

NPN Planer RF TRANSISTOR

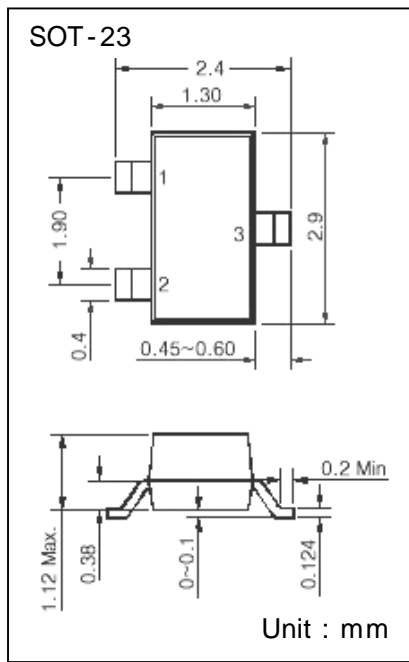
DESCRIPTION

The THN6301S is a low Noise figure and good associated gain performance at UHF,VHF and Microwave frequencies

It is suitable for a high density surface mount since transistor has been SOT23 package

FEATURES

- o Low Noise Figure
N.F = 1.1dB TYP. @ f=1GHz, V_{CE}=8V, I_c=5mA
- o High Gain
MAG = 16.5dB TYP. @ f=1GHz, V_{CE}=8V, I_c=15mA
- o High Transition Frequency
f_T = 10GHz TYP. @ f=1GHz, V_{CE}=8V, I_c=15mA



PIN CONFIGURATION

| PIN NO | SYMBOL | DESCRIPTION |
|--------|--------|-------------|
| 1 | B | Base |
| 2 | E | Emitter |
| 3 | C | Collector |

MARKING : AA1

MAXIMUM RATINGS

| SYMBOL | PARAMETER | CONDITION | VALUE | Unit |
|------------------|--------------------------------|---------------------|-----------|------|
| V _{CBO} | Collector-Base Voltage | Open Emitter | 25 | V |
| V _{CEO} | Collector-Emitter Voltage | Open Base | 12 | V |
| V _{EBO} | Emitter-Base Voltage | Open Collector | 2.5 | V |
| I _c | Collector Current (DC) | | 65 | mA |
| P _T | Total Power Dissipation | T _s = 60 | 150 | mW |
| T _{STG} | Storage Temperature | | -65 ~ 150 | |
| T _J | Operating Junction Temperature | | 150 | |

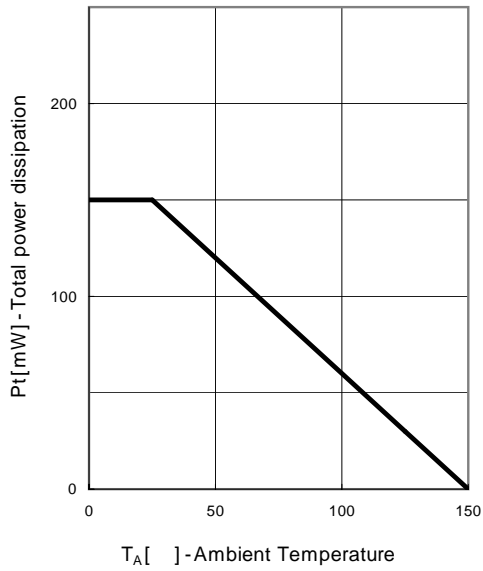
Electrical Characteristics ($T_A = 25$)

| SYMBOL | PARAMETER | CONDITION | VALUE | | | Unit |
|------------------|----------------------------|---|-------|------|-----|------|
| | | | min | typ | max | |
| V _{CB0} | Collector-Base Voltage | I _{CE} = 100uA, I _E = 0 | 20 | 25 | | V |
| V _{CEO} | Collector-Emitter Voltage | I _{CE} = 100uA, I _B = 0 | 12 | 14 | | V |
| I _{CB0} | Collector-Cut-off current | V _{CB} = 10V, I _E = 0 | | | 100 | n A |
| I _{EBO} | Emitter-Cut-off current | V _{EB} = 1V, I _C = 0 | | | 100 | n A |
| h _{fe} | D.C Current Gain | V _{CE} = 8V, I _C = 15mA | 100 | 200 | 300 | |
| f _T | Transition Frequency | V _{CE} = 8V, I _C = 15mA | | 10 | | GHz |
| C _{CB} | Collector-Base Capacitance | V _{CB} = 10V, f = 1MHz | | 0.60 | | pF |

