



EC3H07B

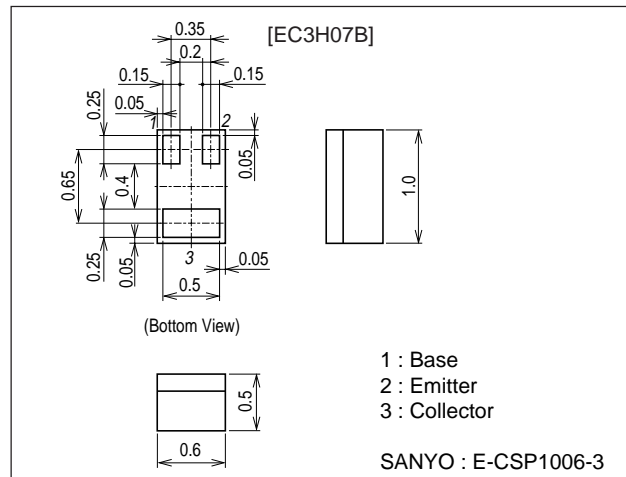
UHF to S Band Low-Noise Amplifier and OSC Applications

Features

- Low noise : NF=1.5dB typ (f=2GHz).
- High cut-off frequency : $f_T=10\text{GHz}$ typ ($V_{CE}=1\text{V}$),
: $f_T=12.5\text{GHz}$ typ ($V_{CE}=3\text{V}$).
- Low operating voltage.
- High gain : $|S_{21e}|^2=9.5\text{dB}$ typ (f=2GHz).
- Ultraminiature (1006 size) and thin (0.5mm) leadless package.

Package Dimensions

unit : mm
2183



Specifications

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

| Parameter | Symbol | Conditions | Ratings | Unit |
|------------------------------|-----------|------------|-------------|------------------|
| Collector-to- Base Voltage | V_{CBO} | | 9 | V |
| Collector-to-Emitter Voltage | V_{CEO} | | 4 | V |
| Emitter-to-Base Voltage | V_{EBO} | | 2 | V |
| Collector Current | I_C | | 30 | mA |
| Collector Dissipation | P_C | | 100 | 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} | $V_{CB}=5\text{V}, I_E=0$ | | | 1.0 | μA |
| Emitter Cutoff Current | I_{EBO} | $V_{EB}=1\text{V}, I_C=0$ | | | 10 | μA |
| DC Current Gain | h_{FE} | $V_{CE}=1\text{V}, I_C=5\text{mA}$ | 100 | | 160 | |
| Gain-Bandwidth Product | f_T1 | $V_{CE}=1\text{V}, I_C=5\text{mA}$ | 8 | 10 | | GHz |
| | f_T2 | $V_{CE}=3\text{V}, I_C=15\text{mA}$ | | 12.5 | | GHz |
| Output Capacitance | C_{ob} | $V_{CB}=1\text{V}, f=1\text{MHz}$ | | 0.55 | 0.7 | pF |
| Reverse Transfer Capacitance | C_{re} | $V_{CB}=1\text{V}, f=1\text{MHz}$ | | 0.4 | | pF |
| Forward Transfer Gain | $ S_{21e} ^{21}$ | $V_{CE}=1\text{V}, I_C=5\text{mA}, f=2\text{GHz}$ | 8 | 9.5 | | dB |
| | $ S_{21e} ^{22}$ | $V_{CE}=3\text{V}, I_C=15\text{mA}, f=2\text{GHz}$ | | 10.5 | | dB |
| Noise Figure | NF | $V_{CE}=1\text{V}, I_C=3\text{mA}, f=2\text{GHz}$ | | 1.5 | 2.3 | dB |

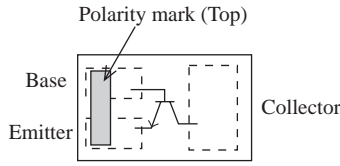
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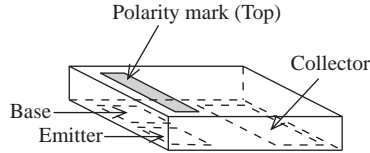
SANYO Electric Co.,Ltd. Semiconductor Company

TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

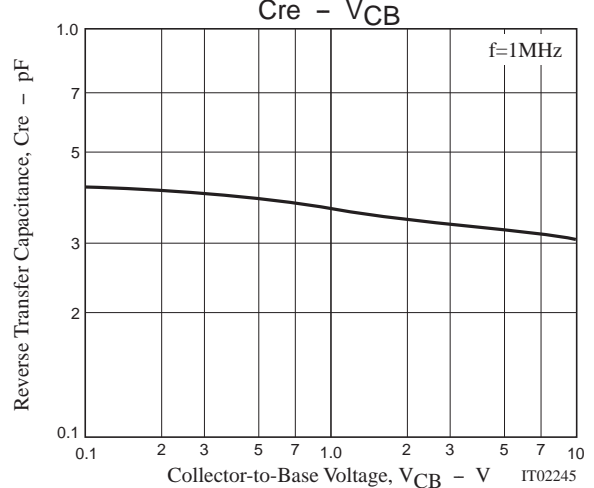
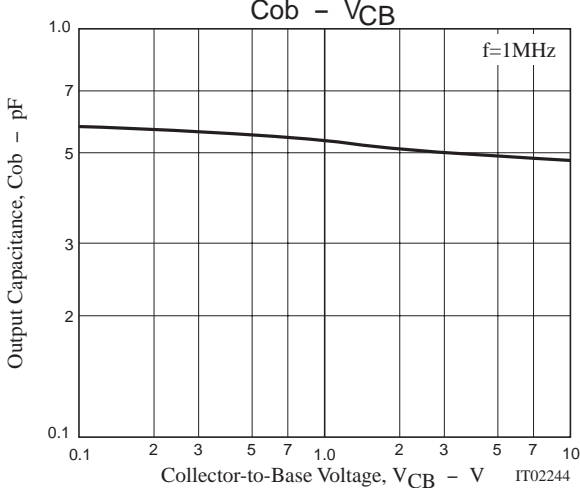
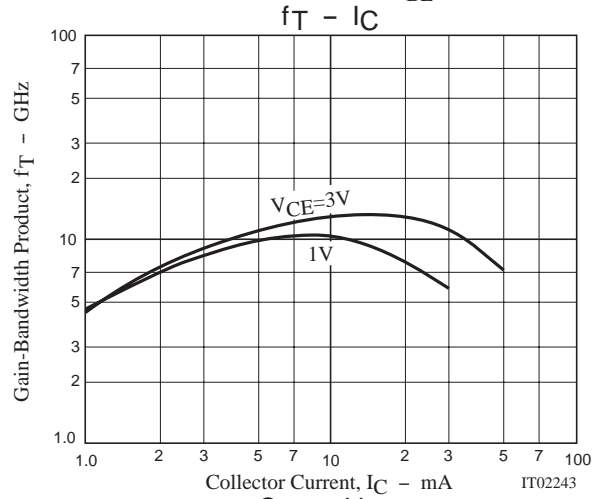
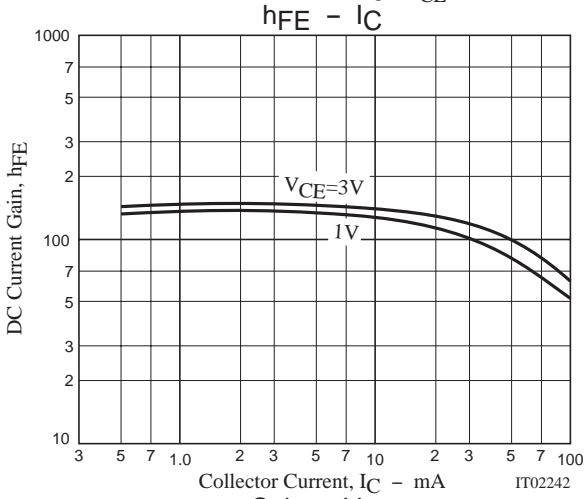
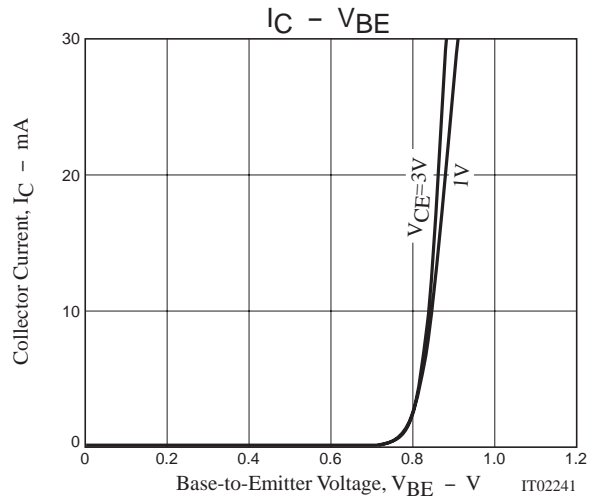
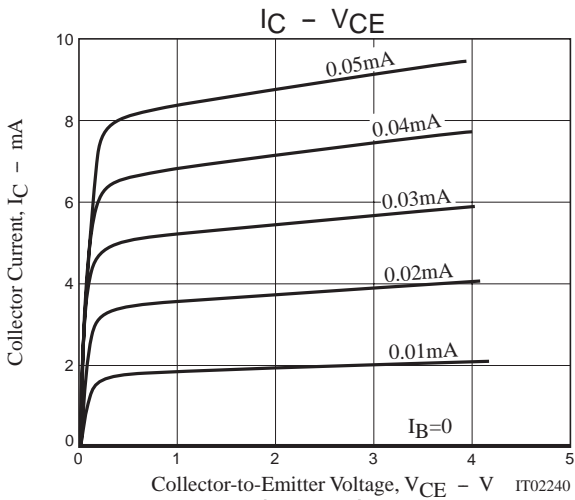
Type No. Indication (Top view) Electrical Connection (Top view)



