

NPN SILICON RF TRANSISTOR 2SC5800

NPN SILICON RF TRANSISTOR FOR HIGH-FREQUENCY LOW NOISE FLAT-LEAD 3-PIN THIN-TYPE ULTRA SUPER MINIMOLD

FEATURES

- Low phase distortion, low voltage operation
- Ideal for OSC applications
- Flat-lead 3-pin thin-type ultra super minimold package

ORDERING INFORMATION

| Part Number | Quantity | Supplying Form |
|-------------|-------------------|--|
| 2SC5800 | 50 pcs (Non reel) | <ul style="list-style-type: none"> • 8 mm wide embossed taping • Pin 3 (collector) face the perforation side of the tape |
| 2SC5800-T1 | 3 kpcs/reel | |

Remark To order evaluation samples, consult your NEC sales representative.
Unit sample quantity is 50 pcs.

ABSOLUTE MAXIMUM RATINGS (T_A = +25°C)

| Parameter | Symbol | Ratings | Unit |
|------------------------------|----------------------------------|-------------|------|
| Collector to Base Voltage | V _{CBO} | 9.0 | V |
| Collector to Emitter Voltage | V _{CEO} | 5.5 | V |
| Emitter to Base Voltage | V _{EBO} | 1.5 | V |
| Collector Current | I _c | 100 | mA |
| Total Power Dissipation | P _{tot} ^{Note} | 200 | mW |
| Junction Temperature | T _j | 150 | °C |
| Storage Temperature | T _{stg} | -65 to +150 | °C |

Note Mounted on 1.08 cm² × 1.0 mm (t) glass epoxy PCB

Because this product uses high-frequency technology, avoid excessive static electricity, etc.

The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.
Not all devices/types available in every country. Please check with local NEC representative for availability and additional information.

ELECTRICAL CHARACTERISTICS (T_A = +25°C)

| Parameter | Symbol | Test Conditions | MIN. | TYP. | MAX. | Unit |
|------------------------------|-----------------------------------|--|------|------|------|------|
| DC Characteristics | | | | | | |
| Collector Cut-off Current | I _{CBO} | V _{CB} = 5 V, I _E = 0 mA | – | – | 600 | nA |
| Emitter Cut-off Current | I _{EBO} | V _{BE} = 1 V, I _C = 0 mA | – | – | 600 | nA |
| DC Current Gain | h _{FE} ^{Note 1} | V _{CE} = 1 V, I _C = 5 mA | 100 | 120 | 145 | – |
| RF Characteristics | | | | | | |
| Gain Bandwidth Product (1) | f _T | V _{CE} = 1 V, I _C = 5 mA, f = 2 GHz | 3.0 | 4.5 | – | GHz |
| Gain Bandwidth Product (2) | f _T | V _{CE} = 1 V, I _C = 15 mA, f = 2 GHz | 5.0 | 6.5 | – | GHz |
| Insertion Power Gain (1) | S _{21e} ² | V _{CE} = 1 V, I _C = 5 mA, f = 2 GHz | 3.0 | 4.0 | – | dB |
| Insertion Power Gain (2) | S _{21e} ² | V _{CE} = 1 V, I _C = 15 mA, f = 2 GHz | 4.5 | 5.5 | – | dB |
| Noise Figure | NF | V _{CE} = 1 V, I _C = 10 mA, f = 2 GHz, Z _S = Z _{opt} | – | 1.9 | 2.5 | dB |
| Reverse Transfer Capacitance | C _{re} ^{Note 2} | V _{CB} = 0.5 V, I _E = 0 mA, f = 1 MHz | – | 0.6 | 0.8 | pF |

Notes 1. Pulse measurement: PW ≤ 350 μs, Duty Cycle ≤ 2%

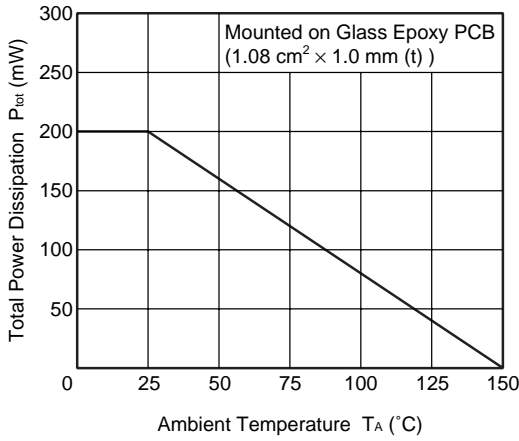
2. Collector to base capacitance when the emitter grounded

h_{FE} CLASSIFICATION

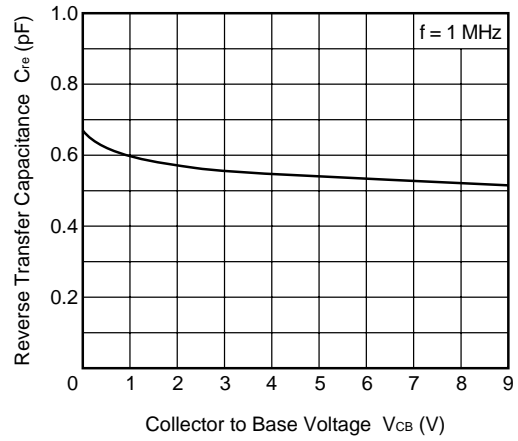
| | |
|-----------------------|------------|
| Rank | FB |
| Marking | 80 |
| h _{FE} Value | 100 to 145 |

TYPICAL CHARACTERISTICS (Unless otherwise specified, $T_A = +25^\circ\text{C}$)

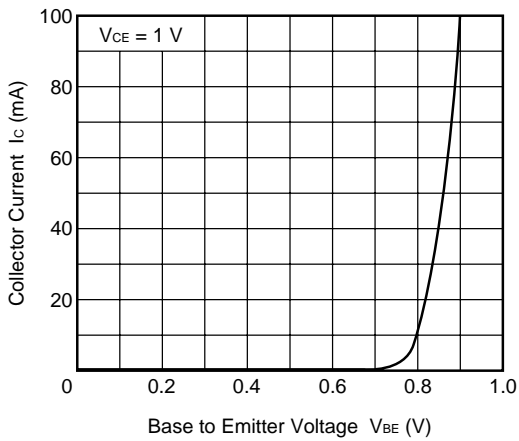
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



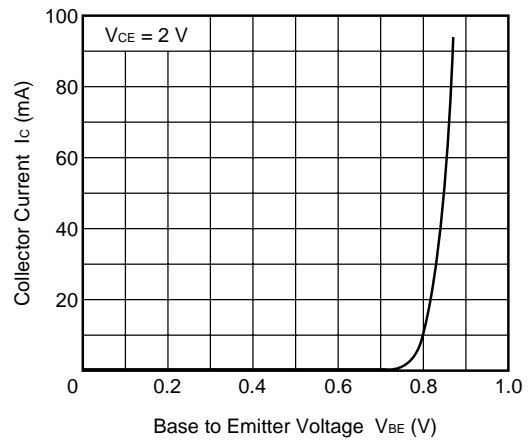
REVERSE TRANSFER CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



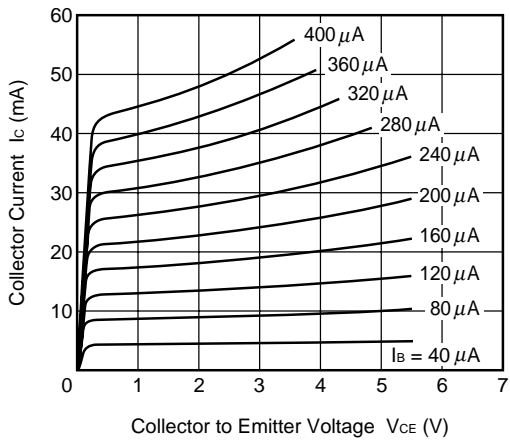
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



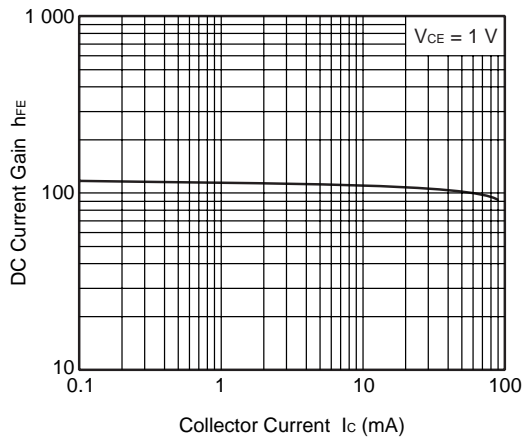
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



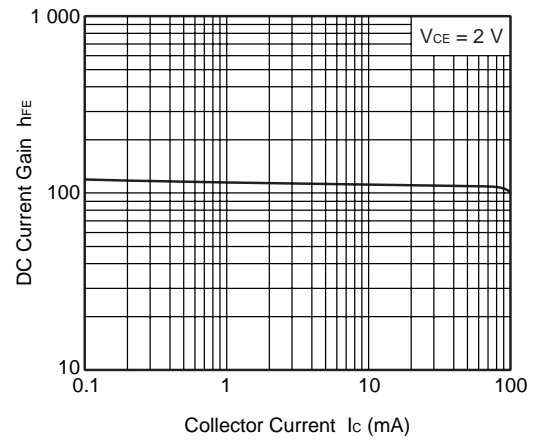
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



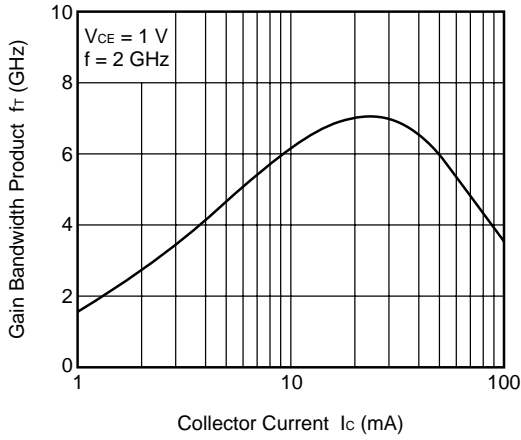
DC CURRENT GAIN vs.
COLLECTOR CURRENT



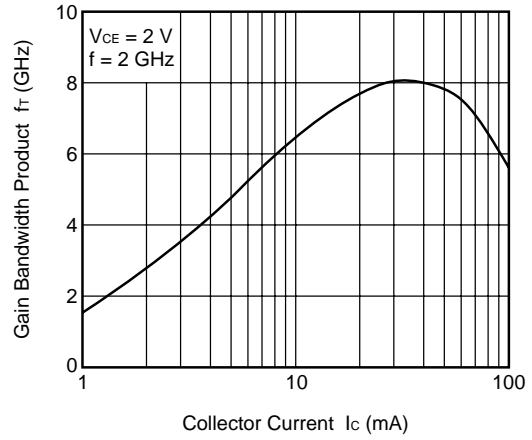
DC CURRENT GAIN vs.
COLLECTOR CURRENT



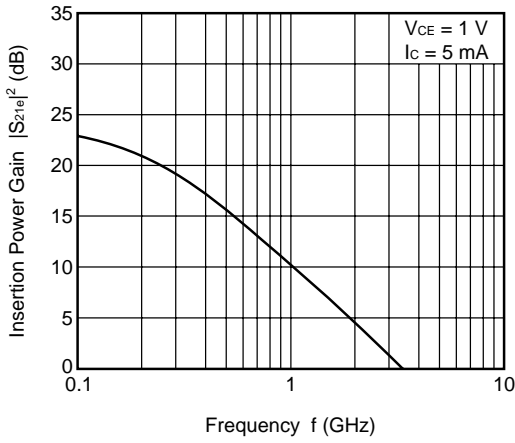
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



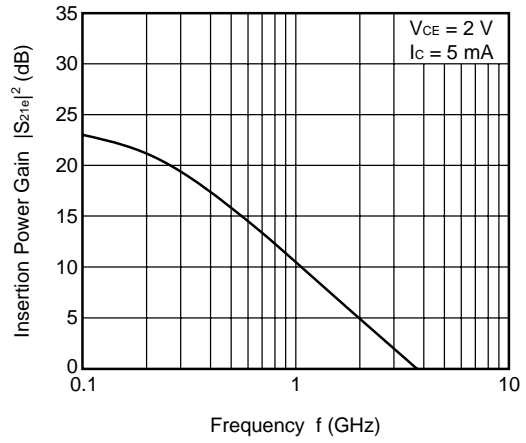
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



