

## UHF/VHF OSCILLATOR AND VHF MIXER

## NPN SILICON EPITAXIAL TRANSISTOR

## SUPER MINI MOLD

### DESCRIPTION

The 2SC4182 is designed for use as an oscillator or a mixer in a VHF TV tuners. Super mini mold package makes it suitable for use in small type equipments especially recommended for Hibrid Integrated Circuits and other applications.

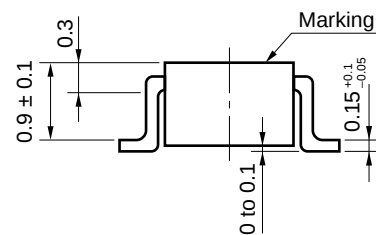
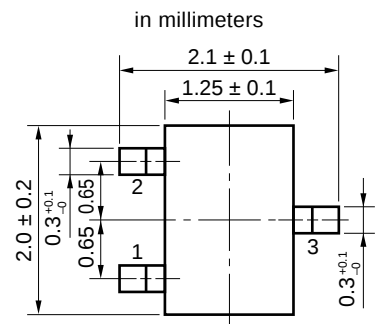
### FEATURES

- High Gain Bandwidth Product :  $f_T = 1.1 \text{ GHz TYP.}$
- Low Collector to Base Time Constant:  $C_C \cdot r_{b'b} = 9 \text{ ps TYP.}$
- Low Output Capacitance :  $C_{ob} = 1.5 \text{ pF MAX.}$

### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ )

|                              |           |             |                  |
|------------------------------|-----------|-------------|------------------|
| Collector to Base Voltage    | $V_{CB0}$ | 30          | V                |
| Collector to Emitter Voltage | $V_{CE0}$ | 15          | V                |
| Emitter to Base Voltage      | $V_{EB0}$ | 4.5         | V                |
| Collector Current            | $I_C$     | 50          | mA               |
| Total Power Dissipation      | $P_T$     | 160         | mW               |
| Junction Temperature         | $T_j$     | 150         | $^\circ\text{C}$ |
| Storage Temperature          | $T_{stg}$ | -65 to +150 | $^\circ\text{C}$ |