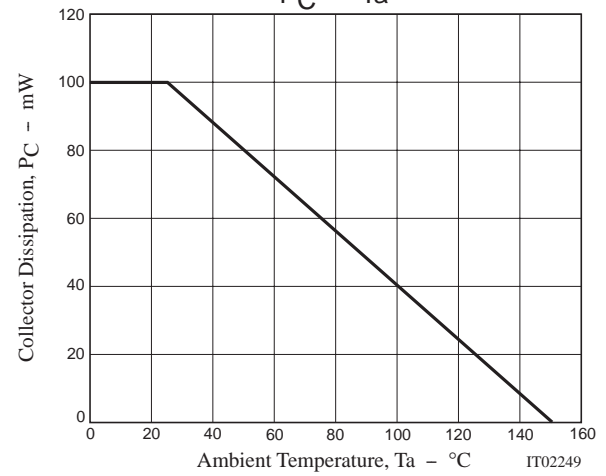
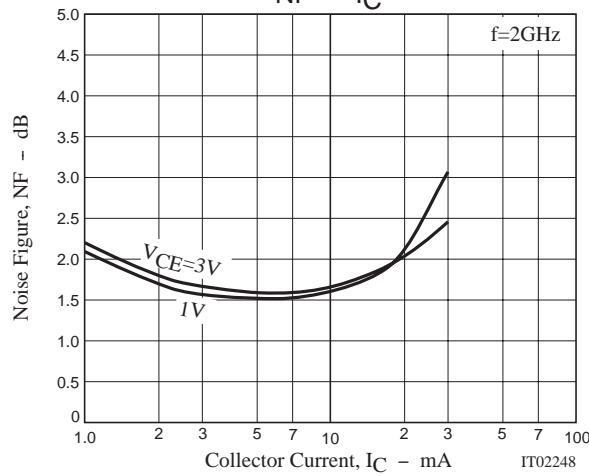
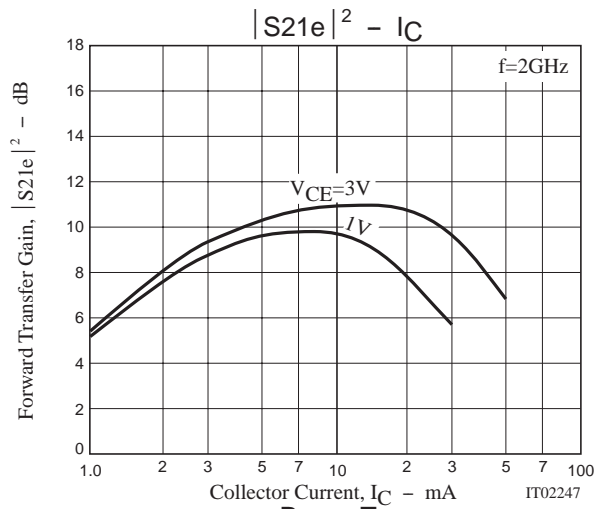
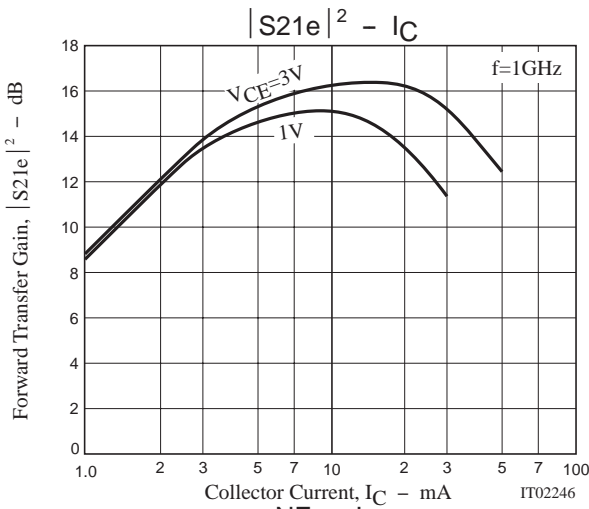
*Electrodes : on the bottom