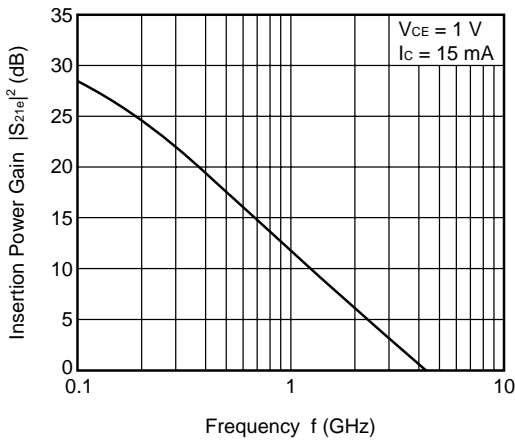
INSERTION POWER GAIN vs. FREQUENCY



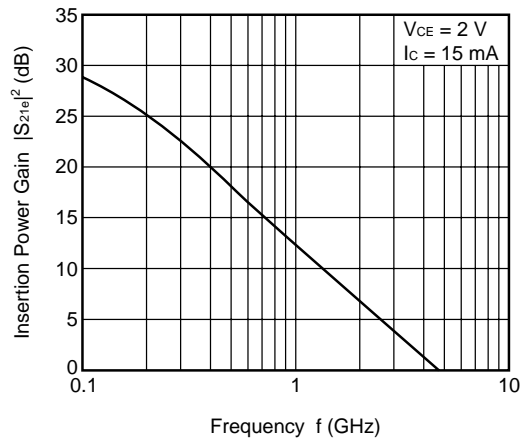
INSERTION POWER GAIN vs. FREQUENCY

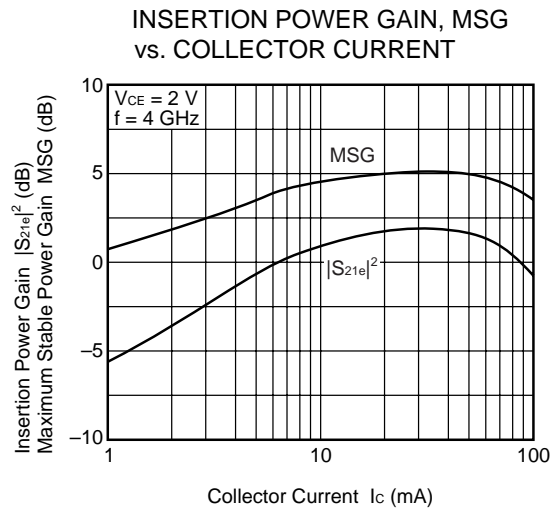
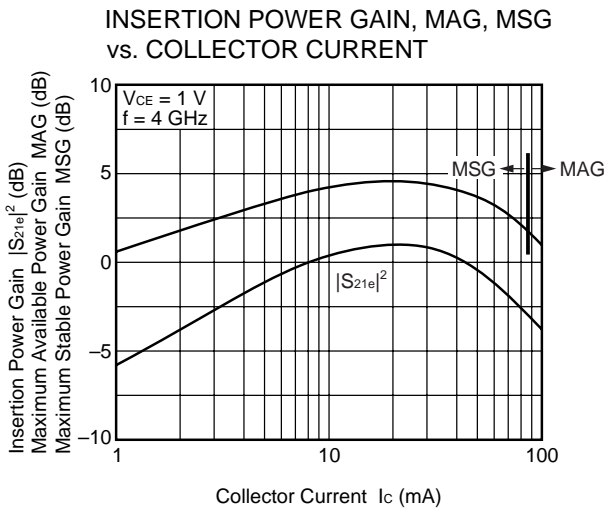
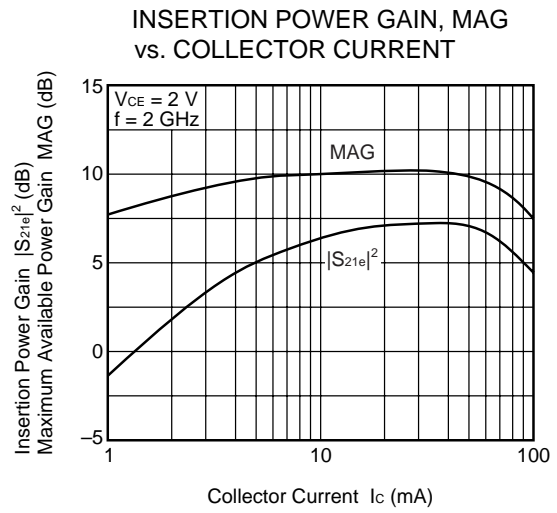
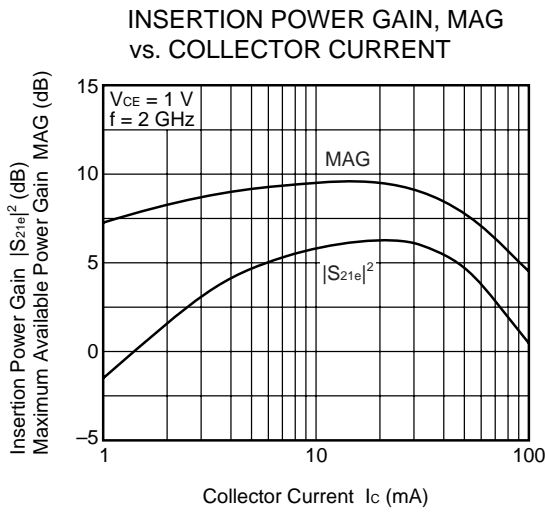
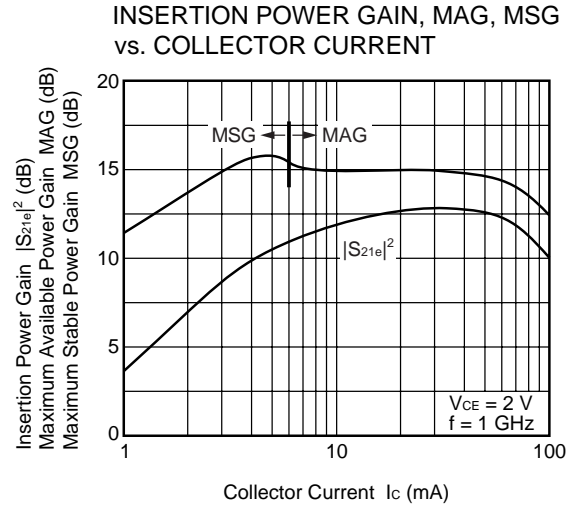
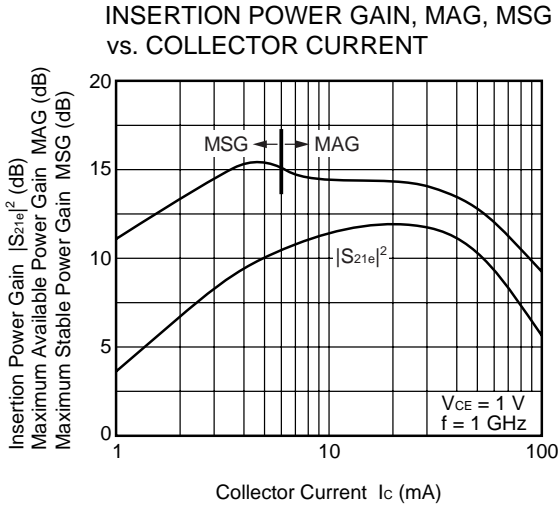


INSERTION POWER GAIN vs. FREQUENCY

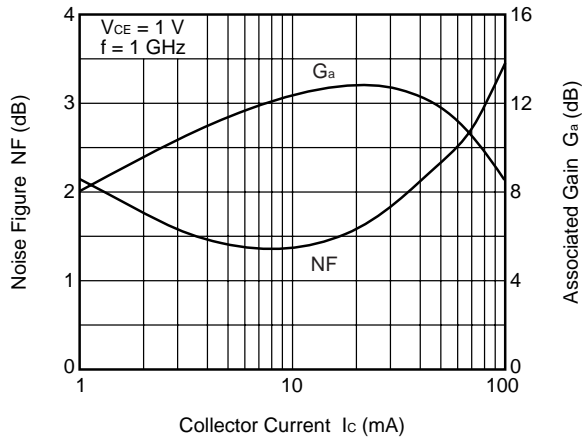


INSERTION POWER GAIN vs. FREQUENCY

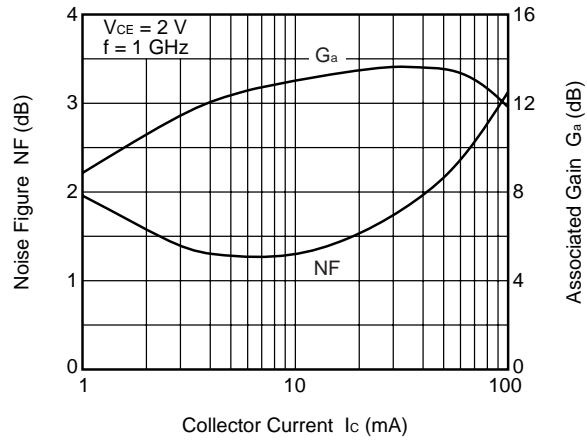




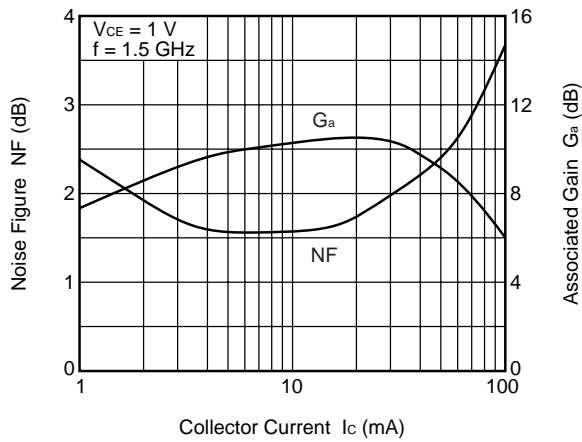
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



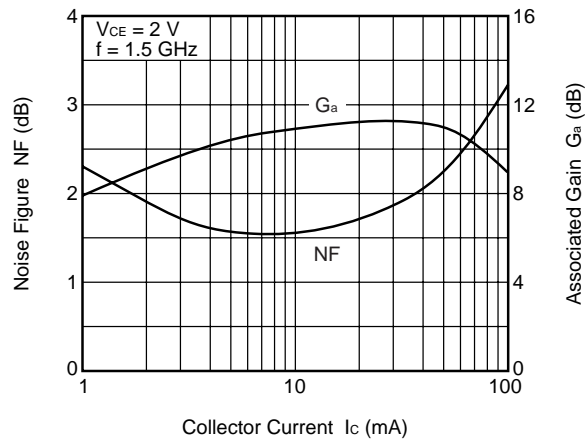
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



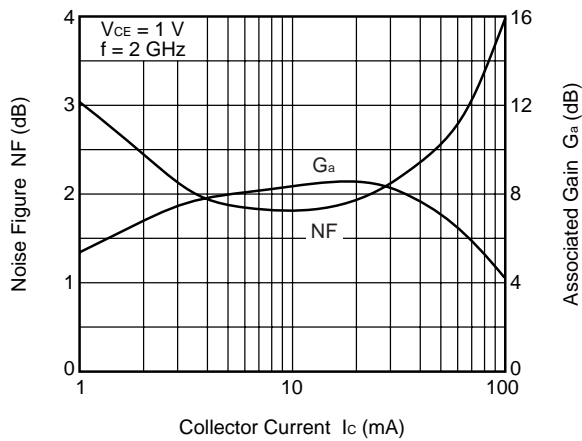
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