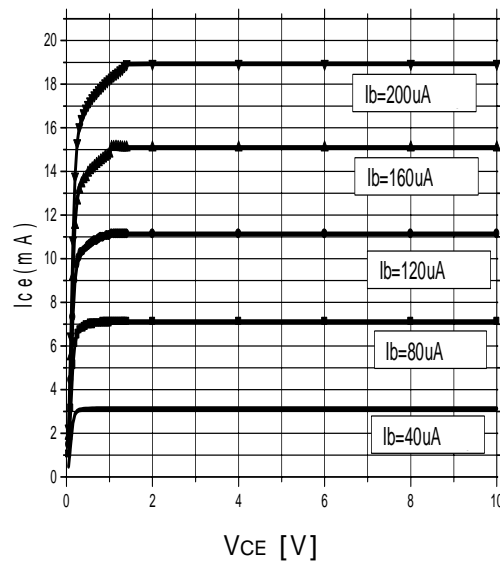
Performance Characteristics

| SYMBOL | PARAMETER | CONDITION | VALUE | | | Unit |
|---------------------------------|----------------------|---|-------|-------|-----|------|
| | | | min | typ | max | |
| [S ₂₁] ² | Insertion Power Gain | V _{CE} =8V, I _C =5mA, f=1GHz | | 11.5 | | dB |
| | | V _{CE} =8V, I _C =15mA, f=1GHz | | 13.5 | | |
| MSG | Maximum Stable Gain | V _{CE} =8V, I _C =5mA, f=1GHz | | 15.5 | | dB |
| | | V _{CE} =8V, I _C =15mA, f=1GHz | | 16.5 | | |
| NF _{min} | Minimum Noise Figure | V _{CE} =8V, I _C =5mA, f=1GHz | | 1.1 | | dB |
| r _n | Noise Resistance | V _{CE} =8V, I _C =5mA, f=1GHz | | 0.055 | | |
| G _A | Associated Gain | V _{CE} =8V, I _C =5mA, f=1GHz | | 14.5 | | dB |
| | | V _{CE} =8V, I _C =15mA, f=1GHz | | 15 | | |
| OIP ₃ | Output 3rd Intercept | V _{CE} =8V, I _C =15mA, f=1GHz | | 27 | | dBm |

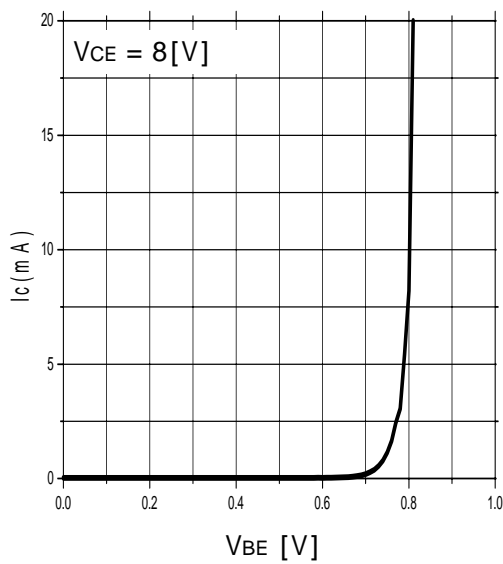
Total power dissipation $P_t = f(T_A)$
 ($T_A = 25$)