This product adopts a high-frequency process. Please be careful when handling it because it is susceptible to static electricity.



EC3H07B



S Parameters (Common emitter)

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

| Freq(MHz) | $ S_{11} $ | $\angle S_{11}$ | $ S_{21} $ | $\angle S_{21}$ | $ S_{12} $ | $\angle S_{12}$ | $ S_{22} $ | $\angle S_{22}$ |
|-----------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 200 | 0.970 | -13.4 | 3.174 | 166.3 | 0.046 | 79.8 | 0.981 | -10.3 |
| 400 | 0.939 | -26.1 | 3.115 | 153.6 | 0.087 | 70.3 | 0.948 | -19.9 |
| 600 | 0.892 | -38.6 | 2.986 | 141.5 | 0.122 | 61.2 | 0.899 | -28.4 |
| 800 | 0.839 | -50.0 | 2.803 | 130.5 | 0.149 | 54.2 | 0.849 | -36.1 |
| 1000 | 0.791 | -59.7 | 2.596 | 121.8 | 0.171 | 48.5 | 0.798 | -42.4 |
| 1200 | 0.739 | -69.5 | 2.426 | 112.0 | 0.185 | 43.3 | 0.757 | -48.6 |
| 1400 | 0.686 | -77.7 | 2.210 | 104.5 | 0.195 | 39.7 | 0.708 | -54.0 |
| 1600 | 0.649 | -85.1 | 2.077 | 97.8 | 0.204 | 36.1 | 0.680 | -58.0 |
| 1800 | 0.623 | -91.6 | 1.987 | 90.9 | 0.210 | 33.3 | 0.651 | -61.7 |
| 2000 | 0.595 | -97.8 | 1.871 | 84.8 | 0.212 | 31.3 | 0.632 | -65.1 |
| 2200 | 0.568 | -104.1 | 1.768 | 78.9 | 0.213 | 30.0 | 0.617 | -68.2 |
| 2400 | 0.542 | -109.7 | 1.682 | 73.4 | 0.217 | 28.8 | 0.611 | -72.5 |
| 2600 | 0.523 | -114.6 | 1.593 | 68.4 | 0.212 | 27.9 | 0.579 | -75.1 |
| 2800 | 0.505 | -119.6 | 1.541 | 64.1 | 0.209 | 29.2 | 0.570 | -75.8 |
| 3000 | 0.489 | -124.1 | 1.468 | 60.2 | 0.216 | 31.2 | 0.604 | -75.7 |