### PACKAGE DIMENSIONS



### PIN CONNECTIONS

1. Emitter
2. Base
3. Collector

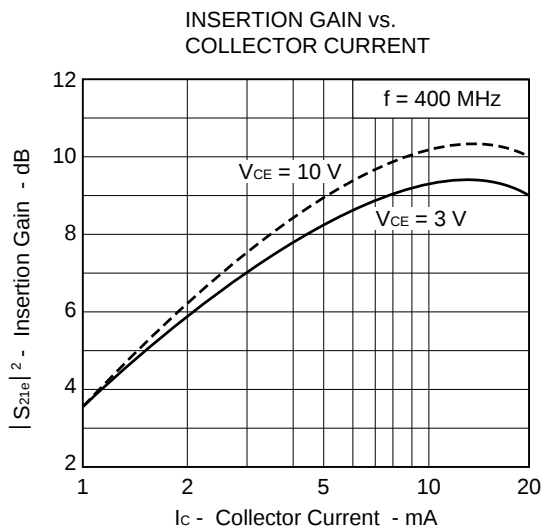
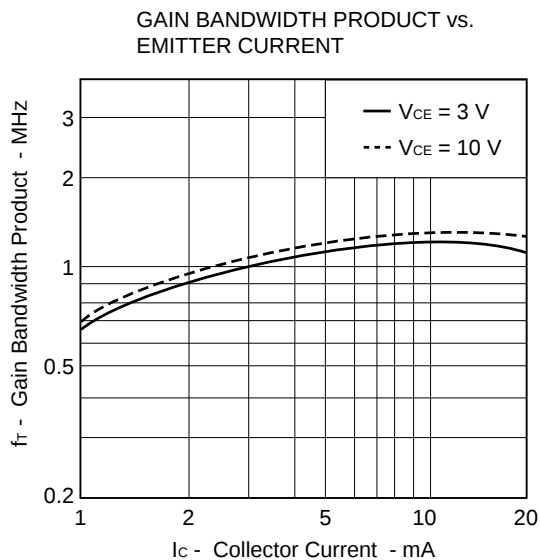
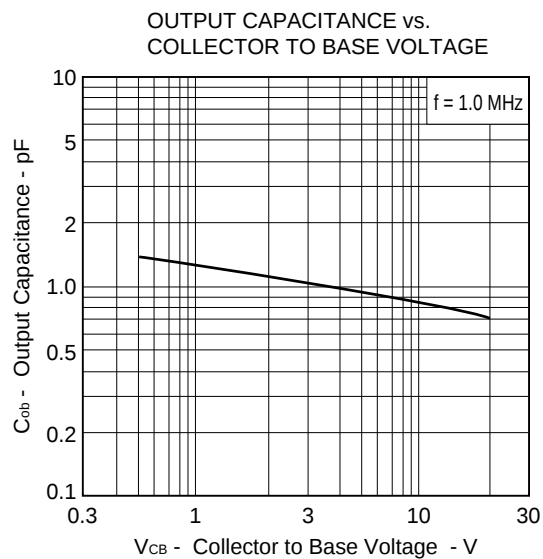
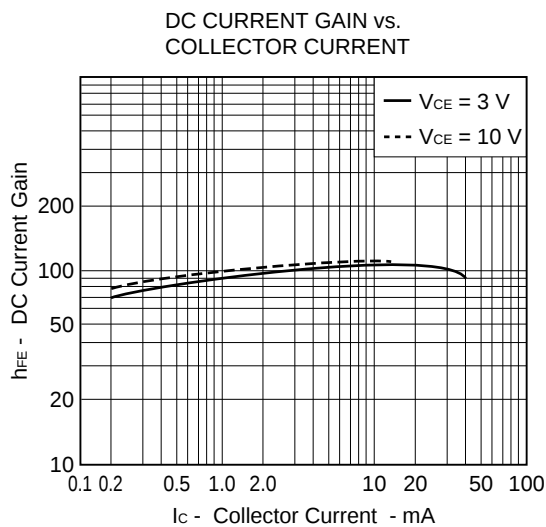
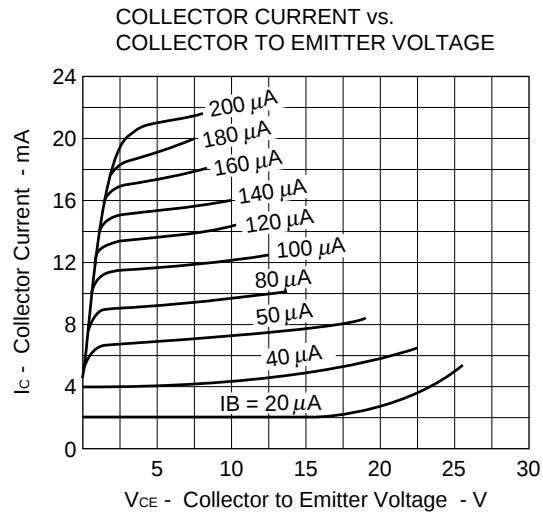
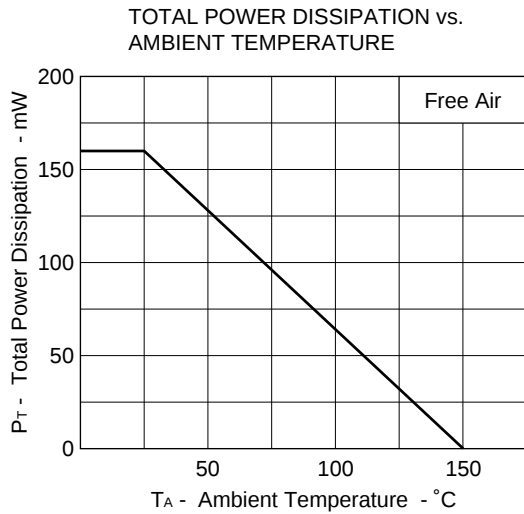
### ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ )