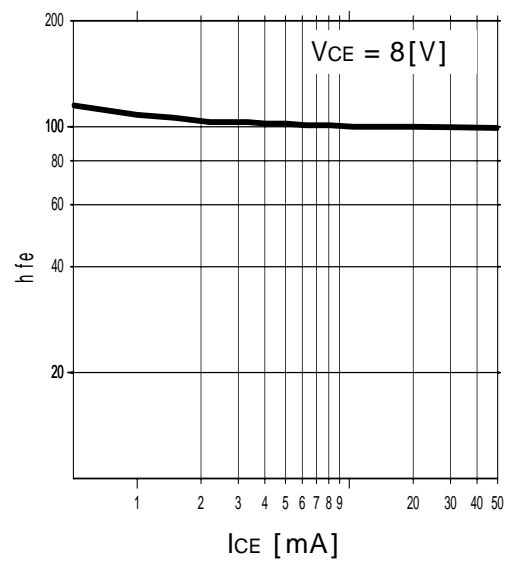
Icc vs. VCE



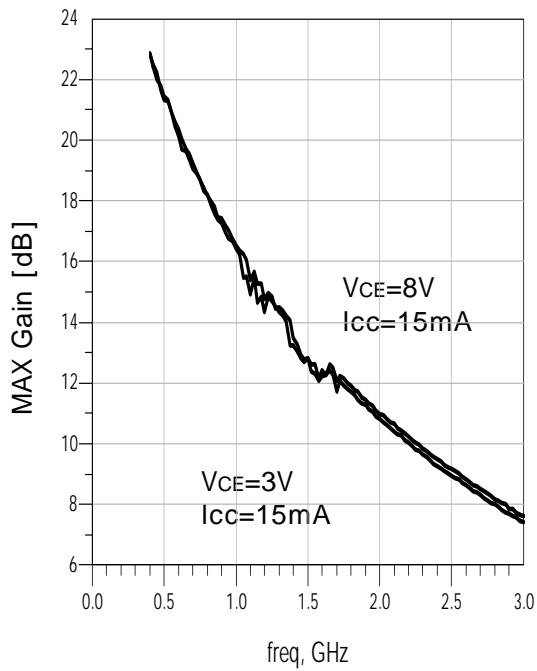
Icc vs. VBE



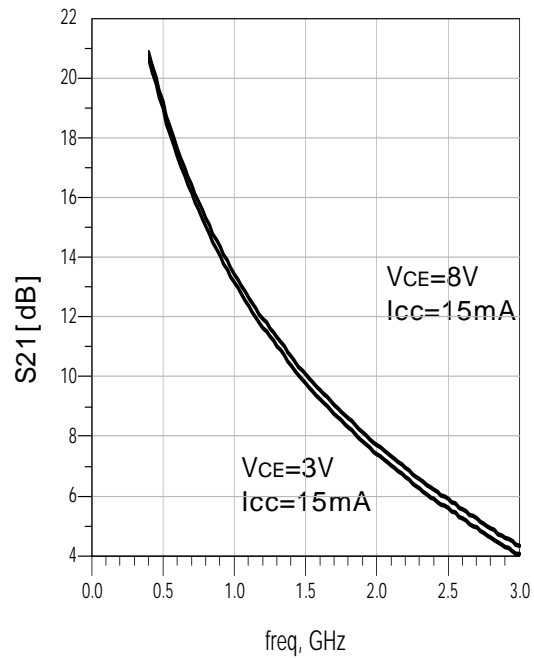
hfe vs. Icc



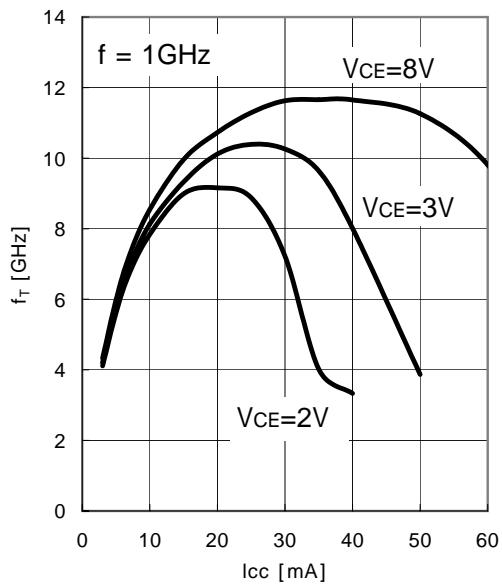
Power Gain : MSG vs. Frequency



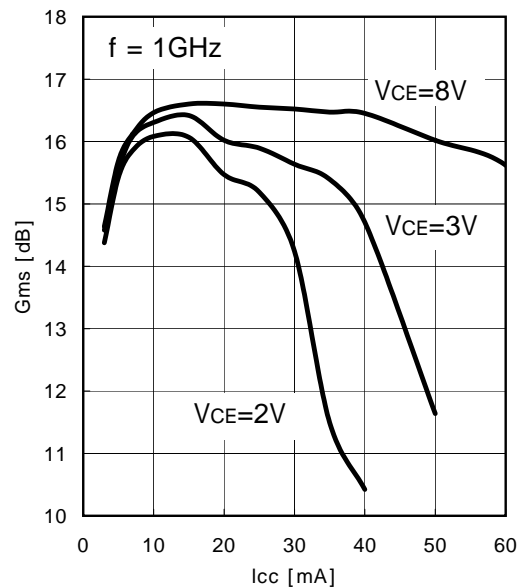
Power Gain : S₂₁ vs. Frequency



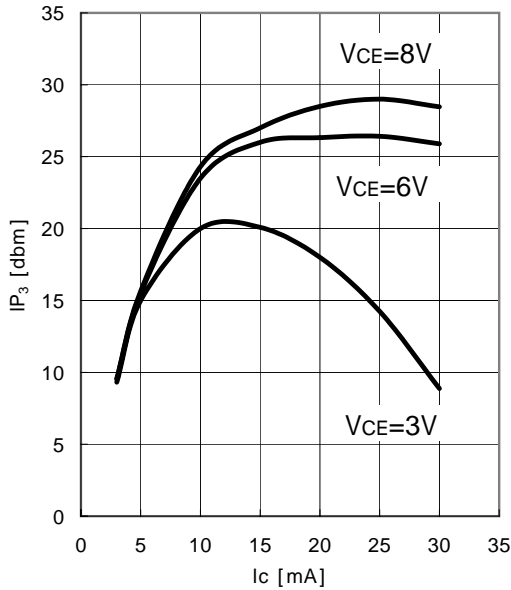
Transition Frequency : f_T vs. I_{CC}