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$V_{CE}=1V, I_C=5mA, Z_O=50\Omega$

| Freq(MHz) | S ₁₁ | ∠S ₁₁ | S ₂₁ | ∠S ₂₁ | S ₁₂ | ∠S ₁₂ | S ₂₂ | ∠S ₂₂ |
|-----------|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|
| 200 | 0.859 | -31.5 | 11.298 | 153.4 | 0.042 | 70.7 | 0.901 | -22.4 |
| 400 | 0.740 | -55.7 | 9.494 | 133.0 | 0.072 | 59.4 | 0.763 | -38.4 |
| 600 | 0.619 | -76.3 | 7.753 | 118.3 | 0.088 | 52.9 | 0.631 | -49.6 |
| 800 | 0.546 | -90.6 | 6.351 | 108.4 | 0.099 | 49.4 | 0.548 | -56.1 |
| 1000 | 0.480 | -104.5 | 5.414 | 100.0 | 0.108 | 48.0 | 0.471 | -61.0 |
| 1200 | 0.443 | -113.5 | 4.629 | 94.2 | 0.116 | 48.2 | 0.422 | -64.5 |
| 1400 | 0.418 | -121.2 | 4.063 | 88.7 | 0.124 | 48.6 | 0.399 | -67.9 |
| 1600 | 0.393 | -127.4 | 3.615 | 83.7 | 0.130 | 49.3 | 0.372 | -70.3 |
| 1800 | 0.382 | -132.4 | 3.292 | 79.3 | 0.140 | 49.9 | 0.356 | -72.1 |
| 2000 | 0.372 | -138.0 | 3.003 | 75.1 | 0.147 | 51.6 | 0.343 | -74.1 |
| 2200 | 0.360 | -143.3 | 2.764 | 71.2 | 0.157 | 51.9 | 0.333 | -76.7 |
| 2400 | 0.352 | -148.2 | 2.567 | 67.3 | 0.166 | 51.9 | 0.338 | -79.6 |
| 2600 | 0.349 | -152.4 | 2.408 | 63.9 | 0.173 | 52.6 | 0.310 | -81.9 |
| 2800 | 0.348 | -155.5 | 2.272 | 60.5 | 0.183 | 53.8 | 0.301 | -83.5 |
| 3000 | 0.348 | -158.1 | 2.154 | 57.7 | 0.194 | 53.9 | 0.293 | -85.3 |

$V_{CE}=1V, I_C=10mA, Z_O=50\Omega$

| Freq(MHz) | S ₁₁ | ∠S ₁₁ | S ₂₁ | ∠S ₂₁ | S ₁₂ | ∠S ₁₂ | S ₂₂ | ∠S ₂₂ |
|-----------|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|
| 200 | 0.747 | -46.5 | 15.679 | 144.0 | 0.039 | 66.9 | 0.807 | -30.4 |
| 400 | 0.588 | -77.7 | 11.464 | 122.1 | 0.059 | 55.5 | 0.614 | -46.8 |
| 600 | 0.490 | -98.9 | 8.634 | 108.9 | 0.072 | 51.8 | 0.485 | -55.5 |
| 800 | 0.438 | -114.0 | 6.882 | 99.9 | 0.082 | 52.0 | 0.410 | -60.2 |
| 1000 | 0.404 | -125.0 | 5.688 | 93.3 | 0.091 | 53.3 | 0.362 | -62.9 |
| 1200 | 0.384 | -133.1 | 4.844 | 87.9 | 0.100 | 55.0 | 0.330 | -64.4 |
| 1400 | 0.371 | -139.6 | 4.207 | 83.1 | 0.111 | 56.1 | 0.312 | -67.3 |
| 1600 | 0.357 | -145.5 | 3.734 | 78.6 | 0.121 | 56.4 | 0.299 | -69.3 |
| 1800 | 0.350 | -150.9 | 3.354 | 74.9 | 0.132 | 57.6 | 0.287 | -70.4 |
| 2000 | 0.348 | -155.0 | 3.069 | 71.0 | 0.141 | 58.8 | 0.280 | -72.5 |
| 2200 | 0.344 | -158.7 | 2.818 | 67.7 | 0.152 | 59.4 | 0.275 | -75.6 |
| 2400 | 0.342 | -163.1 | 2.615 | 64.0 | 0.165 | 58.9 | 0.280 | -78.4 |
| 2600 | 0.341 | -165.4 | 2.435 | 60.8 | 0.175 | 60.2 | 0.262 | -79.9 |
| 2800 | 0.341 | -168.4 | 2.287 | 57.9 | 0.187 | 60.5 | 0.257 | -81.5 |
| 3000 | 0.349 | -171.5 | 2.181 | 55.4 | 0.200 | 59.5 | 0.255 | -83.7 |