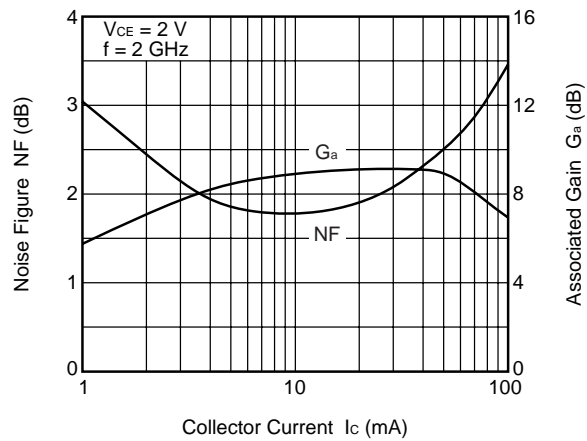
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



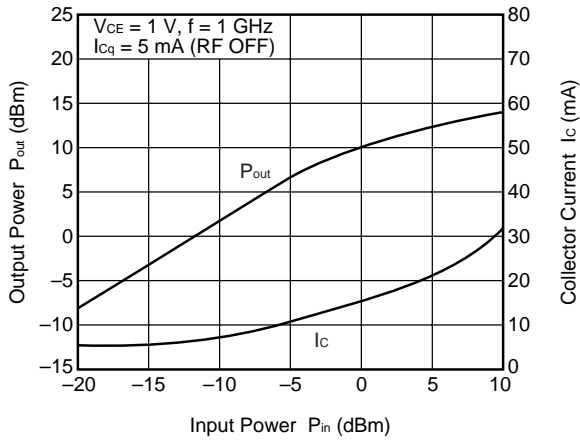
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



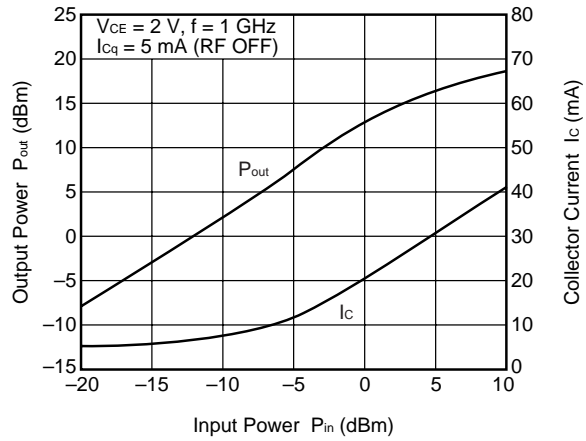
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



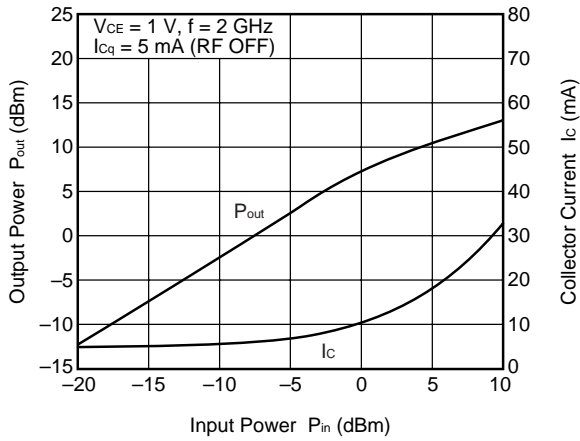
OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER



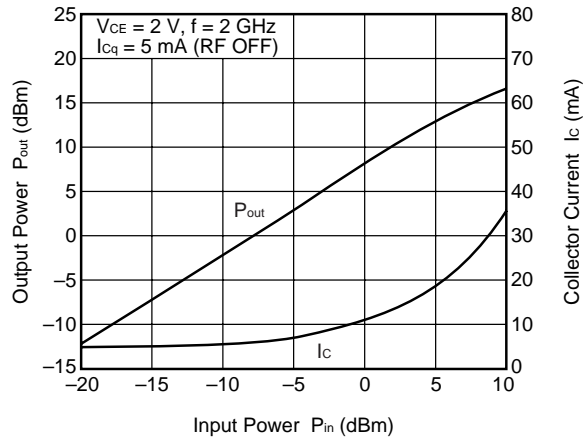
OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER



OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER



OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER



Remark The graphs indicate nominal characteristics.

S-PARAMETERS

Note When $K \geq 1$, the MAG (Maximum Available Power Gain) is used. $MAG = \left| \frac{S_{21}}{S_{12}} \right| (K - \sqrt{K^2 - 1})$

When $K < 1$, the MSG (Maximum Stable Power Gain) is used. $MSG = \left| \frac{S_{21}}{S_{12}} \right|$

$V_{CE} = 1\text{ V}$, $I_c = 1\text{ mA}$, $Z_o = 50\ \Omega$

| Frequency (GHz) | S ₁₁ | | S ₂₁ | | S ₁₂ | | S ₂₂ | | K | MAG/MSG (dB) | Note |
|--------------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-------|-----------------|------|
| | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | | | |
| 0.1 | 0.943 | -24.3 | 3.561 | 164.4 | 0.040 | 74.1 | 0.984 | -8.3 | 0.068 | 19.45 | |
| 0.2 | 0.921 | -47.8 | 3.390 | 147.2 | 0.074 | 62.9 | 0.940 | -15.6 | 0.108 | 16.62 | |
| 0.3 | 0.889 | -68.9 | 3.108 | 134.1 | 0.099 | 51.3 | 0.886 | -21.4 | 0.148 | 14.98 | |
| 0.4 | 0.851 | -86.4 | 2.757 | 122.2 | 0.115 | 41.9 | 0.833 | -26.3 | 0.206 | 13.80 | |
| 0.5 | 0.823 | -101.1 | 2.455 | 112.2 | 0.124 | 34.7 | 0.788 | -30.1 | 0.262 | 12.97 | |
| 0.6 | 0.800 | -113.6 | 2.194 | 104.1 | 0.129 | 28.9 | 0.752 | -33.4 | 0.314 | 12.32 | |
| 0.7 | 0.780 | -124.3 | 1.970 | 96.5 | 0.129 | 24.2 | 0.724 | -36.4 | 0.382 | 11.83 | |
| 0.8 | 0.770 | -133.6 | 1.787 | 89.7 | 0.127 | 20.8 | 0.702 | -39.3 | 0.442 | 11.48 | |
| 0.9 | 0.763 | -141.2 | 1.634 | 84.1 | 0.123 | 18.3 | 0.683 | -42.3 | 0.514 | 11.24 | |
| 1.0 | 0.760 | -148.3 | 1.502 | 79.0 | 0.117 | 16.8 | 0.669 | -45.4 | 0.582 | 11.07 | |
| 1.1 | 0.754 | -154.4 | 1.392 | 74.1 | 0.110 | 16.3 | 0.657 | -48.6 | 0.678 | 11.01 | |
| 1.2 | 0.757 | -160.2 | 1.304 | 69.4 | 0.103 | 17.0 | 0.648 | -52.0 | 0.754 | 11.03 | |
| 1.3 | 0.756 | -165.0 | 1.219 | 65.5 | 0.095 | 18.9 | 0.640 | -55.4 | 0.871 | 11.08 | |
| 1.4 | 0.757 | -169.8 | 1.141 | 61.5 | 0.088 | 22.5 | 0.635 | -59.2 | 0.997 | 11.15 | |
| 1.5 | 0.761 | -174.1 | 1.079 | 57.9 | 0.081 | 28.4 | 0.630 | -63.0 | 1.106 | 9.25 | |
| 1.6 | 0.762 | -178.3 | 1.025 | 54.4 | 0.077 | 36.1 | 0.627 | -67.1 | 1.214 | 8.45 | |
| 1.7 | 0.767 | 178.0 | 0.970 | 51.2 | 0.076 | 45.6 | 0.625 | -71.4 | 1.271 | 7.94 | |
| 1.8 | 0.766 | 174.0 | 0.923 | 47.9 | 0.079 | 55.5 | 0.624 | -75.9 | 1.301 | 7.40 | |
| 1.9 | 0.772 | 170.6 | 0.878 | 45.2 | 0.086 | 64.4 | 0.621 | -80.7 | 1.228 | 7.20 | |
| 2.0 | 0.779 | 167.1 | 0.839 | 42.0 | 0.097 | 71.6 | 0.623 | -85.6 | 1.116 | 7.31 | |
| 2.1 | 0.782 | 164.0 | 0.800 | 39.5 | 0.110 | 76.6 | 0.624 | -90.5 | 1.028 | 7.57 | |
| 2.2 | 0.785 | 161.1 | 0.767 | 37.8 | 0.126 | 79.7 | 0.624 | -95.5 | 0.957 | 7.85 | |
| 2.3 | 0.791 | 158.5 | 0.735 | 35.9 | 0.143 | 81.4 | 0.626 | -100.9 | 0.889 | 7.11 | |
| 2.4 | 0.794 | 156.0 | 0.701 | 34.2 | 0.161 | 82.1 | 0.629 | -106.0 | 0.844 | 6.39 | |
| 2.5 | 0.797 | 153.6 | 0.673 | 33.1 | 0.180 | 82.0 | 0.633 | -111.2 | 0.811 | 5.72 | |
| 2.6 | 0.800 | 151.1 | 0.642 | 31.6 | 0.200 | 81.5 | 0.637 | -116.3 | 0.796 | 5.07 | |
| 2.7 | 0.803 | 149.1 | 0.621 | 30.8 | 0.219 | 80.5 | 0.640 | -121.3 | 0.781 | 4.54 | |
| 2.8 | 0.803 | 147.1 | 0.601 | 29.9 | 0.238 | 79.3 | 0.645 | -125.9 | 0.781 | 4.02 | |
| 2.9 | 0.798 | 145.1 | 0.592 | 29.0 | 0.256 | 77.8 | 0.643 | -130.7 | 0.798 | 3.63 | |
| 3.0 | 0.801 | 143.2 | 0.574 | 29.3 | 0.276 | 76.0 | 0.646 | -135.6 | 0.810 | 3.18 | |
| 4.0 | 0.798 | 125.7 | 0.515 | 26.1 | 0.441 | 54.9 | 0.681 | 179.9 | 0.930 | 0.68 | |
| 5.0 | 0.794 | 116.1 | 0.519 | 22.3 | 0.510 | 38.5 | 0.725 | 149.0 | 0.989 | 0.08 | |