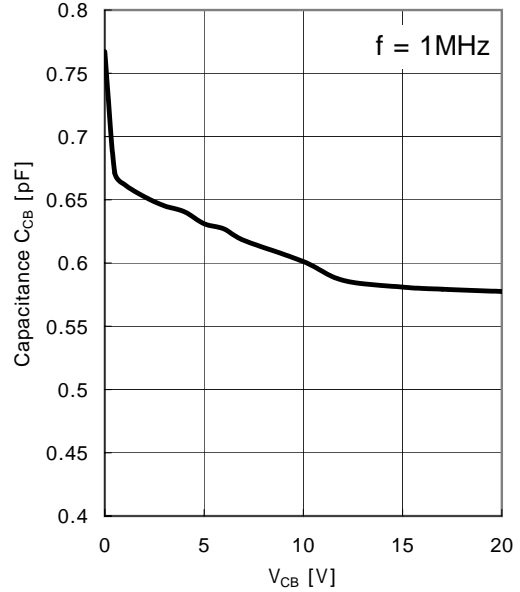
Power Gain : MSG vs. I_{CC}



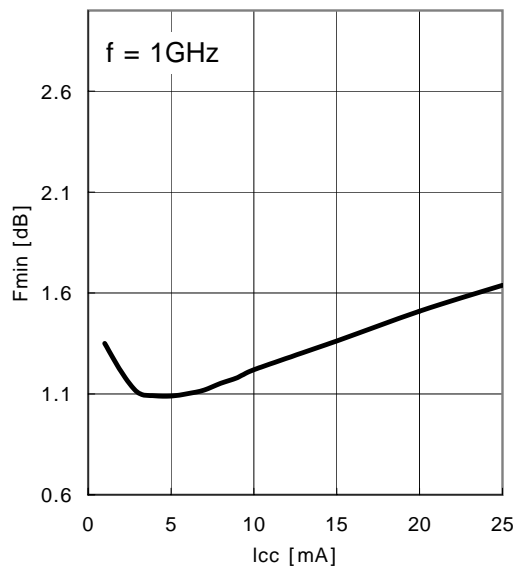
Intermodulation Intercept Point $IP3=f(Ic)$
 ($Z_S = Z_L = 50 \Omega$)



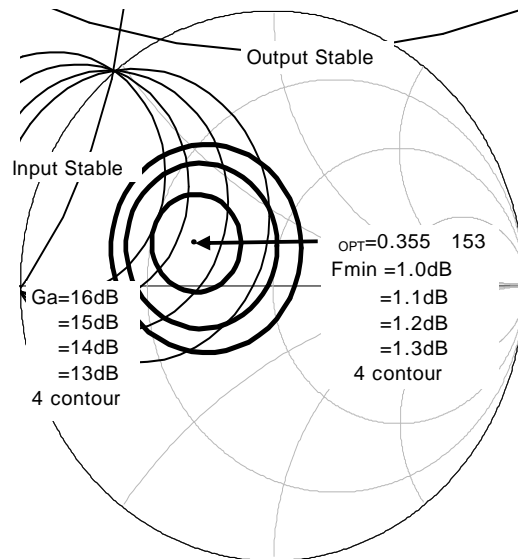
C_{CB} vs. V_{CB}



Fmin vs. Icc
 $V_{CE} = 8V, I_{cc} = \text{parameter}, Z_s = Z_{opt}$



Noise Figure Contours & Constant Gain
 $f = 1\text{GHz}, V_{CE} = 8V, I_{cc} = 5\text{mA}$