| Characteristics                 | Symbol              | MIN. | TYP.  | MAX. | Unit          | Test Conditions                                                   |
|---------------------------------|---------------------|------|-------|------|---------------|-------------------------------------------------------------------|
| Collector Cutoff Current        | $I_{CB0}$           |      |       | 0.1  | $\mu\text{A}$ | $V_{CB} = 20 \text{ V}, I_E = 0$                                  |
| DC Current Gain                 | $h_{FE}$            | 60   |       | 220  |               | $V_{CE} = 3 \text{ V}, I_C = 5 \text{ mA}$                        |
| Collector Saturation Voltage    | $V_{CE(sat)}$       |      |       | 0.5  | V             | $I_C = 10 \text{ mA}, I_B = 1 \text{ mA}$                         |
| Gain Bandwidth Product          | $f_T$               |      | 1 100 |      | MHz           | $V_{CE} = 3 \text{ V}, I_C = 5 \text{ mA}$                        |
| Output Capacitance              | $C_{ob}$            |      | 1.1   | 1.5  | pF            | $V_{CB} = 3 \text{ V}, I_E = 0$                                   |
| Collector to Base Time Constant | $C_C \cdot r_{b'b}$ |      | 9     | 15   | ps            | $V_{CE} = 3 \text{ V}, I_E = -5 \text{ mA}, f = 31.9 \text{ MHz}$ |

### $h_{FE}$ Classifications

| Rank     | T32       | T33       | T34        |
|----------|-----------|-----------|------------|
| Marking  | T32       | T33       | T34        |
| $h_{FE}$ | 60 to 105 | 85 to 150 | 120 to 220 |

TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ )



## S-PARAMETER

 $V_{CE} = 3\text{ V}$ ,  $I_C = 3\text{ mA}$ 

| Frequency<br>MHz | S11   |        | S21   |       | S12   |      | S22   |       |
|------------------|-------|--------|-------|-------|-------|------|-------|-------|
|                  | MAG   | ANG    | MAG   | ANG   | MAG   | ANG  | MAG   | ANG   |
| 100.00           | 0.644 | -57.9  | 6.137 | 125.9 | 0.045 | 66.9 | 0.857 | -14.1 |
| 200.00           | 0.466 | -85.1  | 3.833 | 104.4 | 0.065 | 59.1 | 0.764 | -15.7 |
| 300.00           | 0.388 | -103.6 | 2.855 | 91.8  | 0.085 | 54.1 | 0.718 | -18.6 |
| 400.00           | 0.365 | -117.7 | 2.189 | 83.9  | 0.100 | 54.0 | 0.701 | -19.7 |
| 500.00           | 0.363 | -130.2 | 1.802 | 76.5  | 0.111 | 50.7 | 0.670 | -21.5 |
| 600.00           | 0.371 | -142.2 | 1.559 | 71.6  | 0.125 | 50.5 | 0.675 | -23.8 |
| 700.00           | 0.378 | -153.2 | 1.392 | 64.2  | 0.133 | 48.2 | 0.665 | -25.6 |
| 800.00           | 0.390 | -161.9 | 1.268 | 59.0  | 0.144 | 47.3 | 0.673 | -29.6 |
| 900.00           | 0.403 | -169.1 | 1.132 | 53.7  | 0.147 | 48.7 | 0.671 | -32.7 |
| 1000.00          | 0.429 | -176.5 | 1.040 | 49.1  | 0.153 | 47.5 | 0.658 | -38.1 |
| 1100.00          | 0.454 | 175.9  | 0.969 | 45.6  | 0.159 | 50.1 | 0.653 | -42.2 |
| 1200.00          | 0.466 | 167.3  | 0.918 | 40.3  | 0.167 | 49.9 | 0.631 | -46.4 |
| 1300.00          | 0.473 | 161.5  | 0.886 | 35.9  | 0.178 | 50.8 | 0.618 | -50.4 |
| 1400.00          | 0.476 | 157.0  | 0.799 | 31.7  | 0.179 | 51.8 | 0.607 | -54.3 |
| 1500.00          | 0.503 | 153.0  | 0.757 | 26.1  | 0.189 | 52.1 | 0.604 | -58.7 |
| 1600.00          | 0.527 | 148.9  | 0.696 | 26.0  | 0.196 | 56.4 | 0.599 | -64.0 |
| 1700.00          | 0.547 | 142.8  | 0.647 | 23.2  | 0.207 | 57.0 | 0.591 | -69.6 |
| 1800.00          | 0.566 | 138.1  | 0.636 | 22.6  | 0.227 | 59.8 | 0.578 | -76.3 |
| 1900.00          | 0.574 | 134.2  | 0.604 | 20.1  | 0.247 | 59.8 | 0.568 | -81.5 |
| 2000.00          | 0.588 | 130.5  | 0.594 | 16.7  | 0.267 | 58.3 | 0.549 | -87.6 |