V_{CE} = 1 V, I_c = 3 mA, Z_o = 50 Ω

| Frequency (GHz) | S ₁₁ | | S ₂₁ | | S ₁₂ | | S ₂₂ | | K | MAG/MSG (dB) |
|--------------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-------|-----------------|
| | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | | |
| 0.1 | 0.863 | -35.3 | 9.304 | 157.1 | 0.039 | 70.0 | 0.941 | -15.7 | 0.106 | 23.82 |
| 0.2 | 0.798 | -67.4 | 8.126 | 136.7 | 0.063 | 56.1 | 0.822 | -27.1 | 0.176 | 21.12 |
| 0.3 | 0.745 | -91.9 | 6.813 | 122.2 | 0.078 | 46.2 | 0.711 | -34.2 | 0.253 | 19.41 |
| 0.4 | 0.698 | -109.8 | 5.657 | 111.4 | 0.086 | 39.6 | 0.624 | -38.5 | 0.351 | 18.18 |
| 0.5 | 0.667 | -123.4 | 4.783 | 102.9 | 0.090 | 36.2 | 0.562 | -41.3 | 0.447 | 17.25 |
| 0.6 | 0.655 | -134.6 | 4.138 | 96.4 | 0.092 | 34.3 | 0.518 | -43.5 | 0.526 | 16.52 |
| 0.7 | 0.643 | -143.5 | 3.632 | 90.4 | 0.093 | 33.9 | 0.485 | -45.4 | 0.619 | 15.91 |
| 0.8 | 0.635 | -151.0 | 3.219 | 85.2 | 0.094 | 34.3 | 0.461 | -47.3 | 0.714 | 15.37 |
| 0.9 | 0.630 | -157.2 | 2.907 | 80.7 | 0.093 | 35.8 | 0.441 | -49.3 | 0.807 | 14.93 |
| 1.0 | 0.633 | -162.5 | 2.648 | 76.7 | 0.094 | 37.9 | 0.426 | -51.6 | 0.879 | 14.50 |
| 1.1 | 0.634 | -167.4 | 2.433 | 72.9 | 0.095 | 40.6 | 0.415 | -54.2 | 0.953 | 14.10 |
| 1.2 | 0.636 | -171.7 | 2.258 | 69.2 | 0.096 | 43.7 | 0.404 | -57.0 | 1.014 | 13.00 |
| 1.3 | 0.638 | -175.3 | 2.099 | 65.8 | 0.098 | 46.9 | 0.396 | -60.0 | 1.069 | 11.69 |
| 1.4 | 0.639 | -178.9 | 1.965 | 62.5 | 0.101 | 50.5 | 0.389 | -63.4 | 1.112 | 10.85 |
| 1.5 | 0.644 | 177.6 | 1.850 | 59.4 | 0.106 | 54.1 | 0.384 | -66.9 | 1.124 | 10.28 |
| 1.6 | 0.649 | 174.3 | 1.754 | 56.2 | 0.111 | 57.4 | 0.380 | -70.7 | 1.127 | 9.82 |
| 1.7 | 0.657 | 171.5 | 1.660 | 53.3 | 0.117 | 60.4 | 0.376 | -74.8 | 1.113 | 9.46 |
| 1.8 | 0.660 | 168.5 | 1.580 | 50.4 | 0.125 | 63.1 | 0.375 | -79.1 | 1.099 | 9.09 |
| 1.9 | 0.665 | 165.9 | 1.502 | 47.6 | 0.134 | 65.4 | 0.373 | -83.8 | 1.080 | 8.77 |
| 2.0 | 0.675 | 162.9 | 1.435 | 44.6 | 0.144 | 67.3 | 0.374 | -88.4 | 1.035 | 8.84 |
| 2.1 | 0.682 | 160.8 | 1.370 | 41.9 | 0.155 | 68.7 | 0.376 | -93.4 | 1.001 | 9.31 |
| 2.2 | 0.686 | 158.3 | 1.318 | 39.7 | 0.166 | 69.8 | 0.378 | -98.3 | 0.975 | 8.99 |
| 2.3 | 0.695 | 156.2 | 1.263 | 37.5 | 0.178 | 70.3 | 0.380 | -103.6 | 0.944 | 8.51 |
| 2.4 | 0.703 | 154.4 | 1.210 | 35.3 | 0.191 | 70.6 | 0.387 | -108.8 | 0.909 | 8.01 |
| 2.5 | 0.706 | 152.4 | 1.164 | 33.3 | 0.205 | 70.4 | 0.394 | -113.7 | 0.892 | 7.55 |
| 2.6 | 0.712 | 150.6 | 1.116 | 31.0 | 0.218 | 70.3 | 0.402 | -118.8 | 0.870 | 7.08 |
| 2.7 | 0.717 | 149.1 | 1.074 | 29.4 | 0.232 | 69.9 | 0.410 | -123.3 | 0.851 | 6.65 |
| 2.8 | 0.723 | 147.5 | 1.036 | 27.4 | 0.246 | 69.4 | 0.419 | -127.8 | 0.832 | 6.24 |
| 2.9 | 0.721 | 145.8 | 1.009 | 25.4 | 0.260 | 68.6 | 0.424 | -132.4 | 0.831 | 5.88 |
| 3.0 | 0.730 | 144.0 | 0.975 | 24.3 | 0.275 | 67.7 | 0.431 | -137.1 | 0.815 | 5.50 |
| 4.0 | 0.767 | 128.6 | 0.739 | 12.7 | 0.416 | 52.9 | 0.527 | -179.2 | 0.815 | 2.50 |
| 5.0 | 0.792 | 118.0 | 0.611 | 8.6 | 0.493 | 38.7 | 0.637 | 150.6 | 0.897 | 0.93 |

V_{CE} = 1 V, I_c = 5 mA, Z_o = 50 Ω

| Frequency (GHz) | S ₁₁ | | S ₂₁ | | S ₁₂ | | S ₂₂ | | K | MAG/MSG (dB) |
|--------------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-------|-----------------|
| | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | | |
| 0.1 | 0.782 | -45.4 | 14.156 | 151.1 | 0.035 | 66.8 | 0.890 | -22.1 | 0.145 | 26.04 |
| 0.2 | 0.699 | -82.8 | 11.386 | 128.7 | 0.054 | 53.1 | 0.715 | -35.8 | 0.258 | 23.21 |
| 0.3 | 0.650 | -107.7 | 8.963 | 114.6 | 0.065 | 45.7 | 0.582 | -42.7 | 0.373 | 21.43 |
| 0.4 | 0.609 | -124.4 | 7.187 | 105.1 | 0.071 | 42.3 | 0.492 | -46.3 | 0.502 | 20.08 |
| 0.5 | 0.594 | -136.7 | 5.963 | 97.7 | 0.074 | 41.6 | 0.432 | -48.1 | 0.608 | 19.05 |
| 0.6 | 0.582 | -146.7 | 5.086 | 92.2 | 0.078 | 42.3 | 0.390 | -49.7 | 0.707 | 18.15 |
| 0.7 | 0.576 | -154.3 | 4.418 | 87.1 | 0.081 | 43.9 | 0.361 | -51.1 | 0.797 | 17.35 |
| 0.8 | 0.576 | -160.5 | 3.896 | 82.7 | 0.085 | 45.8 | 0.339 | -52.5 | 0.877 | 16.63 |
| 0.9 | 0.574 | -165.5 | 3.505 | 78.8 | 0.088 | 48.2 | 0.321 | -54.2 | 0.944 | 15.98 |
| 1.0 | 0.579 | -169.8 | 3.180 | 75.3 | 0.093 | 50.5 | 0.308 | -56.4 | 0.988 | 15.33 |
| 1.1 | 0.579 | -174.0 | 2.913 | 71.9 | 0.097 | 52.9 | 0.297 | -58.8 | 1.037 | 13.58 |
| 1.2 | 0.587 | -177.6 | 2.699 | 68.6 | 0.103 | 55.1 | 0.287 | -61.5 | 1.054 | 12.77 |
| 1.3 | 0.587 | 179.3 | 2.505 | 65.6 | 0.109 | 57.1 | 0.279 | -64.6 | 1.082 | 11.87 |
| 1.4 | 0.591 | 176.1 | 2.341 | 62.6 | 0.115 | 59.1 | 0.274 | -68.1 | 1.092 | 11.23 |
| 1.5 | 0.596 | 173.4 | 2.201 | 59.8 | 0.123 | 60.8 | 0.268 | -71.8 | 1.093 | 10.69 |
| 1.6 | 0.599 | 170.5 | 2.085 | 56.9 | 0.130 | 62.3 | 0.265 | -75.7 | 1.091 | 10.21 |
| 1.7 | 0.609 | 168.1 | 1.972 | 54.3 | 0.138 | 63.6 | 0.261 | -80.1 | 1.072 | 9.90 |
| 1.8 | 0.614 | 165.5 | 1.875 | 51.5 | 0.147 | 64.7 | 0.260 | -84.7 | 1.062 | 9.53 |
| 1.9 | 0.620 | 163.2 | 1.786 | 49.0 | 0.157 | 65.4 | 0.259 | -89.8 | 1.046 | 9.26 |
| 2.0 | 0.629 | 160.4 | 1.705 | 46.1 | 0.166 | 66.2 | 0.260 | -94.7 | 1.025 | 9.14 |
| 2.1 | 0.636 | 158.5 | 1.628 | 43.6 | 0.177 | 66.6 | 0.262 | -100.0 | 1.005 | 9.22 |
| 2.2 | 0.641 | 156.7 | 1.565 | 41.4 | 0.187 | 66.7 | 0.265 | -105.4 | 0.989 | 9.23 |
| 2.3 | 0.651 | 154.7 | 1.505 | 39.3 | 0.198 | 66.8 | 0.269 | -110.8 | 0.964 | 8.82 |
| 2.4 | 0.659 | 153.0 | 1.444 | 37.2 | 0.209 | 66.6 | 0.277 | -116.0 | 0.946 | 8.40 |
| 2.5 | 0.666 | 151.3 | 1.387 | 35.1 | 0.221 | 66.1 | 0.284 | -121.2 | 0.928 | 7.99 |
| 2.6 | 0.671 | 149.7 | 1.331 | 32.8 | 0.233 | 65.9 | 0.294 | -126.2 | 0.915 | 7.57 |
| 2.7 | 0.678 | 148.3 | 1.287 | 31.1 | 0.244 | 65.4 | 0.303 | -130.5 | 0.898 | 7.22 |
| 2.8 | 0.683 | 147.2 | 1.242 | 29.1 | 0.256 | 64.8 | 0.313 | -134.8 | 0.884 | 6.86 |
| 2.9 | 0.685 | 145.7 | 1.212 | 27.1 | 0.268 | 64.2 | 0.321 | -139.1 | 0.876 | 6.55 |
| 3.0 | 0.692 | 144.2 | 1.174 | 25.7 | 0.280 | 63.4 | 0.330 | -143.5 | 0.863 | 6.22 |
| 4.0 | 0.745 | 129.6 | 0.886 | 11.3 | 0.404 | 51.0 | 0.443 | 177.5 | 0.819 | 3.41 |
| 5.0 | 0.784 | 119.5 | 0.701 | 4.2 | 0.482 | 38.3 | 0.577 | 149.8 | 0.860 | 1.63 |

V_{CE} = 1 V, I_c = 7 mA, Z_o = 50 Ω

| Frequency (GHz) | S ₁₁ | | S ₂₁ | | S ₁₂ | | S ₂₂ | | K | MAG/MSG (dB) |
|--------------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-------|-----------------|
| | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | | |
| 0.1 | 0.717 | -54.3 | 17.949 | 146.4 | 0.032 | 63.9 | 0.844 | -27.4 | 0.182 | 27.46 |
| 0.2 | 0.634 | -94.2 | 13.441 | 123.2 | 0.049 | 51.0 | 0.634 | -42.1 | 0.340 | 24.42 |
| 0.3 | 0.593 | -118.5 | 10.199 | 110.0 | 0.057 | 46.6 | 0.496 | -48.5 | 0.476 | 22.56 |
| 0.4 | 0.563 | -134.5 | 8.038 | 101.3 | 0.062 | 45.8 | 0.410 | -51.4 | 0.612 | 21.10 |
| 0.5 | 0.553 | -145.4 | 6.594 | 94.7 | 0.067 | 47.1 | 0.354 | -52.8 | 0.722 | 19.91 |
| 0.6 | 0.548 | -153.8 | 5.604 | 89.7 | 0.072 | 48.8 | 0.317 | -54.2 | 0.809 | 18.88 |
| 0.7 | 0.545 | -160.6 | 4.847 | 85.2 | 0.077 | 51.0 | 0.290 | -55.4 | 0.888 | 17.96 |
| 0.8 | 0.547 | -166.2 | 4.262 | 81.2 | 0.083 | 52.8 | 0.270 | -56.7 | 0.948 | 17.11 |
| 0.9 | 0.548 | -170.5 | 3.831 | 77.6 | 0.089 | 55.3 | 0.254 | -58.4 | 0.995 | 16.36 |
| 1.0 | 0.550 | -174.4 | 3.467 | 74.5 | 0.095 | 57.1 | 0.242 | -60.5 | 1.028 | 14.58 |
| 1.1 | 0.553 | -177.9 | 3.173 | 71.3 | 0.102 | 58.9 | 0.231 | -63.1 | 1.054 | 13.52 |
| 1.2 | 0.559 | 178.7 | 2.931 | 68.2 | 0.109 | 60.2 | 0.223 | -65.9 | 1.065 | 12.75 |
| 1.3 | 0.563 | 176.2 | 2.723 | 65.5 | 0.116 | 61.5 | 0.216 | -69.3 | 1.072 | 12.06 |
| 1.4 | 0.567 | 173.3 | 2.541 | 62.6 | 0.124 | 62.6 | 0.211 | -73.1 | 1.077 | 11.42 |
| 1.5 | 0.574 | 170.7 | 2.389 | 59.9 | 0.132 | 63.6 | 0.206 | -77.2 | 1.070 | 10.95 |
| 1.6 | 0.577 | 168.3 | 2.263 | 57.3 | 0.141 | 64.3 | 0.202 | -81.6 | 1.066 | 10.49 |
| 1.7 | 0.586 | 166.0 | 2.137 | 54.8 | 0.150 | 64.9 | 0.199 | -86.5 | 1.053 | 10.13 |
| 1.8 | 0.589 | 163.7 | 2.029 | 52.1 | 0.159 | 65.3 | 0.199 | -91.6 | 1.051 | 9.68 |
| 1.9 | 0.597 | 161.5 | 1.933 | 49.8 | 0.169 | 65.5 | 0.199 | -97.1 | 1.036 | 9.44 |
| 2.0 | 0.608 | 159.2 | 1.846 | 47.0 | 0.178 | 65.7 | 0.201 | -102.4 | 1.015 | 9.41 |
| 2.1 | 0.615 | 157.2 | 1.764 | 44.6 | 0.189 | 65.7 | 0.204 | -108.3 | 1.001 | 9.56 |
| 2.2 | 0.621 | 155.1 | 1.696 | 42.4 | 0.199 | 65.4 | 0.208 | -113.8 | 0.989 | 9.31 |
| 2.3 | 0.629 | 153.6 | 1.631 | 40.4 | 0.209 | 65.1 | 0.214 | -119.6 | 0.974 | 8.93 |
| 2.4 | 0.636 | 152.1 | 1.565 | 38.3 | 0.220 | 64.8 | 0.222 | -124.8 | 0.960 | 8.53 |
| 2.5 | 0.642 | 150.5 | 1.508 | 36.3 | 0.230 | 64.1 | 0.231 | -130.0 | 0.948 | 8.16 |
| 2.6 | 0.650 | 148.7 | 1.446 | 34.1 | 0.241 | 63.7 | 0.242 | -134.8 | 0.936 | 7.78 |
| 2.7 | 0.655 | 147.8 | 1.399 | 32.4 | 0.252 | 63.2 | 0.251 | -138.9 | 0.924 | 7.44 |
| 2.8 | 0.664 | 146.7 | 1.350 | 30.3 | 0.263 | 62.6 | 0.262 | -143.0 | 0.908 | 7.10 |
| 2.9 | 0.664 | 145.2 | 1.322 | 28.3 | 0.274 | 61.9 | 0.271 | -146.9 | 0.902 | 6.83 |
| 3.0 | 0.669 | 143.9 | 1.280 | 27.1 | 0.285 | 61.1 | 0.280 | -150.9 | 0.896 | 6.52 |
| 4.0 | 0.730 | 130.4 | 0.975 | 11.8 | 0.399 | 49.6 | 0.398 | 173.3 | 0.835 | 3.88 |
| 5.0 | 0.778 | 120.2 | 0.770 | 2.9 | 0.474 | 38.0 | 0.542 | 148.2 | 0.848 | 2.11 |