Common Emitter S-Parameter Data
 $V_{CE} = 3V, I_{CC} = 3mA$

| freq | S(1,1) | S(2,1) | S(1,2) | S(2,2) |
|----------|------------------|-----------------|----------------|------------------|
| 400.0MHz | 0.669 / -91.260 | 6.389 / 113.667 | 0.093 / 41.242 | 0.658 / -56.210 |
| 600.0MHz | 0.591 / -116.551 | 4.795 / 97.539 | 0.106 / 34.002 | 0.554 / -69.347 |
| 800.0MHz | 0.548 / -134.577 | 3.799 / 85.274 | 0.107 / 31.893 | 0.492 / -79.180 |
| 1.000GHz | 0.530 / -148.770 | 3.121 / 75.149 | 0.109 / 34.373 | 0.461 / -88.098 |
| 1.200GHz | 0.522 / -159.455 | 2.638 / 67.037 | 0.111 / 36.704 | 0.458 / -94.276 |
| 1.400GHz | 0.524 / -169.504 | 2.291 / 58.719 | 0.117 / 40.679 | 0.462 / -103.617 |
| 1.600GHz | 0.533 / -177.611 | 2.019 / 52.033 | 0.122 / 45.350 | 0.467 / -110.131 |
| 1.800GHz | 0.543 / 174.468 | 1.804 / 45.454 | 0.135 / 49.642 | 0.483 / -116.174 |
| 2.000GHz | 0.557 / 167.968 | 1.621 / 39.619 | 0.148 / 53.084 | 0.501 / -122.880 |
| 2.200GHz | 0.569 / 161.134 | 1.478 / 34.016 | 0.166 / 55.353 | 0.518 / -129.476 |
| 2.400GHz | 0.580 / 155.148 | 1.348 / 29.268 | 0.187 / 56.417 | 0.538 / -135.444 |
| 2.600GHz | 0.596 / 149.582 | 1.244 / 24.067 | 0.210 / 56.426 | 0.559 / -142.351 |
| 2.800GHz | 0.607 / 142.626 | 1.144 / 19.595 | 0.233 / 55.556 | 0.579 / -146.080 |
| 3.000GHz | 0.614 / 137.215 | 1.059 / 16.254 | 0.255 / 54.303 | 0.605 / -152.161 |

 $V_{CE} = 3V, I_{CC} = 5mA$

| freq | S(1,1) | S(2,1) | S(1,2) | S(2,2) |
|----------|------------------|-----------------|----------------|------------------|
| 400.0MHz | 0.578 / -108.220 | 8.153 / 106.751 | 0.080 / 42.751 | 0.537 / -66.313 |
| 600.0MHz | 0.524 / -131.976 | 5.878 / 92.628 | 0.090 / 40.339 | 0.440 / -78.796 |
| 800.0MHz | 0.499 / -148.190 | 4.565 / 82.116 | 0.095 / 41.840 | 0.386 / -88.029 |
| 1.000GHz | 0.489 / -160.975 | 3.713 / 73.353 | 0.104 / 43.842 | 0.366 / -96.568 |
| 1.200GHz | 0.485 / -170.201 | 3.127 / 66.308 | 0.112 / 47.872 | 0.367 / -101.536 |
| 1.400GHz | 0.491 / -179.049 | 2.708 / 58.910 | 0.124 / 49.734 | 0.376 / -110.217 |
| 1.600GHz | 0.503 / 174.017 | 2.383 / 52.876 | 0.135 / 52.795 | 0.385 / -116.309 |
| 1.800GHz | 0.513 / 167.188 | 2.133 / 46.876 | 0.150 / 54.802 | 0.401 / -121.481 |
| 2.000GHz | 0.526 / 161.512 | 1.920 / 41.437 | 0.167 / 55.925 | 0.420 / -127.551 |
| 2.200GHz | 0.539 / 155.297 | 1.754 / 36.122 | 0.187 / 56.242 | 0.437 / -133.592 |
| 2.400GHz | 0.549 / 150.174 | 1.604 / 31.518 | 0.205 / 55.989 | 0.459 / -139.147 |
| 2.600GHz | 0.567 / 145.239 | 1.483 / 26.473 | 0.227 / 55.156 | 0.482 / -145.317 |
| 2.800GHz | 0.577 / 138.729 | 1.368 / 21.950 | 0.247 / 53.513 | 0.505 / -147.922 |
| 3.000GHz | 0.582 / 133.719 | 1.274 / 18.402 | 0.267 / 52.001 | 0.533 / -153.890 |

 $V_{CE} = 3V, I_{CC} = 10mA$

| freq | S(1,1) | S(2,1) | S(1,2) | S(2,2) |
|----------|------------------|-----------------|----------------|------------------|
| 400.0MHz | 0.489 / -131.217 | 10.037 / 98.564 | 0.063 / 49.972 | 0.380 / -81.298 |
| 600.0MHz | 0.465 / -151.502 | 6.988 / 87.307 | 0.076 / 50.120 | 0.311 / -92.732 |
| 800.0MHz | 0.459 / -164.677 | 5.348 / 78.762 | 0.087 / 54.098 | 0.279 / -101.861 |
| 1.000GHz | 0.459 / -174.570 | 4.315 / 71.431 | 0.101 / 55.498 | 0.273 / -110.245 |
| 1.200GHz | 0.461 / 177.870 | 3.624 / 65.549 | 0.117 / 58.181 | 0.280 / -113.766 |
| 1.400GHz | 0.470 / 170.614 | 3.133 / 59.011 | 0.133 / 59.002 | 0.293 / -121.839 |
| 1.600GHz | 0.480 / 164.637 | 2.757 / 53.722 | 0.151 / 59.298 | 0.305 / -127.311 |
| 1.800GHz | 0.490 / 159.080 | 2.470 / 48.339 | 0.169 / 58.336 | 0.323 / -130.964 |
| 2.000GHz | 0.504 / 154.302 | 2.228 / 43.463 | 0.187 / 57.893 | 0.343 / -136.001 |
| 2.200GHz | 0.515 / 148.888 | 2.039 / 38.506 | 0.206 / 56.544 | 0.360 / -141.355 |
| 2.400GHz | 0.524 / 144.454 | 1.870 / 34.200 | 0.226 / 55.344 | 0.382 / -145.863 |
| 2.600GHz | 0.540 / 139.868 | 1.737 / 29.435 | 0.244 / 53.624 | 0.404 / -151.178 |
| 2.800GHz | 0.550 / 134.110 | 1.609 / 25.062 | 0.265 / 51.986 | 0.428 / -152.701 |
| 3.000GHz | 0.557 / 129.455 | 1.504 / 21.416 | 0.281 / 49.802 | 0.457 / -157.936 |