 $V_{CE} = 3\text{ V}$ ,  $I_C = 10\text{ mA}$ 

| Frequency<br>MHz | S11   |        | S21   |       | S12   |      | S22   |       |
|------------------|-------|--------|-------|-------|-------|------|-------|-------|
|                  | MAG   | ANG    | MAG   | ANG   | MAG   | ANG  | MAG   | ANG   |
| 100.00           | 0.411 | -89.0  | 9.009 | 109.8 | 0.031 | 63.2 | 0.727 | -14.9 |
| 200.00           | 0.371 | -119.5 | 5.001 | 93.7  | 0.050 | 59.7 | 0.663 | -14.3 |
| 300.00           | 0.377 | -137.9 | 3.455 | 83.5  | 0.066 | 56.7 | 0.632 | -16.4 |
| 400.00           | 0.398 | -150.7 | 2.725 | 77.1  | 0.075 | 57.8 | 0.622 | -17.3 |
| 500.00           | 0.423 | -161.2 | 2.198 | 70.6  | 0.084 | 56.5 | 0.601 | -18.9 |
| 600.00           | 0.441 | -170.7 | 1.874 | 66.3  | 0.095 | 58.8 | 0.608 | -21.0 |
| 700.00           | 0.452 | -179.3 | 1.644 | 59.5  | 0.103 | 58.7 | 0.605 | -22.9 |
| 800.00           | 0.466 | 174.9  | 1.478 | 54.7  | 0.113 | 60.0 | 0.614 | -26.8 |
| 900.00           | 0.476 | 170.4  | 1.298 | 49.9  | 0.120 | 62.7 | 0.617 | -30.1 |
| 1000.00          | 0.510 | 165.1  | 1.182 | 45.5  | 0.130 | 62.8 | 0.608 | -35.4 |
| 1100.00          | 0.539 | 159.6  | 1.088 | 42.6  | 0.140 | 65.9 | 0.604 | -39.8 |
| 1200.00          | 0.549 | 152.3  | 1.021 | 37.7  | 0.151 | 66.4 | 0.585 | -44.1 |
| 1300.00          | 0.554 | 147.3  | 0.977 | 33.4  | 0.168 | 67.6 | 0.573 | -48.2 |
| 1400.00          | 0.554 | 143.7  | 0.874 | 29.6  | 0.177 | 68.6 | 0.564 | -52.5 |
| 1500.00          | 0.577 | 140.5  | 0.821 | 24.1  | 0.195 | 67.9 | 0.561 | -57.0 |
| 1600.00          | 0.596 | 137.3  | 0.750 | 24.4  | 0.209 | 71.0 | 0.557 | -62.5 |
| 1700.00          | 0.615 | 132.3  | 0.693 | 21.7  | 0.228 | 69.9 | 0.548 | -68.4 |
| 1800.00          | 0.629 | 128.5  | 0.676 | 21.3  | 0.253 | 71.0 | 0.536 | -75.4 |
| 1900.00          | 0.636 | 125.1  | 0.640 | 19.1  | 0.277 | 69.2 | 0.527 | -81.1 |
| 2000.00          | 0.649 | 121.9  | 0.626 | 15.9  | 0.302 | 66.3 | 0.510 | -87.4 |