V_{CE} = 1 V, I_c = 10 mA, Z_o = 50 Ω

| Frequency (GHz) | S ₁₁ | | S ₂₁ | | S ₁₂ | | S ₂₂ | | K | MAG/MSG (dB) |
|--------------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-------|-----------------|
| | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | | |
| 0.1 | 0.629 | -65.6 | 22.146 | 140.8 | 0.031 | 61.6 | 0.780 | -33.7 | 0.257 | 28.58 |
| 0.2 | 0.569 | -107.8 | 15.408 | 117.8 | 0.043 | 52.0 | 0.544 | -48.8 | 0.433 | 25.59 |
| 0.3 | 0.545 | -130.5 | 11.295 | 105.5 | 0.050 | 50.2 | 0.411 | -54.6 | 0.589 | 23.56 |
| 0.4 | 0.529 | -144.4 | 8.772 | 98.0 | 0.056 | 51.2 | 0.332 | -57.2 | 0.723 | 21.94 |
| 0.5 | 0.520 | -153.7 | 7.124 | 92.0 | 0.062 | 53.3 | 0.282 | -58.4 | 0.831 | 20.58 |
| 0.6 | 0.518 | -161.2 | 6.027 | 87.6 | 0.069 | 55.6 | 0.250 | -59.6 | 0.906 | 19.43 |
| 0.7 | 0.521 | -166.7 | 5.190 | 83.5 | 0.076 | 57.8 | 0.226 | -61.0 | 0.958 | 18.35 |
| 0.8 | 0.522 | -171.7 | 4.570 | 79.8 | 0.083 | 59.5 | 0.208 | -62.2 | 1.000 | 17.31 |
| 0.9 | 0.523 | -175.0 | 4.090 | 76.6 | 0.091 | 61.1 | 0.194 | -64.4 | 1.030 | 15.48 |
| 1.0 | 0.530 | -178.5 | 3.700 | 73.7 | 0.099 | 62.4 | 0.183 | -66.7 | 1.046 | 14.44 |
| 1.1 | 0.532 | 178.3 | 3.385 | 70.7 | 0.107 | 63.4 | 0.174 | -69.7 | 1.061 | 13.51 |
| 1.2 | 0.538 | 175.5 | 3.126 | 67.9 | 0.115 | 64.2 | 0.166 | -73.1 | 1.064 | 12.80 |
| 1.3 | 0.544 | 173.1 | 2.899 | 65.3 | 0.123 | 64.8 | 0.160 | -77.0 | 1.065 | 12.15 |
| 1.4 | 0.547 | 170.8 | 2.708 | 62.6 | 0.132 | 65.2 | 0.156 | -81.5 | 1.065 | 11.55 |
| 1.5 | 0.555 | 168.5 | 2.542 | 60.0 | 0.142 | 65.6 | 0.152 | -86.4 | 1.057 | 11.08 |
| 1.6 | 0.559 | 165.9 | 2.404 | 57.5 | 0.151 | 65.7 | 0.150 | -91.7 | 1.053 | 10.62 |
| 1.7 | 0.568 | 164.0 | 2.272 | 55.2 | 0.160 | 65.7 | 0.149 | -97.4 | 1.042 | 10.27 |
| 1.8 | 0.573 | 161.8 | 2.154 | 52.6 | 0.170 | 65.7 | 0.150 | -103.2 | 1.036 | 9.87 |
| 1.9 | 0.578 | 159.8 | 2.058 | 50.4 | 0.179 | 65.3 | 0.151 | -109.3 | 1.030 | 9.54 |
| 2.0 | 0.590 | 157.5 | 1.961 | 47.6 | 0.189 | 65.2 | 0.155 | -115.4 | 1.012 | 9.47 |
| 2.1 | 0.596 | 155.7 | 1.873 | 45.4 | 0.200 | 64.9 | 0.160 | -121.5 | 1.004 | 9.35 |
| 2.2 | 0.603 | 154.2 | 1.804 | 43.3 | 0.209 | 64.5 | 0.167 | -127.3 | 0.992 | 9.35 |
| 2.3 | 0.614 | 152.5 | 1.733 | 41.3 | 0.219 | 63.9 | 0.175 | -132.9 | 0.977 | 8.97 |
| 2.4 | 0.620 | 151.1 | 1.664 | 39.3 | 0.229 | 63.4 | 0.184 | -138.0 | 0.969 | 8.61 |
| 2.5 | 0.624 | 149.6 | 1.602 | 37.4 | 0.240 | 62.6 | 0.195 | -142.8 | 0.963 | 8.25 |
| 2.6 | 0.634 | 148.1 | 1.539 | 35.2 | 0.250 | 62.0 | 0.206 | -147.1 | 0.951 | 7.88 |
| 2.7 | 0.641 | 147.0 | 1.489 | 33.6 | 0.261 | 61.4 | 0.216 | -150.7 | 0.939 | 7.57 |
| 2.8 | 0.646 | 146.0 | 1.440 | 31.6 | 0.271 | 60.7 | 0.227 | -154.2 | 0.930 | 7.26 |
| 2.9 | 0.648 | 144.8 | 1.409 | 29.6 | 0.281 | 60.0 | 0.237 | -157.7 | 0.923 | 7.00 |
| 3.0 | 0.653 | 143.6 | 1.367 | 28.3 | 0.292 | 59.1 | 0.246 | -161.3 | 0.918 | 6.71 |
| 4.0 | 0.715 | 130.6 | 1.050 | 12.8 | 0.395 | 48.0 | 0.365 | 167.4 | 0.859 | 4.24 |
| 5.0 | 0.769 | 121.0 | 0.831 | 2.9 | 0.467 | 37.3 | 0.512 | 145.8 | 0.854 | 2.50 |

V_{CE} = 1 V, I_c = 20 mA, Z_o = 50 Ω

| Frequency (GHz) | S ₁₁ | | S ₂₁ | | S ₁₂ | | S ₂₂ | | K | MAG/MSG (dB) |
|--------------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-------|-----------------|
| | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | | |
| 0.1 | 0.484 | -95.4 | 29.200 | 129.3 | 0.025 | 57.9 | 0.626 | -47.5 | 0.420 | 30.75 |
| 0.2 | 0.486 | -134.4 | 17.811 | 108.4 | 0.033 | 56.6 | 0.383 | -62.5 | 0.660 | 27.28 |
| 0.3 | 0.493 | -151.2 | 12.457 | 98.5 | 0.041 | 59.4 | 0.273 | -68.2 | 0.809 | 24.79 |
| 0.4 | 0.491 | -161.1 | 9.518 | 92.5 | 0.050 | 62.3 | 0.213 | -71.4 | 0.908 | 22.81 |
| 0.5 | 0.495 | -167.2 | 7.682 | 87.8 | 0.059 | 64.7 | 0.175 | -73.5 | 0.963 | 21.16 |
| 0.6 | 0.496 | -172.7 | 6.453 | 84.2 | 0.068 | 66.2 | 0.151 | -76.1 | 1.001 | 19.57 |
| 0.7 | 0.499 | -176.6 | 5.548 | 80.7 | 0.077 | 67.5 | 0.134 | -79.1 | 1.026 | 17.58 |
| 0.8 | 0.504 | 179.7 | 4.858 | 77.6 | 0.087 | 68.1 | 0.120 | -82.2 | 1.042 | 16.22 |
| 0.9 | 0.507 | 177.3 | 4.354 | 74.7 | 0.097 | 68.7 | 0.111 | -86.5 | 1.049 | 15.19 |
| 1.0 | 0.513 | 174.7 | 3.933 | 72.2 | 0.106 | 68.8 | 0.103 | -91.2 | 1.052 | 14.28 |
| 1.1 | 0.517 | 172.2 | 3.595 | 69.5 | 0.116 | 68.8 | 0.098 | -96.7 | 1.054 | 13.48 |
| 1.2 | 0.525 | 170.4 | 3.316 | 66.9 | 0.126 | 68.7 | 0.094 | -102.6 | 1.049 | 12.85 |
| 1.3 | 0.528 | 168.2 | 3.074 | 64.6 | 0.136 | 68.4 | 0.092 | -109.4 | 1.051 | 12.16 |
| 1.4 | 0.533 | 166.4 | 2.865 | 62.1 | 0.146 | 68.0 | 0.093 | -116.0 | 1.048 | 11.59 |
| 1.5 | 0.542 | 164.3 | 2.690 | 59.7 | 0.156 | 67.7 | 0.094 | -123.3 | 1.040 | 11.14 |
| 1.6 | 0.547 | 162.1 | 2.541 | 57.5 | 0.166 | 67.1 | 0.098 | -129.9 | 1.035 | 10.70 |
| 1.7 | 0.554 | 160.6 | 2.401 | 55.2 | 0.176 | 66.6 | 0.102 | -136.6 | 1.029 | 10.29 |
| 1.8 | 0.559 | 158.6 | 2.273 | 52.7 | 0.186 | 65.9 | 0.109 | -142.4 | 1.027 | 9.86 |
| 1.9 | 0.565 | 156.9 | 2.167 | 50.6 | 0.196 | 65.1 | 0.116 | -148.1 | 1.022 | 9.53 |
| 2.0 | 0.577 | 155.0 | 2.066 | 48.1 | 0.206 | 64.5 | 0.125 | -153.1 | 1.009 | 9.42 |
| 2.1 | 0.584 | 153.0 | 1.976 | 46.0 | 0.217 | 63.7 | 0.135 | -157.7 | 1.002 | 9.35 |
| 2.2 | 0.590 | 151.6 | 1.898 | 44.1 | 0.226 | 63.0 | 0.145 | -161.7 | 0.997 | 9.23 |
| 2.3 | 0.598 | 150.4 | 1.830 | 42.2 | 0.236 | 62.2 | 0.156 | -165.6 | 0.988 | 8.90 |
| 2.4 | 0.606 | 149.2 | 1.757 | 40.4 | 0.246 | 61.3 | 0.168 | -168.8 | 0.980 | 8.54 |
| 2.5 | 0.614 | 147.7 | 1.691 | 38.4 | 0.255 | 60.4 | 0.180 | -171.5 | 0.974 | 8.21 |
| 2.6 | 0.619 | 146.3 | 1.627 | 36.4 | 0.266 | 59.6 | 0.192 | -174.0 | 0.970 | 7.87 |
| 2.7 | 0.627 | 145.5 | 1.578 | 34.9 | 0.275 | 58.7 | 0.202 | -176.3 | 0.960 | 7.59 |
| 2.8 | 0.633 | 144.5 | 1.520 | 32.9 | 0.285 | 57.9 | 0.213 | -178.3 | 0.955 | 7.28 |
| 2.9 | 0.632 | 143.3 | 1.494 | 30.9 | 0.294 | 57.2 | 0.223 | 179.5 | 0.950 | 7.06 |
| 3.0 | 0.640 | 142.1 | 1.451 | 29.7 | 0.303 | 56.2 | 0.232 | 177.0 | 0.943 | 6.80 |
| 4.0 | 0.701 | 130.1 | 1.123 | 14.4 | 0.394 | 45.2 | 0.343 | 154.6 | 0.898 | 4.54 |
| 5.0 | 0.758 | 121.1 | 0.902 | 3.9 | 0.459 | 35.6 | 0.482 | 139.2 | 0.878 | 2.93 |