$V_{CE}=1V, I_C=20mA, Z_O=50\Omega$

| Freq(MHz) | S ₁₁ | ∠S ₁₁ | S ₂₁ | ∠S ₂₁ | S ₁₂ | ∠S ₁₂ | S ₂₂ | ∠S ₂₂ |
|-----------|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|
| 200 | 0.598 | -71.6 | 16.506 | 131.7 | 0.036 | 57.2 | 0.648 | -37.6 |
| 400 | 0.476 | -108.0 | 10.451 | 110.5 | 0.050 | 52.1 | 0.448 | -50.7 |
| 600 | 0.429 | -128.1 | 7.427 | 99.3 | 0.061 | 54.2 | 0.353 | -55.1 |
| 800 | 0.410 | -141.1 | 5.736 | 91.8 | 0.071 | 56.7 | 0.307 | -57.5 |
| 1000 | 0.398 | -149.3 | 4.699 | 85.9 | 0.080 | 58.4 | 0.282 | -59.0 |
| 1200 | 0.393 | -155.7 | 3.949 | 81.0 | 0.092 | 60.5 | 0.268 | -60.1 |
| 1400 | 0.388 | -160.9 | 3.420 | 76.7 | 0.104 | 61.9 | 0.265 | -63.5 |
| 1600 | 0.383 | -165.3 | 3.042 | 72.4 | 0.116 | 62.8 | 0.261 | -65.4 |
| 1800 | 0.382 | -169.0 | 2.726 | 68.7 | 0.126 | 63.5 | 0.261 | -67.7 |
| 2000 | 0.382 | -172.0 | 2.491 | 65.1 | 0.139 | 64.4 | 0.259 | -70.2 |
| 2200 | 0.382 | -175.0 | 2.294 | 61.9 | 0.152 | 65.1 | 0.258 | -74.0 |
| 2400 | 0.381 | -177.9 | 2.131 | 58.4 | 0.166 | 64.7 | 0.268 | -77.5 |
| 2600 | 0.383 | 179.9 | 2.003 | 55.4 | 0.175 | 64.6 | 0.254 | -80.2 |
| 2800 | 0.386 | 177.0 | 1.859 | 52.4 | 0.191 | 65.0 | 0.253 | -82.3 |
| 3000 | 0.390 | 175.0 | 1.765 | 49.6 | 0.205 | 64.2 | 0.252 | -85.1 |

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$V_{CE}=3V, I_C=1mA, Z_O=50\Omega$