$V_{CE} = 5\text{ V}$ ,  $I_C = 3\text{ mA}$ 

| Frequency<br>MHz | S11   |        | S21   |       | S12   |      | S22   |       |
|------------------|-------|--------|-------|-------|-------|------|-------|-------|
|                  | MAG   | ANG    | MAG   | ANG   | MAG   | ANG  | MAG   | ANG   |
| 100.00           | 0.657 | -54.8  | 6.220 | 127.2 | 0.038 | 66.5 | 0.876 | -12.6 |
| 200.00           | 0.473 | -80.6  | 3.926 | 105.9 | 0.058 | 60.5 | 0.793 | -14.0 |
| 300.00           | 0.391 | -98.6  | 2.930 | 93.4  | 0.078 | 55.6 | 0.748 | -16.8 |
| 400.00           | 0.364 | -112.6 | 2.253 | 85.6  | 0.091 | 55.7 | 0.734 | -17.8 |
| 500.00           | 0.359 | -125.0 | 1.855 | 78.5  | 0.102 | 52.4 | 0.702 | -19.4 |
| 600.00           | 0.365 | -137.5 | 1.606 | 73.9  | 0.115 | 52.1 | 0.709 | -21.5 |
| 700.00           | 0.370 | -148.9 | 1.437 | 66.5  | 0.122 | 50.2 | 0.700 | -23.1 |
| 800.00           | 0.381 | -158.2 | 1.307 | 61.5  | 0.133 | 49.7 | 0.709 | -26.9 |
| 900.00           | 0.393 | -165.8 | 1.164 | 56.2  | 0.135 | 50.7 | 0.709 | -29.7 |
| 1000.00          | 0.417 | -173.6 | 1.074 | 51.6  | 0.141 | 49.7 | 0.697 | -34.8 |
| 1100.00          | 0.442 | 178.4  | 0.998 | 48.1  | 0.147 | 52.6 | 0.692 | -38.5 |
| 1200.00          | 0.454 | 169.6  | 0.945 | 42.9  | 0.153 | 52.9 | 0.669 | -42.4 |
| 1300.00          | 0.460 | 163.6  | 0.911 | 38.5  | 0.164 | 53.9 | 0.656 | -45.8 |
| 1400.00          | 0.463 | 159.0  | 0.822 | 34.3  | 0.165 | 55.4 | 0.645 | -49.4 |
| 1500.00          | 0.491 | 154.8  | 0.779 | 28.9  | 0.176 | 55.9 | 0.642 | -53.3 |
| 1600.00          | 0.515 | 150.5  | 0.717 | 28.7  | 0.183 | 60.6 | 0.639 | -58.0 |
| 1700.00          | 0.536 | 144.3  | 0.667 | 25.8  | 0.195 | 61.2 | 0.631 | -63.1 |
| 1800.00          | 0.555 | 139.4  | 0.657 | 25.1  | 0.214 | 64.0 | 0.618 | -69.2 |
| 1900.00          | 0.563 | 135.4  | 0.625 | 22.5  | 0.234 | 64.0 | 0.609 | -74.0 |
| 2000.00          | 0.578 | 131.6  | 0.614 | 18.9  | 0.255 | 62.6 | 0.589 | -79.5 |