V_{CE} = 2 V, I_c = 1 mA, Z_o = 50 Ω

| Frequency (GHz) | S ₁₁ | | S ₂₁ | | S ₁₂ | | S ₂₂ | | K | MAG/MSG (dB) |
|--------------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-------|-----------------|
| | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | | |
| 0.1 | 0.942 | -23.5 | 3.506 | 164.8 | 0.038 | 75.1 | 0.985 | -7.6 | 0.061 | 19.68 |
| 0.2 | 0.925 | -46.3 | 3.350 | 148.3 | 0.068 | 63.5 | 0.946 | -14.5 | 0.108 | 16.90 |
| 0.3 | 0.898 | -67.1 | 3.086 | 135.3 | 0.092 | 52.2 | 0.896 | -20.2 | 0.141 | 15.25 |
| 0.4 | 0.854 | -84.5 | 2.752 | 123.5 | 0.108 | 43.1 | 0.848 | -24.7 | 0.203 | 14.05 |
| 0.5 | 0.827 | -98.9 | 2.457 | 113.7 | 0.117 | 35.9 | 0.806 | -28.4 | 0.257 | 13.22 |
| 0.6 | 0.803 | -111.7 | 2.206 | 105.7 | 0.121 | 30.0 | 0.772 | -31.6 | 0.305 | 12.59 |
| 0.7 | 0.784 | -122.2 | 1.986 | 98.1 | 0.122 | 25.4 | 0.745 | -34.7 | 0.369 | 12.10 |
| 0.8 | 0.772 | -131.7 | 1.799 | 91.4 | 0.120 | 21.9 | 0.722 | -37.3 | 0.436 | 11.75 |
| 0.9 | 0.766 | -139.6 | 1.646 | 85.7 | 0.116 | 19.4 | 0.705 | -40.3 | 0.500 | 11.51 |
| 1.0 | 0.761 | -146.7 | 1.515 | 80.6 | 0.111 | 17.9 | 0.690 | -43.3 | 0.573 | 11.35 |
| 1.1 | 0.756 | -153.1 | 1.405 | 75.7 | 0.104 | 17.5 | 0.680 | -46.4 | 0.665 | 11.31 |
| 1.2 | 0.757 | -158.9 | 1.314 | 71.1 | 0.097 | 18.1 | 0.669 | -49.6 | 0.755 | 11.33 |
| 1.3 | 0.759 | -164.0 | 1.230 | 67.1 | 0.089 | 20.2 | 0.663 | -53.0 | 0.854 | 11.40 |
| 1.4 | 0.757 | -168.7 | 1.154 | 63.2 | 0.082 | 24.5 | 0.656 | -56.5 | 0.997 | 11.50 |
| 1.5 | 0.756 | -173.2 | 1.090 | 59.6 | 0.076 | 30.7 | 0.651 | -60.3 | 1.138 | 9.32 |
| 1.6 | 0.762 | -177.4 | 1.036 | 56.2 | 0.072 | 39.2 | 0.649 | -64.1 | 1.222 | 8.77 |
| 1.7 | 0.767 | 178.7 | 0.977 | 53.0 | 0.071 | 49.5 | 0.645 | -68.4 | 1.273 | 8.23 |
| 1.8 | 0.767 | 174.9 | 0.940 | 49.8 | 0.075 | 59.7 | 0.642 | -72.7 | 1.265 | 7.88 |
| 1.9 | 0.769 | 171.3 | 0.888 | 46.9 | 0.083 | 68.7 | 0.640 | -77.3 | 1.217 | 7.49 |
| 2.0 | 0.776 | 167.7 | 0.853 | 43.8 | 0.094 | 75.9 | 0.641 | -82.1 | 1.090 | 7.74 |
| 2.1 | 0.780 | 164.6 | 0.810 | 41.3 | 0.108 | 80.5 | 0.641 | -86.8 | 0.999 | 8.74 |
| 2.2 | 0.783 | 161.6 | 0.777 | 39.5 | 0.125 | 83.3 | 0.641 | -91.9 | 0.925 | 7.95 |
| 2.3 | 0.790 | 158.9 | 0.746 | 38.0 | 0.142 | 84.8 | 0.640 | -96.9 | 0.854 | 7.21 |
| 2.4 | 0.794 | 156.3 | 0.711 | 36.1 | 0.161 | 85.3 | 0.645 | -102.1 | 0.805 | 6.46 |
| 2.5 | 0.797 | 153.8 | 0.682 | 34.7 | 0.180 | 84.8 | 0.647 | -107.2 | 0.776 | 5.79 |
| 2.6 | 0.798 | 151.3 | 0.654 | 33.1 | 0.200 | 84.3 | 0.651 | -112.3 | 0.762 | 5.15 |
| 2.7 | 0.799 | 149.3 | 0.631 | 32.5 | 0.219 | 83.2 | 0.651 | -117.1 | 0.764 | 4.60 |
| 2.8 | 0.802 | 147.6 | 0.613 | 31.7 | 0.238 | 81.8 | 0.655 | -121.8 | 0.752 | 4.11 |
| 2.9 | 0.794 | 145.4 | 0.600 | 30.8 | 0.257 | 80.2 | 0.653 | -126.6 | 0.784 | 3.69 |
| 3.0 | 0.799 | 143.3 | 0.584 | 30.5 | 0.276 | 78.3 | 0.654 | -131.6 | 0.788 | 3.26 |
| 4.0 | 0.794 | 125.9 | 0.524 | 27.4 | 0.444 | 56.6 | 0.682 | -176.7 | 0.924 | 0.72 |
| 5.0 | 0.793 | 116.2 | 0.526 | 22.7 | 0.515 | 39.8 | 0.723 | 151.4 | 0.981 | 0.09 |

V_{CE} = 2 V, I_c = 3 mA, Z_o = 50 Ω

| Frequency (GHz) | S ₁₁ | | S ₂₁ | | S ₁₂ | | S ₂₂ | | K | MAG/MSG (dB) |
|--------------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-------|-----------------|
| | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | | |
| 0.1 | 0.870 | -34.1 | 9.420 | 158.0 | 0.035 | 71.2 | 0.945 | -14.7 | 0.091 | 24.28 |
| 0.2 | 0.801 | -65.1 | 8.304 | 137.8 | 0.059 | 56.9 | 0.834 | -25.5 | 0.180 | 21.51 |
| 0.3 | 0.747 | -89.0 | 7.010 | 123.5 | 0.073 | 46.9 | 0.727 | -32.3 | 0.258 | 19.80 |
| 0.4 | 0.697 | -107.3 | 5.852 | 112.7 | 0.081 | 40.9 | 0.643 | -36.4 | 0.350 | 18.57 |
| 0.5 | 0.665 | -121.1 | 4.964 | 104.2 | 0.085 | 37.5 | 0.582 | -39.1 | 0.445 | 17.66 |
| 0.6 | 0.647 | -132.5 | 4.304 | 97.6 | 0.087 | 35.6 | 0.538 | -41.1 | 0.529 | 16.93 |
| 0.7 | 0.634 | -141.7 | 3.776 | 91.7 | 0.088 | 35.3 | 0.506 | -43.1 | 0.621 | 16.31 |
| 0.8 | 0.626 | -149.2 | 3.356 | 86.5 | 0.089 | 35.8 | 0.481 | -44.7 | 0.717 | 15.79 |
| 0.9 | 0.625 | -155.2 | 3.030 | 82.1 | 0.089 | 37.4 | 0.462 | -46.6 | 0.800 | 15.33 |
| 1.0 | 0.623 | -161.0 | 2.757 | 78.2 | 0.089 | 39.6 | 0.447 | -48.7 | 0.881 | 14.89 |
| 1.1 | 0.623 | -165.9 | 2.536 | 74.2 | 0.090 | 42.5 | 0.435 | -51.1 | 0.958 | 14.50 |
| 1.2 | 0.628 | -170.4 | 2.353 | 70.5 | 0.092 | 45.5 | 0.424 | -53.7 | 1.011 | 13.45 |
| 1.3 | 0.629 | -174.2 | 2.191 | 67.3 | 0.094 | 49.0 | 0.416 | -56.7 | 1.063 | 12.15 |
| 1.4 | 0.630 | -177.9 | 2.049 | 63.9 | 0.097 | 52.6 | 0.410 | -59.7 | 1.104 | 11.28 |
| 1.5 | 0.635 | 178.8 | 1.926 | 60.8 | 0.102 | 56.3 | 0.403 | -63.1 | 1.118 | 10.69 |
| 1.6 | 0.636 | 175.4 | 1.829 | 57.8 | 0.107 | 59.7 | 0.399 | -66.6 | 1.124 | 10.19 |
| 1.7 | 0.645 | 172.7 | 1.729 | 54.9 | 0.114 | 62.9 | 0.395 | -70.5 | 1.107 | 9.83 |
| 1.8 | 0.650 | 169.3 | 1.646 | 51.8 | 0.122 | 65.6 | 0.392 | -74.6 | 1.088 | 9.51 |
| 1.9 | 0.653 | 166.7 | 1.567 | 49.2 | 0.131 | 67.8 | 0.390 | -79.0 | 1.069 | 9.18 |
| 2.0 | 0.663 | 163.9 | 1.499 | 46.0 | 0.140 | 69.7 | 0.389 | -83.5 | 1.025 | 9.33 |
| 2.1 | 0.669 | 161.5 | 1.431 | 43.5 | 0.152 | 71.1 | 0.390 | -88.2 | 0.993 | 9.75 |
| 2.2 | 0.674 | 159.0 | 1.374 | 41.2 | 0.163 | 72.1 | 0.390 | -93.1 | 0.966 | 9.26 |
| 2.3 | 0.683 | 157.1 | 1.319 | 39.0 | 0.175 | 72.5 | 0.392 | -98.2 | 0.930 | 8.77 |
| 2.4 | 0.690 | 155.0 | 1.264 | 36.8 | 0.188 | 72.8 | 0.397 | -103.2 | 0.901 | 8.28 |
| 2.5 | 0.695 | 153.1 | 1.215 | 34.7 | 0.202 | 72.6 | 0.402 | -108.2 | 0.877 | 7.80 |
| 2.6 | 0.702 | 151.2 | 1.160 | 32.4 | 0.216 | 72.5 | 0.410 | -113.2 | 0.855 | 7.31 |
| 2.7 | 0.709 | 149.7 | 1.125 | 30.7 | 0.229 | 72.0 | 0.416 | -117.8 | 0.830 | 6.91 |
| 2.8 | 0.713 | 148.4 | 1.081 | 28.9 | 0.243 | 71.4 | 0.423 | -122.4 | 0.817 | 6.48 |
| 2.9 | 0.710 | 146.6 | 1.055 | 27.0 | 0.258 | 70.7 | 0.427 | -126.9 | 0.818 | 6.12 |
| 3.0 | 0.719 | 144.8 | 1.018 | 25.6 | 0.272 | 69.7 | 0.434 | -131.6 | 0.804 | 5.73 |
| 4.0 | 0.759 | 129.3 | 0.769 | 13.2 | 0.416 | 54.7 | 0.522 | -174.8 | 0.799 | 2.67 |
| 5.0 | 0.788 | 118.8 | 0.633 | 8.5 | 0.496 | 40.1 | 0.632 | 153.4 | 0.880 | 1.06 |