 $V_{CE} = 3V, I_{CC} = 15mA$

| freq | S(1,1) | S(2,1) | S(1,2) | S(2,2) |
|----------|------------------|-----------------|----------------|------------------|
| 400.0MHz | 0.457 / -143.864 | 10.763 / 94.877 | 0.056 / 52.840 | 0.309 / -90.025 |
| 600.0MHz | 0.450 / -160.675 | 7.407 / 84.972 | 0.072 / 57.561 | 0.261 / -102.139 |
| 800.0MHz | 0.450 / -172.089 | 5.648 / 77.279 | 0.086 / 58.622 | 0.238 / -110.428 |
| 1.000GHz | 0.455 / 179.229 | 4.543 / 70.572 | 0.104 / 59.409 | 0.238 / -119.619 |
| 1.200GHz | 0.457 / 172.555 | 3.815 / 65.126 | 0.120 / 62.677 | 0.247 / -121.459 |
| 1.400GHz | 0.464 / 166.085 | 3.297 / 58.952 | 0.140 / 61.046 | 0.266 / -129.382 |
| 1.600GHz | 0.475 / 160.738 | 2.900 / 53.980 | 0.157 / 60.538 | 0.277 / -133.493 |
| 1.800GHz | 0.484 / 155.274 | 2.599 / 48.822 | 0.175 / 59.746 | 0.296 / -136.613 |
| 2.000GHz | 0.498 / 151.051 | 2.345 / 44.201 | 0.195 / 58.344 | 0.314 / -141.273 |
| 2.200GHz | 0.509 / 145.763 | 2.150 / 39.453 | 0.213 / 56.759 | 0.335 / -145.798 |
| 2.400GHz | 0.518 / 141.657 | 1.972 / 35.219 | 0.234 / 55.180 | 0.355 / -150.183 |
| 2.600GHz | 0.532 / 137.359 | 1.834 / 30.634 | 0.252 / 53.317 | 0.377 / -155.051 |
| 2.800GHz | 0.539 / 131.839 | 1.702 / 26.305 | 0.270 / 51.445 | 0.398 / -155.911 |
| 3.000GHz | 0.548 / 127.407 | 1.594 / 22.787 | 0.289 / 49.058 | 0.428 / -160.790 |

V_{CE} = 3V, I_{CC} = 20mA

| freq | S(1,1) | S(2,1) | S(1,2) | S(2,2) |
|----------|------------------|-----------------|----------------|------------------|
| 400.0MHz | 0.443 / -151.627 | 11.094 / 92.666 | 0.051 / 57.096 | 0.268 / -95.518 |
| 600.0MHz | 0.446 / -166.399 | 7.595 / 83.555 | 0.069 / 60.370 | 0.235 / -107.809 |
| 800.0MHz | 0.451 / -176.508 | 5.779 / 76.341 | 0.087 / 63.139 | 0.219 / -116.167 |
| 1.000GHz | 0.455 / 175.854 | 4.642 / 69.948 | 0.105 / 64.020 | 0.223 / -125.295 |
| 1.200GHz | 0.457 / 169.542 | 3.899 / 64.752 | 0.123 / 63.650 | 0.232 / -126.388 |
| 1.400GHz | 0.468 / 163.338 | 3.367 / 58.803 | 0.143 / 62.762 | 0.250 / -133.833 |
| 1.600GHz | 0.478 / 158.313 | 2.962 / 53.979 | 0.161 / 62.049 | 0.264 / -137.425 |
| 1.800GHz | 0.486 / 153.251 | 2.654 / 48.961 | 0.181 / 60.463 | 0.283 / -140.012 |
| 2.000GHz | 0.497 / 149.094 | 2.396 / 44.448 | 0.199 / 58.916 | 0.301 / -144.647 |
| 2.200GHz | 0.511 / 144.034 | 2.197 / 39.748 | 0.217 / 57.239 | 0.321 / -148.938 |
| 2.400GHz | 0.518 / 139.969 | 2.016 / 35.656 | 0.237 / 55.494 | 0.342 / -152.735 |
| 2.600GHz | 0.533 / 136.025 | 1.875 / 31.126 | 0.257 / 53.154 | 0.365 / -157.310 |
| 2.800GHz | 0.542 / 130.423 | 1.740 / 26.903 | 0.275 / 50.863 | 0.385 / -157.623 |
| 3.000GHz | 0.548 / 126.076 | 1.632 / 23.498 | 0.294 / 49.074 | 0.415 / -162.833 |