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

| Frequency<br>MHz | S11   |        | S21   |       | S12   |      | S22   |       |
|------------------|-------|--------|-------|-------|-------|------|-------|-------|
|                  | MAG   | ANG    | MAG   | ANG   | MAG   | ANG  | MAG   | ANG   |
| 100.00           | 0.420 | -83.2  | 9.315 | 111.3 | 0.029 | 67.9 | 0.759 | -13.4 |
| 200.00           | 0.366 | -112.8 | 5.199 | 95.2  | 0.045 | 62.5 | 0.701 | -12.8 |
| 300.00           | 0.364 | -132.2 | 3.618 | 85.3  | 0.060 | 57.8 | 0.669 | -14.9 |
| 400.00           | 0.381 | -146.0 | 2.856 | 78.9  | 0.070 | 59.4 | 0.661 | -15.7 |
| 500.00           | 0.403 | -156.9 | 2.306 | 72.7  | 0.078 | 57.8 | 0.638 | -17.0 |
| 600.00           | 0.420 | -167.0 | 1.967 | 68.5  | 0.088 | 59.6 | 0.647 | -19.0 |
| 700.00           | 0.432 | -176.0 | 1.729 | 61.8  | 0.095 | 60.0 | 0.644 | -20.5 |
| 800.00           | 0.446 | 177.8  | 1.553 | 57.0  | 0.106 | 61.0 | 0.655 | -24.1 |
| 900.00           | 0.457 | 172.8  | 1.367 | 52.2  | 0.111 | 64.0 | 0.658 | -27.0 |
| 1000.00          | 0.490 | 167.3  | 1.243 | 48.0  | 0.121 | 64.3 | 0.648 | -32.0 |
| 1100.00          | 0.518 | 161.5  | 1.147 | 44.9  | 0.130 | 67.6 | 0.644 | -36.0 |
| 1200.00          | 0.529 | 154.0  | 1.074 | 40.1  | 0.140 | 68.5 | 0.626 | -39.8 |
| 1300.00          | 0.535 | 149.0  | 1.029 | 35.7  | 0.155 | 70.0 | 0.615 | -43.4 |
| 1400.00          | 0.536 | 145.3  | 0.920 | 31.9  | 0.164 | 71.2 | 0.605 | -47.0 |
| 1500.00          | 0.559 | 142.1  | 0.865 | 26.4  | 0.181 | 70.9 | 0.604 | -51.0 |
| 1600.00          | 0.579 | 138.7  | 0.791 | 26.7  | 0.196 | 74.1 | 0.600 | -55.8 |
| 1700.00          | 0.598 | 133.7  | 0.732 | 23.9  | 0.213 | 73.4 | 0.593 | -61.2 |
| 1800.00          | 0.614 | 129.8  | 0.716 | 23.2  | 0.237 | 74.5 | 0.580 | -67.3 |
| 1900.00          | 0.621 | 126.3  | 0.677 | 20.9  | 0.260 | 73.1 | 0.571 | -72.4 |
| 2000.00          | 0.635 | 123.0  | 0.663 | 17.4  | 0.285 | 70.2 | 0.553 | -78.0 |

**V<sub>CE</sub> = 10 V, I<sub>c</sub> = 3 mA**

| Frequency<br>MHz | S11   |        | S21   |       | S12   |      | S22   |       |
|------------------|-------|--------|-------|-------|-------|------|-------|-------|
|                  | MAG   | ANG    | MAG   | ANG   | MAG   | ANG  | MAG   | ANG   |
| 100.00           | 0.671 | -50.9  | 6.248 | 128.7 | 0.035 | 69.8 | 0.897 | -10.6 |
| 200.00           | 0.486 | -74.5  | 3.991 | 107.7 | 0.052 | 62.3 | 0.824 | -12.2 |
| 300.00           | 0.398 | -91.4  | 2.991 | 95.4  | 0.070 | 57.2 | 0.781 | -14.9 |
| 400.00           | 0.367 | -104.8 | 2.306 | 87.9  | 0.083 | 57.2 | 0.770 | -15.8 |
| 500.00           | 0.356 | -117.2 | 1.902 | 80.9  | 0.092 | 54.0 | 0.738 | -17.2 |
| 600.00           | 0.359 | -130.2 | 1.654 | 76.4  | 0.104 | 54.5 | 0.747 | -19.1 |
| 700.00           | 0.361 | -142.0 | 1.482 | 69.3  | 0.111 | 52.1 | 0.739 | -20.3 |
| 800.00           | 0.367 | -152.0 | 1.347 | 64.4  | 0.121 | 51.7 | 0.750 | -23.8 |
| 900.00           | 0.379 | -160.5 | 1.202 | 59.0  | 0.123 | 53.2 | 0.751 | -26.3 |
| 1000.00          | 0.399 | -168.8 | 1.110 | 54.4  | 0.129 | 52.1 | 0.739 | -31.1 |
| 1100.00          | 0.422 | -177.3 | 1.030 | 50.9  | 0.134 | 55.0 | 0.734 | -34.5 |
| 1200.00          | 0.433 | 173.5  | 0.976 | 45.8  | 0.140 | 55.5 | 0.711 | -37.9 |
| 1300.00          | 0.440 | 167.2  | 0.940 | 41.4  | 0.149 | 56.7 | 0.698 | -40.8 |
| 1400.00          | 0.445 | 162.3  | 0.848 | 37.2  | 0.151 | 58.6 | 0.686 | -43.8 |
| 1500.00          | 0.472 | 157.8  | 0.803 | 31.8  | 0.161 | 59.6 | 0.687 | -47.0 |
| 1600.00          | 0.497 | 153.2  | 0.743 | 31.6  | 0.167 | 64.5 | 0.683 | -51.2 |
| 1700.00          | 0.517 | 146.7  | 0.691 | 28.6  | 0.180 | 65.5 | 0.678 | -55.8 |
| 1800.00          | 0.537 | 141.5  | 0.681 | 27.7  | 0.198 | 68.3 | 0.667 | -61.0 |
| 1900.00          | 0.546 | 137.3  | 0.649 | 25.0  | 0.216 | 68.8 | 0.657 | -65.4 |
| 2000.00          | 0.561 | 133.5  | 0.637 | 21.2  | 0.237 | 67.2 | 0.638 | -70.2 |