V_{CE} = 2 V, I_c = 5 mA, Z_o = 50 Ω

| Frequency (GHz) | S ₁₁ | | S ₂₁ | | S ₁₂ | | S ₂₂ | | K | MAG/MSG (dB) |
|--------------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-------|-----------------|
| | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | | |
| 0.1 | 0.798 | -43.2 | 14.194 | 152.6 | 0.034 | 71.0 | 0.901 | -20.4 | 0.100 | 26.18 |
| 0.2 | 0.707 | -78.7 | 11.604 | 130.3 | 0.052 | 54.0 | 0.738 | -33.2 | 0.260 | 23.51 |
| 0.3 | 0.652 | -103.3 | 9.221 | 116.4 | 0.062 | 46.9 | 0.609 | -39.9 | 0.367 | 21.74 |
| 0.4 | 0.608 | -121.0 | 7.443 | 106.6 | 0.068 | 43.2 | 0.519 | -43.1 | 0.490 | 20.41 |
| 0.5 | 0.586 | -133.6 | 6.193 | 99.2 | 0.071 | 42.8 | 0.459 | -44.9 | 0.600 | 19.39 |
| 0.6 | 0.574 | -143.5 | 5.297 | 93.5 | 0.075 | 43.4 | 0.418 | -46.3 | 0.698 | 18.51 |
| 0.7 | 0.568 | -151.6 | 4.608 | 88.4 | 0.078 | 44.7 | 0.388 | -47.5 | 0.786 | 17.72 |
| 0.8 | 0.563 | -158.0 | 4.066 | 84.0 | 0.081 | 46.7 | 0.366 | -48.8 | 0.870 | 16.99 |
| 0.9 | 0.562 | -163.3 | 3.656 | 80.1 | 0.085 | 49.1 | 0.348 | -50.4 | 0.938 | 16.35 |
| 1.0 | 0.566 | -167.8 | 3.316 | 76.6 | 0.089 | 51.5 | 0.334 | -52.2 | 0.987 | 15.72 |
| 1.1 | 0.567 | -172.2 | 3.043 | 73.2 | 0.093 | 54.0 | 0.323 | -54.4 | 1.029 | 14.09 |
| 1.2 | 0.571 | -175.7 | 2.817 | 70.0 | 0.098 | 56.2 | 0.313 | -56.9 | 1.057 | 13.11 |
| 1.3 | 0.574 | -179.1 | 2.617 | 66.9 | 0.104 | 58.4 | 0.305 | -59.7 | 1.075 | 12.32 |
| 1.4 | 0.576 | 177.8 | 2.443 | 64.0 | 0.111 | 60.4 | 0.298 | -62.7 | 1.090 | 11.61 |
| 1.5 | 0.582 | 175.1 | 2.299 | 61.2 | 0.118 | 62.4 | 0.292 | -66.1 | 1.088 | 11.09 |
| 1.6 | 0.587 | 172.0 | 2.176 | 58.3 | 0.125 | 63.9 | 0.288 | -69.8 | 1.080 | 10.67 |
| 1.7 | 0.594 | 169.5 | 2.059 | 55.8 | 0.133 | 65.3 | 0.283 | -73.9 | 1.068 | 10.29 |
| 1.8 | 0.601 | 166.7 | 1.956 | 52.9 | 0.142 | 66.4 | 0.281 | -78.1 | 1.054 | 9.97 |
| 1.9 | 0.606 | 164.5 | 1.865 | 50.5 | 0.151 | 67.2 | 0.279 | -82.8 | 1.041 | 9.68 |
| 2.0 | 0.613 | 161.8 | 1.782 | 47.5 | 0.161 | 68.1 | 0.278 | -87.5 | 1.020 | 9.59 |
| 2.1 | 0.622 | 159.6 | 1.700 | 45.1 | 0.171 | 68.5 | 0.279 | -92.5 | 0.996 | 9.97 |
| 2.2 | 0.628 | 157.7 | 1.637 | 43.0 | 0.182 | 68.8 | 0.280 | -97.7 | 0.978 | 9.54 |
| 2.3 | 0.639 | 155.8 | 1.573 | 40.8 | 0.192 | 68.8 | 0.283 | -103.0 | 0.953 | 9.13 |
| 2.4 | 0.644 | 154.1 | 1.506 | 38.6 | 0.204 | 68.6 | 0.288 | -108.3 | 0.940 | 8.69 |
| 2.5 | 0.652 | 152.3 | 1.450 | 36.6 | 0.216 | 68.2 | 0.294 | -113.4 | 0.918 | 8.28 |
| 2.6 | 0.656 | 150.6 | 1.389 | 34.2 | 0.227 | 67.9 | 0.302 | -118.4 | 0.909 | 7.86 |
| 2.7 | 0.664 | 149.4 | 1.345 | 32.5 | 0.239 | 67.4 | 0.310 | -122.9 | 0.888 | 7.50 |
| 2.8 | 0.671 | 148.0 | 1.296 | 30.5 | 0.252 | 66.9 | 0.318 | -127.4 | 0.872 | 7.12 |
| 2.9 | 0.670 | 146.5 | 1.266 | 28.4 | 0.263 | 66.2 | 0.324 | -131.9 | 0.868 | 6.82 |
| 3.0 | 0.678 | 145.3 | 1.225 | 27.1 | 0.276 | 65.4 | 0.332 | -136.4 | 0.854 | 6.47 |
| 4.0 | 0.736 | 130.6 | 0.926 | 12.1 | 0.403 | 52.9 | 0.436 | -177.3 | 0.803 | 3.61 |
| 5.0 | 0.781 | 120.2 | 0.732 | 4.5 | 0.484 | 39.8 | 0.571 | 153.1 | 0.840 | 1.80 |

V_{CE} = 2 V, I_c = 7 mA, Z_o = 50 Ω

| Frequency (GHz) | S ₁₁ | | S ₂₁ | | S ₁₂ | | S ₂₂ | | K | MAG/MSG (dB) |
|--------------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-------|-----------------|
| | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | | |
| 0.1 | 0.723 | -50.2 | 18.053 | 147.9 | 0.032 | 65.6 | 0.859 | -25.1 | 0.196 | 27.53 |
| 0.2 | 0.634 | -89.7 | 13.837 | 125.1 | 0.046 | 52.3 | 0.662 | -38.9 | 0.336 | 24.77 |
| 0.3 | 0.585 | -114.1 | 10.591 | 111.7 | 0.054 | 47.6 | 0.526 | -45.0 | 0.472 | 22.90 |
| 0.4 | 0.558 | -130.4 | 8.393 | 102.8 | 0.060 | 46.7 | 0.439 | -47.6 | 0.596 | 21.45 |
| 0.5 | 0.541 | -141.4 | 6.890 | 96.1 | 0.065 | 47.9 | 0.383 | -48.8 | 0.713 | 20.27 |
| 0.6 | 0.533 | -150.8 | 5.854 | 91.1 | 0.069 | 49.7 | 0.345 | -49.8 | 0.805 | 19.26 |
| 0.7 | 0.531 | -158.0 | 5.082 | 86.5 | 0.074 | 51.6 | 0.318 | -50.8 | 0.879 | 18.35 |
| 0.8 | 0.528 | -163.8 | 4.470 | 82.5 | 0.080 | 53.8 | 0.298 | -51.8 | 0.944 | 17.49 |
| 0.9 | 0.529 | -167.9 | 4.014 | 78.9 | 0.085 | 55.9 | 0.282 | -53.2 | 0.992 | 16.73 |
| 1.0 | 0.533 | -172.2 | 3.635 | 75.8 | 0.091 | 57.9 | 0.269 | -55.1 | 1.023 | 15.06 |
| 1.1 | 0.536 | -176.1 | 3.329 | 72.6 | 0.098 | 59.8 | 0.258 | -57.2 | 1.048 | 13.98 |
| 1.2 | 0.541 | -179.4 | 3.079 | 69.5 | 0.104 | 61.4 | 0.249 | -59.7 | 1.061 | 13.19 |
| 1.3 | 0.547 | -177.6 | 2.860 | 66.8 | 0.112 | 62.6 | 0.241 | -62.7 | 1.066 | 12.51 |
| 1.4 | 0.549 | -175.0 | 2.668 | 64.0 | 0.119 | 63.9 | 0.235 | -66.0 | 1.073 | 11.84 |
| 1.5 | 0.557 | -172.3 | 2.508 | 61.3 | 0.128 | 64.9 | 0.229 | -69.6 | 1.064 | 11.39 |
| 1.6 | 0.559 | -170.0 | 2.373 | 58.7 | 0.136 | 65.6 | 0.225 | -73.5 | 1.062 | 10.89 |
| 1.7 | 0.567 | -167.4 | 2.245 | 56.2 | 0.144 | 66.4 | 0.220 | -77.9 | 1.053 | 10.51 |
| 1.8 | 0.574 | -165.0 | 2.131 | 53.6 | 0.154 | 66.8 | 0.218 | -82.5 | 1.041 | 10.18 |
| 1.9 | 0.578 | -162.9 | 2.031 | 51.3 | 0.163 | 67.1 | 0.216 | -87.5 | 1.033 | 9.84 |
| 2.0 | 0.590 | -160.2 | 1.940 | 48.4 | 0.173 | 67.3 | 0.216 | -92.6 | 1.009 | 9.93 |
| 2.1 | 0.596 | -158.6 | 1.852 | 46.0 | 0.183 | 67.4 | 0.217 | -98.1 | 0.997 | 10.05 |
| 2.2 | 0.602 | -156.5 | 1.780 | 44.0 | 0.193 | 67.2 | 0.220 | -103.8 | 0.986 | 9.65 |
| 2.3 | 0.614 | -154.8 | 1.715 | 41.9 | 0.203 | 67.0 | 0.223 | -109.3 | 0.962 | 9.26 |
| 2.4 | 0.618 | -153.3 | 1.643 | 39.8 | 0.214 | 66.6 | 0.229 | -114.9 | 0.955 | 8.86 |
| 2.5 | 0.624 | -151.7 | 1.582 | 37.8 | 0.225 | 66.0 | 0.236 | -120.1 | 0.943 | 8.48 |
| 2.6 | 0.633 | -150.1 | 1.518 | 35.5 | 0.236 | 65.6 | 0.245 | -125.1 | 0.928 | 8.09 |
| 2.7 | 0.640 | -148.8 | 1.469 | 33.8 | 0.247 | 65.0 | 0.253 | -129.6 | 0.913 | 7.74 |
| 2.8 | 0.647 | -147.9 | 1.419 | 31.8 | 0.258 | 64.5 | 0.262 | -134.0 | 0.900 | 7.41 |
| 2.9 | 0.649 | -146.4 | 1.386 | 29.7 | 0.269 | 63.8 | 0.270 | -138.3 | 0.891 | 7.12 |
| 3.0 | 0.655 | -145.0 | 1.346 | 28.5 | 0.281 | 63.0 | 0.278 | -142.6 | 0.884 | 6.81 |
| 4.0 | 0.719 | -131.4 | 1.024 | 12.9 | 0.397 | 51.5 | 0.388 | 179.0 | 0.822 | 4.12 |
| 5.0 | 0.770 | -121.2 | 0.805 | 3.4 | 0.475 | 39.5 | 0.534 | 151.6 | 0.836 | 2.29 |