V_{CE} = 3V, I_{CC} = 25mA

| freq | S(1,1) | S(2,1) | S(1,2) | S(2,2) |
|----------|------------------|-----------------|----------------|------------------|
| 400.0MHz | 0.441 / -156.587 | 11.211 / 91.193 | 0.049 / 61.572 | 0.247 / -100.342 |
| 600.0MHz | 0.448 / -170.345 | 7.647 / 82.577 | 0.067 / 63.159 | 0.216 / -111.761 |
| 800.0MHz | 0.454 / -179.290 | 5.812 / 75.641 | 0.087 / 64.772 | 0.205 / -119.410 |
| 1.000GHz | 0.461 / 173.579 | 4.665 / 69.420 | 0.106 / 66.203 | 0.213 / -128.166 |
| 1.200GHz | 0.462 / 167.184 | 3.919 / 64.372 | 0.125 / 64.000 | 0.223 / -128.854 |
| 1.400GHz | 0.472 / 161.220 | 3.383 / 58.517 | 0.144 / 64.286 | 0.244 / -135.882 |
| 1.600GHz | 0.484 / 156.644 | 2.976 / 53.774 | 0.164 / 62.616 | 0.259 / -139.515 |
| 1.800GHz | 0.492 / 151.586 | 2.667 / 48.816 | 0.183 / 61.190 | 0.276 / -142.023 |
| 2.000GHz | 0.503 / 147.864 | 2.408 / 44.328 | 0.202 / 59.000 | 0.294 / -146.084 |
| 2.200GHz | 0.514 / 142.927 | 2.207 / 39.695 | 0.221 / 57.139 | 0.314 / -150.402 |
| 2.400GHz | 0.523 / 138.932 | 2.027 / 35.635 | 0.240 / 55.370 | 0.335 / -154.115 |
| 2.600GHz | 0.536 / 135.003 | 1.883 / 31.127 | 0.260 / 53.130 | 0.358 / -158.456 |
| 2.800GHz | 0.546 / 129.366 | 1.750 / 26.994 | 0.277 / 51.175 | 0.378 / -158.948 |
| 3.000GHz | 0.550 / 125.160 | 1.641 / 23.527 | 0.296 / 48.748 | 0.408 / -163.880 |

V_{CE} = 3V, I_{CC} = 30mA

| freq | S(1,1) | S(2,1) | S(1,2) | S(2,2) |
|----------|------------------|-----------------|----------------|------------------|
| 400.0MHz | 0.450 / -161.058 | 11.155 / 90.003 | 0.050 / 61.082 | 0.224 / -103.425 |
| 600.0MHz | 0.455 / -173.438 | 7.595 / 81.705 | 0.066 / 65.309 | 0.203 / -114.073 |
| 800.0MHz | 0.461 / 178.359 | 5.770 / 74.924 | 0.086 / 66.355 | 0.198 / -121.814 |
| 1.000GHz | 0.467 / 171.557 | 4.630 / 68.853 | 0.106 / 66.465 | 0.205 / -130.277 |
| 1.200GHz | 0.470 / 165.861 | 3.888 / 63.827 | 0.124 / 66.819 | 0.218 / -129.816 |
| 1.400GHz | 0.480 / 160.230 | 3.355 / 58.021 | 0.146 / 65.371 | 0.240 / -136.905 |
| 1.600GHz | 0.492 / 155.411 | 2.950 / 53.293 | 0.164 / 63.630 | 0.254 / -140.521 |
| 1.800GHz | 0.500 / 150.705 | 2.644 / 48.374 | 0.184 / 61.439 | 0.274 / -142.896 |
| 2.000GHz | 0.513 / 146.799 | 2.387 / 43.916 | 0.204 / 59.512 | 0.291 / -146.924 |
| 2.200GHz | 0.523 / 141.832 | 2.188 / 39.308 | 0.224 / 57.805 | 0.313 / -151.119 |
| 2.400GHz | 0.530 / 138.189 | 2.009 / 35.269 | 0.243 / 55.917 | 0.334 / -154.667 |
| 2.600GHz | 0.544 / 134.038 | 1.869 / 30.749 | 0.262 / 53.494 | 0.356 / -159.331 |
| 2.800GHz | 0.552 / 128.737 | 1.734 / 26.548 | 0.282 / 51.051 | 0.376 / -159.288 |
| 3.000GHz | 0.559 / 124.653 | 1.628 / 23.197 | 0.299 / 48.932 | 0.406 / -164.152 |