| Freq(MHz) | S ₁₁ | ∠S ₁₁ | S ₂₁ | ∠S ₂₁ | S ₁₂ | ∠S ₁₂ | S ₂₂ | ∠S ₂₂ |
|-----------|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|
| 200 | 0.973 | -12.2 | 3.240 | 167.1 | 0.040 | 80.6 | 0.984 | -9.2 |
| 400 | 0.946 | -24.1 | 3.185 | 155.4 | 0.077 | 72.0 | 0.957 | -17.9 |
| 600 | 0.901 | -35.8 | 3.049 | 144.0 | 0.108 | 63.2 | 0.915 | -25.8 |
| 800 | 0.850 | -46.4 | 2.870 | 134.1 | 0.133 | 56.5 | 0.871 | -33.0 |
| 1000 | 0.813 | -55.6 | 2.679 | 124.0 | 0.155 | 51.3 | 0.825 | -39.1 |
| 1200 | 0.753 | -64.9 | 2.493 | 116.4 | 0.167 | 46.1 | 0.784 | -44.9 |
| 1400 | 0.713 | -72.1 | 2.332 | 108.5 | 0.178 | 42.5 | 0.740 | -49.7 |
| 1600 | 0.678 | -79.4 | 2.215 | 100.4 | 0.188 | 39.1 | 0.713 | -53.8 |
| 1800 | 0.643 | -86.8 | 2.042 | 93.6 | 0.191 | 36.2 | 0.689 | -57.5 |
| 2000 | 0.609 | -92.9 | 1.916 | 87.7 | 0.195 | 34.4 | 0.670 | -60.9 |
| 2200 | 0.581 | -98.9 | 1.811 | 81.8 | 0.196 | 33.1 | 0.653 | -64.1 |
| 2400 | 0.552 | -104.5 | 1.726 | 76.4 | 0.200 | 32.3 | 0.646 | -68.2 |
| 2600 | 0.530 | -109.0 | 1.632 | 71.6 | 0.195 | 31.3 | 0.611 | -70.8 |
| 2800 | 0.510 | -113.8 | 1.552 | 67.4 | 0.194 | 33.0 | 0.601 | -71.5 |
| 3000 | 0.493 | -118.3 | 1.505 | 63.6 | 0.200 | 35.3 | 0.635 | -71.4 |

$V_{CE}=3V, I_C=5mA, Z_O=50\Omega$

| Freq(MHz) | S ₁₁ | ∠S ₁₁ | S ₂₁ | ∠S ₂₁ | S ₁₂ | ∠S ₁₂ | S ₂₂ | ∠S ₂₂ |
|-----------|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|
| 200 | 0.876 | -27.6 | 11.400 | 155.7 | 0.036 | 73.0 | 0.919 | -19.4 |
| 400 | 0.756 | -50.7 | 9.463 | 137.5 | 0.065 | 61.9 | 0.788 | -34.8 |
| 600 | 0.634 | -70.0 | 8.035 | 122.7 | 0.081 | 55.4 | 0.673 | -44.7 |
| 800 | 0.555 | -83.7 | 6.684 | 112.7 | 0.093 | 51.2 | 0.588 | -50.8 |
| 1000 | 0.490 | -95.2 | 5.807 | 103.8 | 0.101 | 50.0 | 0.515 | -55.3 |
| 1200 | 0.450 | -103.5 | 5.045 | 97.1 | 0.107 | 50.0 | 0.477 | -58.1 |
| 1400 | 0.421 | -111.2 | 4.444 | 91.5 | 0.116 | 50.3 | 0.442 | -61.5 |
| 1600 | 0.392 | -117.2 | 3.968 | 86.3 | 0.123 | 51.4 | 0.413 | -63.7 |
| 1800 | 0.376 | -123.2 | 3.601 | 82.0 | 0.131 | 52.0 | 0.393 | -65.4 |
| 2000 | 0.359 | -128.9 | 3.300 | 77.8 | 0.138 | 53.2 | 0.377 | -67.3 |
| 2200 | 0.345 | -133.9 | 3.026 | 74.3 | 0.149 | 53.9 | 0.360 | -69.6 |
| 2400 | 0.336 | -138.9 | 2.798 | 70.4 | 0.157 | 54.0 | 0.361 | -72.2 |
| 2600 | 0.333 | -142.0 | 2.636 | 66.9 | 0.164 | 54.2 | 0.335 | -73.9 |
| 2800 | 0.329 | -145.8 | 2.477 | 63.6 | 0.174 | 55.5 | 0.331 | -74.9 |
| 3000 | 0.333 | -148.6 | 2.369 | 60.7 | 0.184 | 55.7 | 0.327 | -77.1 |