V_{CE} = 2 V, I_c = 10 mA, Z_o = 50 Ω

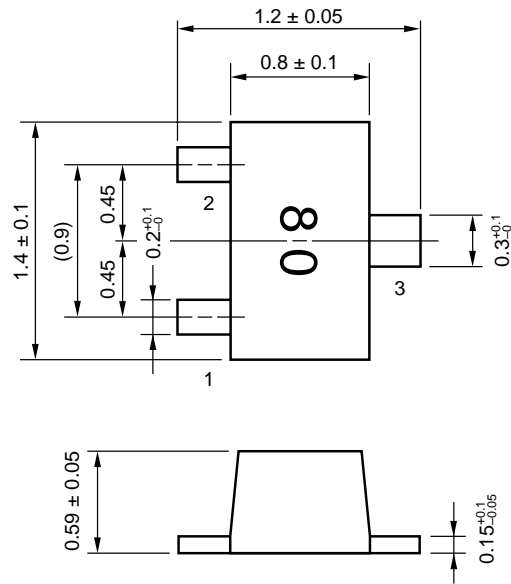
| Frequency (GHz) | S ₁₁ | | S ₂₁ | | S ₁₂ | | S ₂₂ | | K | MAG/MSG (dB) |
|--------------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-------|-----------------|
| | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | | |
| 0.1 | 0.641 | -61.2 | 22.663 | 142.5 | 0.028 | 61.4 | 0.799 | -30.9 | 0.259 | 29.10 |
| 0.2 | 0.561 | -102.1 | 16.085 | 119.4 | 0.040 | 53.0 | 0.572 | -45.2 | 0.435 | 26.07 |
| 0.3 | 0.528 | -125.6 | 11.886 | 107.0 | 0.048 | 51.5 | 0.438 | -50.5 | 0.589 | 23.98 |
| 0.4 | 0.512 | -140.6 | 9.283 | 99.2 | 0.054 | 52.4 | 0.358 | -52.5 | 0.717 | 22.37 |
| 0.5 | 0.499 | -150.6 | 7.550 | 93.2 | 0.060 | 54.3 | 0.308 | -53.3 | 0.828 | 21.03 |
| 0.6 | 0.498 | -158.5 | 6.387 | 88.8 | 0.066 | 56.6 | 0.275 | -54.0 | 0.898 | 19.85 |
| 0.7 | 0.498 | -164.3 | 5.515 | 84.7 | 0.073 | 58.8 | 0.251 | -54.8 | 0.954 | 18.80 |
| 0.8 | 0.500 | -169.2 | 4.847 | 81.0 | 0.080 | 60.6 | 0.233 | -55.8 | 0.994 | 17.83 |
| 0.9 | 0.501 | -172.9 | 4.341 | 77.9 | 0.087 | 62.1 | 0.219 | -57.3 | 1.023 | 16.04 |
| 1.0 | 0.506 | -176.6 | 3.930 | 74.9 | 0.095 | 63.4 | 0.207 | -59.2 | 1.039 | 14.96 |
| 1.1 | 0.509 | -179.8 | 3.596 | 72.0 | 0.103 | 64.6 | 0.197 | -61.5 | 1.052 | 14.04 |
| 1.2 | 0.518 | 177.3 | 3.324 | 69.1 | 0.111 | 65.4 | 0.188 | -64.2 | 1.053 | 13.37 |
| 1.3 | 0.518 | 174.7 | 3.078 | 66.6 | 0.119 | 65.9 | 0.181 | -67.6 | 1.062 | 12.59 |
| 1.4 | 0.525 | 172.5 | 2.875 | 64.0 | 0.128 | 66.5 | 0.176 | -71.3 | 1.058 | 12.04 |
| 1.5 | 0.531 | 170.0 | 2.698 | 61.5 | 0.137 | 66.9 | 0.171 | -75.5 | 1.052 | 11.55 |
| 1.6 | 0.536 | 167.6 | 2.553 | 59.0 | 0.146 | 67.0 | 0.167 | -79.9 | 1.047 | 11.11 |
| 1.7 | 0.543 | 165.4 | 2.414 | 56.6 | 0.155 | 67.2 | 0.163 | -85.1 | 1.040 | 10.70 |
| 1.8 | 0.549 | 163.0 | 2.289 | 54.1 | 0.165 | 67.1 | 0.162 | -90.5 | 1.032 | 10.33 |
| 1.9 | 0.554 | 161.3 | 2.185 | 51.9 | 0.174 | 66.9 | 0.161 | -96.4 | 1.025 | 10.01 |
| 2.0 | 0.566 | 159.0 | 2.083 | 49.2 | 0.184 | 66.8 | 0.162 | -102.0 | 1.009 | 9.97 |
| 2.1 | 0.573 | 157.2 | 1.988 | 47.0 | 0.194 | 66.5 | 0.165 | -108.2 | 0.998 | 10.10 |
| 2.2 | 0.579 | 155.4 | 1.914 | 45.0 | 0.204 | 66.1 | 0.168 | -114.4 | 0.990 | 9.73 |
| 2.3 | 0.590 | 153.8 | 1.844 | 43.0 | 0.213 | 65.5 | 0.174 | -120.5 | 0.974 | 9.36 |
| 2.4 | 0.597 | 152.5 | 1.765 | 41.0 | 0.224 | 65.0 | 0.181 | -126.0 | 0.966 | 8.97 |
| 2.5 | 0.605 | 151.0 | 1.704 | 39.1 | 0.234 | 64.2 | 0.189 | -131.3 | 0.953 | 8.62 |
| 2.6 | 0.611 | 149.5 | 1.634 | 36.9 | 0.245 | 63.6 | 0.199 | -136.2 | 0.947 | 8.25 |
| 2.7 | 0.619 | 148.5 | 1.583 | 35.2 | 0.255 | 63.0 | 0.208 | -140.4 | 0.934 | 7.93 |
| 2.8 | 0.625 | 147.4 | 1.529 | 33.2 | 0.265 | 62.3 | 0.218 | -144.3 | 0.925 | 7.61 |
| 2.9 | 0.627 | 146.2 | 1.494 | 31.1 | 0.275 | 61.6 | 0.226 | -148.3 | 0.918 | 7.34 |
| 3.0 | 0.633 | 144.7 | 1.455 | 29.9 | 0.286 | 60.8 | 0.235 | -152.2 | 0.909 | 7.07 |
| 4.0 | 0.701 | 132.0 | 1.114 | 14.0 | 0.392 | 49.8 | 0.347 | 173.1 | 0.848 | 4.54 |
| 5.0 | 0.763 | 122.1 | 0.878 | 3.5 | 0.467 | 38.9 | 0.497 | 149.2 | 0.838 | 2.74 |

V_{CE} = 2 V, I_c = 20 mA, Z_o = 50 Ω

| Frequency (GHz) | S ₁₁ | | S ₂₁ | | S ₁₂ | | S ₂₂ | | K | MAG/MSG (dB) |
|--------------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-------|-----------------|
| | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | | |
| 0.1 | 0.496 | -86.5 | 30.622 | 131.8 | 0.024 | 62.5 | 0.662 | -42.6 | 0.392 | 31.09 |
| 0.2 | 0.464 | -127.3 | 19.196 | 110.4 | 0.031 | 58.0 | 0.420 | -56.2 | 0.645 | 27.87 |
| 0.3 | 0.462 | -145.8 | 13.510 | 100.2 | 0.040 | 60.5 | 0.305 | -60.4 | 0.793 | 25.32 |
| 0.4 | 0.456 | -157.0 | 10.353 | 94.1 | 0.048 | 62.9 | 0.242 | -62.0 | 0.896 | 23.37 |
| 0.5 | 0.454 | -163.7 | 8.367 | 89.3 | 0.056 | 65.2 | 0.203 | -62.4 | 0.961 | 21.75 |
| 0.6 | 0.459 | -169.7 | 7.037 | 85.6 | 0.065 | 67.0 | 0.177 | -63.4 | 0.991 | 20.35 |
| 0.7 | 0.463 | -173.9 | 6.056 | 82.3 | 0.074 | 68.2 | 0.158 | -64.7 | 1.014 | 18.40 |
| 0.8 | 0.468 | -177.8 | 5.305 | 79.0 | 0.083 | 69.0 | 0.144 | -66.1 | 1.030 | 16.99 |
| 0.9 | 0.469 | 179.4 | 4.748 | 76.3 | 0.093 | 69.5 | 0.132 | -68.5 | 1.041 | 15.87 |
| 1.0 | 0.474 | 176.8 | 4.291 | 73.7 | 0.102 | 69.7 | 0.123 | -71.5 | 1.045 | 14.94 |
| 1.1 | 0.479 | 174.4 | 3.913 | 71.1 | 0.112 | 69.8 | 0.115 | -75.1 | 1.048 | 14.10 |
| 1.2 | 0.486 | 172.5 | 3.616 | 68.7 | 0.121 | 69.8 | 0.109 | -79.5 | 1.044 | 13.47 |
| 1.3 | 0.492 | 170.2 | 3.351 | 66.3 | 0.131 | 69.4 | 0.104 | -84.6 | 1.042 | 12.83 |
| 1.4 | 0.495 | 168.4 | 3.125 | 63.8 | 0.140 | 69.3 | 0.101 | -90.2 | 1.042 | 12.22 |
| 1.5 | 0.503 | 166.3 | 2.933 | 61.5 | 0.150 | 68.9 | 0.098 | -96.8 | 1.036 | 11.75 |
| 1.6 | 0.510 | 164.1 | 2.773 | 59.2 | 0.160 | 68.3 | 0.097 | -103.5 | 1.029 | 11.34 |
| 1.7 | 0.518 | 162.7 | 2.619 | 57.1 | 0.170 | 67.9 | 0.097 | -110.9 | 1.022 | 10.96 |
| 1.8 | 0.524 | 160.7 | 2.482 | 54.8 | 0.180 | 67.3 | 0.100 | -118.2 | 1.019 | 10.56 |
| 1.9 | 0.528 | 158.8 | 2.365 | 52.7 | 0.190 | 66.5 | 0.103 | -125.5 | 1.016 | 10.20 |
| 2.0 | 0.539 | 156.7 | 2.254 | 50.2 | 0.199 | 66.0 | 0.109 | -132.1 | 1.006 | 10.05 |
| 2.1 | 0.550 | 155.2 | 2.154 | 48.1 | 0.210 | 65.3 | 0.116 | -138.5 | 0.995 | 10.12 |
| 2.2 | 0.556 | 153.6 | 2.075 | 46.3 | 0.219 | 64.6 | 0.124 | -144.4 | 0.990 | 9.77 |
| 2.3 | 0.566 | 152.1 | 1.995 | 44.3 | 0.228 | 63.8 | 0.133 | -149.8 | 0.980 | 9.41 |
| 2.4 | 0.573 | 150.8 | 1.915 | 42.5 | 0.238 | 63.0 | 0.143 | -154.3 | 0.977 | 9.05 |
| 2.5 | 0.580 | 149.4 | 1.845 | 40.6 | 0.248 | 62.0 | 0.154 | -158.4 | 0.970 | 8.72 |
| 2.6 | 0.587 | 148.3 | 1.771 | 38.5 | 0.258 | 61.2 | 0.165 | -161.8 | 0.965 | 8.37 |
| 2.7 | 0.594 | 147.1 | 1.717 | 37.0 | 0.268 | 60.5 | 0.175 | -164.7 | 0.957 | 8.07 |
| 2.8 | 0.600 | 146.4 | 1.659 | 35.1 | 0.277 | 59.7 | 0.186 | -167.5 | 0.951 | 7.77 |
| 2.9 | 0.599 | 145.3 | 1.623 | 33.0 | 0.286 | 58.9 | 0.195 | -170.2 | 0.949 | 7.54 |
| 3.0 | 0.609 | 143.9 | 1.578 | 31.8 | 0.296 | 58.0 | 0.203 | -173.2 | 0.939 | 7.27 |
| 4.0 | 0.676 | 132.4 | 1.224 | 16.1 | 0.389 | 47.2 | 0.313 | 160.8 | 0.889 | 4.98 |
| 5.0 | 0.743 | 123.1 | 0.979 | 4.8 | 0.457 | 37.5 | 0.459 | 143.2 | 0.864 | 3.31 |

PACKAGE DIMENSIONS

FLAT-LEAD 3-PIN THIN-TYPE ULTRA SUPER MINIMOLD (UNIT: mm)



PIN CONNECTIONS

- 1. Emitter
- 2. Base
- 3. Collector

[MEMO]

[MEMO]

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