.162      | 137.3           | 3.028      | 60.2            | 0.195      | 63.0            | 0.343      | -59.4           |
| 1400       | 0.177      | 126.4           | 2.633      | 53.7            | 0.225      | 59.7            | 0.353      | -64.9           |
| 1600       | 0.191      | 115.0           | 2.326      | 48.0            | 0.252      | 56.6            | 0.360      | -70.9           |
| 1800       | 0.200      | 106.9           | 2.100      | 42.9            | 0.279      | 53.5            | 0.369      | -75.2           |
| 2000       | 0.204      | 99.8            | 1.915      | 37.9            | 0.307      | 50.6            | 0.376      | -79.3           |

$V_{CE}=8V, I_C=40mA, Z_O=50\Omega$

| Freq (MHz) | $ S_{11} $ | $\angle S_{11}$ | $ S_{21} $ | $\angle S_{21}$ | $ S_{12} $ | $\angle S_{12}$ | $ S_{22} $ | $\angle S_{22}$ |
|------------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 100        | 0.277      | -83.1           | 29.257     | 119.1           | 0.021      | 72.6            | 0.576      | -36.1           |
| 200        | 0.176      | -119.8          | 16.497     | 101.9           | 0.037      | 74.5            | 0.414      | -37.4           |
| 400        | 0.140      | -160.6          | 8.638      | 87.9            | 0.069      | 74.9            | 0.343      | -37.3           |
| 600        | 0.131      | 172.7           | 5.847      | 79.2            | 0.100      | 73.2            | 0.329      | -41.1           |
| 800        | 0.136      | 155.2           | 4.445      | 72.3            | 0.132      | 70.7            | 0.328      | -46.1           |
| 1000       | 0.144      | 140.8           | 3.627      | 66.0            | 0.164      | 67.7            | 0.335      | -51.3           |
| 1200       | 0.159      | 130.3           | 3.089      | 59.7            | 0.194      | 64.3            | 0.344      | -57.0           |
| 1400       | 0.173      | 120.1           | 2.686      | 53.5            | 0.224      | 50.9            | 0.354      | -52.7           |
| 1600       | 0.188      | 110.0           | 2.365      | 48.0            | 0.251      | 57.7            | 0.362      | -68.8           |
| 1800       | 0.188      | 101.8           | 2.134      | 42.7            | 0.278      | 54.5            | 0.372      | -73.3           |
| 2000       | 0.206      | 95.8            | 1.937      | 38.1            | 0.305      | 51.3            | 0.380      | -77.5           |

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