**V<sub>CE</sub> = 10 V, I<sub>c</sub> = 10 mA**

| Frequency<br>MHz | S11   |        | S21   |       | S12   |      | S22   |       |
|------------------|-------|--------|-------|-------|-------|------|-------|-------|
|                  | MAG   | ANG    | MAG   | ANG   | MAG   | ANG  | MAG   | ANG   |
| 100.00           | 0.438 | -73.6  | 9.469 | 113.2 | 0.026 | 67.2 | 0.799 | -11.6 |
| 200.00           | 0.363 | -101.5 | 5.347 | 97.4  | 0.042 | 63.1 | 0.744 | -11.4 |
| 300.00           | 0.348 | -121.7 | 3.753 | 87.6  | 0.057 | 58.9 | 0.711 | -13.6 |
| 400.00           | 0.356 | -136.7 | 2.984 | 81.4  | 0.066 | 60.0 | 0.703 | -14.2 |
| 500.00           | 0.373 | -148.8 | 2.420 | 75.4  | 0.073 | 58.6 | 0.678 | -15.2 |
| 600.00           | 0.388 | -159.8 | 2.073 | 71.3  | 0.082 | 60.5 | 0.688 | -16.9 |
| 700.00           | 0.398 | -169.7 | 1.824 | 64.7  | 0.089 | 60.1 | 0.685 | -18.1 |
| 800.00           | 0.412 | -176.6 | 1.644 | 60.0  | 0.099 | 61.4 | 0.697 | -21.4 |
| 900.00           | 0.425 | 177.7  | 1.449 | 55.2  | 0.103 | 64.5 | 0.701 | -23.9 |
| 1000.00          | 0.456 | 171.7  | 1.321 | 50.9  | 0.112 | 64.6 | 0.692 | -28.5 |
| 1100.00          | 0.483 | 165.3  | 1.216 | 47.7  | 0.120 | 68.1 | 0.688 | -31.9 |
| 1200.00          | 0.495 | 157.6  | 1.147 | 43.0  | 0.128 | 69.4 | 0.667 | -35.3 |
| 1300.00          | 0.501 | 152.4  | 1.093 | 38.6  | 0.142 | 71.0 | 0.657 | -38.3 |
| 1400.00          | 0.504 | 148.5  | 0.978 | 34.8  | 0.149 | 72.8 | 0.646 | -41.1 |
| 1500.00          | 0.528 | 145.1  | 0.922 | 29.2  | 0.165 | 72.9 | 0.648 | -44.4 |
| 1600.00          | 0.550 | 141.6  | 0.846 | 29.2  | 0.178 | 76.4 | 0.644 | -48.5 |
| 1700.00          | 0.570 | 136.4  | 0.784 | 26.2  | 0.194 | 75.9 | 0.640 | -53.1 |
| 1800.00          | 0.587 | 132.1  | 0.766 | 25.3  | 0.217 | 77.6 | 0.630 | -58.4 |
| 1900.00          | 0.595 | 128.7  | 0.728 | 22.7  | 0.238 | 76.4 | 0.621 | -62.9 |
| 2000.00          | 0.610 | 125.2  | 0.711 | 18.8  | 0.262 | 74.0 | 0.603 | -67.8 |

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