$V_{CE}=3V, I_C=10mA, Z_O=50\Omega$

| Freq(MHz) | S ₁₁ | ∠S ₁₁ | S ₂₁ | ∠S ₂₁ | S ₁₂ | ∠S ₁₂ | S ₂₂ | ∠S ₂₂ |
|-----------|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|
| 200 | 0.782 | -38.7 | 16.264 | 148.0 | 0.034 | 68.7 | 0.853 | -25.8 |
| 400 | 0.618 | -67.3 | 12.556 | 126.5 | 0.055 | 58.7 | 0.671 | -41.8 |
| 600 | 0.512 | -86.2 | 9.670 | 113.1 | 0.067 | 55.8 | 0.544 | -49.9 |
| 800 | 0.444 | -101.0 | 7.790 | 103.6 | 0.077 | 54.5 | 0.462 | -54.7 |
| 1000 | 0.398 | -112.0 | 6.474 | 96.8 | 0.086 | 55.1 | 0.408 | -57.2 |
| 1200 | 0.372 | -120.3 | 5.540 | 91.1 | 0.096 | 56.5 | 0.373 | -59.0 |
| 1400 | 0.352 | -127.6 | 4.824 | 86.4 | 0.105 | 57.9 | 0.351 | -61.1 |
| 1600 | 0.333 | -133.0 | 4.287 | 82.0 | 0.115 | 58.3 | 0.334 | -62.8 |
| 1800 | 0.323 | -139.0 | 3.864 | 78.3 | 0.122 | 59.6 | 0.320 | -63.9 |
| 2000 | 0.318 | -143.6 | 3.524 | 74.6 | 0.135 | 60.3 | 0.311 | -65.0 |
| 2200 | 0.311 | -147.8 | 3.233 | 71.3 | 0.144 | 60.7 | 0.302 | -67.6 |
| 2400 | 0.306 | -152.1 | 3.008 | 67.7 | 0.155 | 60.3 | 0.306 | -70.4 |
| 2600 | 0.303 | -154.0 | 2.801 | 64.6 | 0.165 | 61.1 | 0.286 | -71.5 |
| 2800 | 0.305 | -158.4 | 2.623 | 61.6 | 0.175 | 62.0 | 0.281 | -72.2 |
| 3000 | 0.308 | -161.8 | 2.503 | 59.1 | 0.188 | 61.5 | 0.275 | -73.7 |

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$V_{CE}=3V, I_C=20mA, Z_O=50\Omega$

| Freq(MHz) | $ S_{11} $ | $\angle S_{11}$ | $ S_{21} $ | $\angle S_{21}$ | $ S_{12} $ | $\angle S_{12}$ | $ S_{22} $ | $\angle S_{22}$ |
|-----------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 200 | 0.598 | -71.6 | 16.506 | 131.7 | 0.036 | 57.2 | 0.648 | -37.6 |
| 400 | 0.476 | -108.0 | 10.451 | 110.5 | 0.050 | 52.1 | 0.448 | -50.7 |
| 600 | 0.429 | -128.1 | 7.427 | 99.3 | 0.061 | 54.2 | 0.353 | -55.1 |
| 800 | 0.410 | -141.1 | 5.736 | 91.8 | 0.071 | 56.7 | 0.307 | -57.5 |
| 1000 | 0.398 | -149.3 | 4.699 | 85.9 | 0.080 | 58.4 | 0.282 | -59.0 |
| 1200 | 0.393 | -155.7 | 3.949 | 81.0 | 0.092 | 60.5 | 0.268 | -60.1 |
| 1400 | 0.388 | -160.9 | 3.420 | 76.7 | 0.104 | 61.9 | 0.265 | -63.5 |
| 1600 | 0.383 | -165.3 | 3.042 | 72.4 | 0.116 | 62.8 | 0.261 | -65.4 |
| 1800 | 0.382 | -169.0 | 2.726 | 68.7 | 0.126 | 63.5 | 0.261 | -67.7 |
| 2000 | 0.382 | -172.0 | 2.491 | 65.1 | 0.139 | 64.4 | 0.259 | -70.2 |
| 2200 | 0.382 | -175.0 | 2.294 | 61.9 | 0.152 | 65.1 | 0.258 | -74.0 |
| 2400 | 0.381 | -177.9 | 2.131 | 58.4 | 0.166 | 64.7 | 0.268 | -77.5 |
| 2600 | 0.383 | 179.9 | 2.003 | 55.4 | 0.175 | 64.6 | 0.254 | -80.2 |
| 2800 | 0.386 | 177.0 | 1.859 | 52.4 | 0.191 | 65.0 | 0.253 | -82.3 |
| 3000 | 0.390 | 175.0 | 1.765 | 49.6 | 0.205 | 64.2 | 0.252 | -85.1 |

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