V_{CE} = 6V, I_{CC} = 5mA

| freq | S(1,1) | S(2,1) | S(1,2) | S(2,2) |
|----------|------------------|-----------------|----------------|------------------|
| 400.0MHz | 0.584 / -105.075 | 8.147 / 108.031 | 0.079 / 43.298 | 0.554 / -64.699 |
| 600.0MHz | 0.525 / -128.648 | 5.907 / 93.728 | 0.090 / 38.912 | 0.452 / -77.605 |
| 800.0MHz | 0.495 / -145.602 | 4.602 / 83.059 | 0.096 / 40.537 | 0.399 / -86.590 |
| 1.000GHz | 0.484 / -158.406 | 3.747 / 74.141 | 0.103 / 44.831 | 0.375 / -95.746 |
| 1.200GHz | 0.480 / -168.174 | 3.159 / 67.087 | 0.110 / 46.551 | 0.376 / -100.424 |
| 1.400GHz | 0.487 / -177.058 | 2.735 / 59.615 | 0.125 / 49.200 | 0.381 / -109.211 |
| 1.600GHz | 0.497 / 175.757 | 2.406 / 53.580 | 0.134 / 52.964 | 0.391 / -115.428 |
| 1.800GHz | 0.505 / 168.565 | 2.152 / 47.548 | 0.148 / 54.362 | 0.406 / -120.582 |
| 2.000GHz | 0.518 / 162.863 | 1.939 / 42.106 | 0.165 / 55.603 | 0.423 / -126.556 |
| 2.200GHz | 0.531 / 156.643 | 1.772 / 36.735 | 0.183 / 55.667 | 0.442 / -132.646 |
| 2.400GHz | 0.543 / 151.353 | 1.621 / 32.126 | 0.202 / 56.032 | 0.463 / -138.154 |
| 2.600GHz | 0.559 / 146.064 | 1.501 / 27.080 | 0.225 / 55.144 | 0.484 / -144.276 |
| 2.800GHz | 0.569 / 139.544 | 1.386 / 22.598 | 0.245 / 53.850 | 0.507 / -147.189 |
| 3.000GHz | 0.577 / 134.805 | 1.289 / 18.936 | 0.265 / 52.408 | 0.534 / -153.141 |

V_{CE} = 6V, I_{CC} = 10mA

| freq | S(1,1) | S(2,1) | S(1,2) | S(2,2) |
|----------|------------------|-----------------|----------------|------------------|
| 400.0MHz | 0.484 / -128.129 | 10.199 / 99.649 | 0.059 / 48.175 | 0.395 / -79.244 |
| 600.0MHz | 0.458 / -148.684 | 7.124 / 88.199 | 0.075 / 50.721 | 0.322 / -91.926 |
| 800.0MHz | 0.449 / -162.384 | 5.459 / 79.547 | 0.086 / 54.260 | 0.286 / -101.010 |
| 1.000GHz | 0.448 / -172.733 | 4.406 / 72.194 | 0.101 / 56.618 | 0.279 / -109.994 |
| 1.200GHz | 0.450 / 179.728 | 3.703 / 66.272 | 0.115 / 57.771 | 0.283 / -113.079 |
| 1.400GHz | 0.456 / 171.900 | 3.202 / 59.779 | 0.132 / 58.551 | 0.296 / -121.351 |
| 1.600GHz | 0.468 / 166.049 | 2.818 / 54.541 | 0.149 / 58.194 | 0.305 / -126.237 |
| 1.800GHz | 0.477 / 160.067 | 2.524 / 49.099 | 0.167 / 57.941 | 0.324 / -130.058 |
| 2.000GHz | 0.491 / 155.255 | 2.276 / 44.265 | 0.185 / 57.161 | 0.341 / -135.309 |
| 2.200GHz | 0.502 / 149.723 | 2.085 / 39.286 | 0.204 / 56.386 | 0.360 / -140.569 |
| 2.400GHz | 0.513 / 145.239 | 1.912 / 34.967 | 0.223 / 55.214 | 0.381 / -145.225 |
| 2.600GHz | 0.529 / 140.794 | 1.773 / 30.181 | 0.244 / 53.669 | 0.403 / -150.523 |
| 2.800GHz | 0.537 / 134.687 | 1.646 / 25.831 | 0.262 / 51.834 | 0.426 / -152.214 |
| 3.000GHz | 0.543 / 130.299 | 1.539 / 22.248 | 0.281 / 49.856 | 0.454 / -157.446 |

V_{CE} = 6V, I_{CC} = 15mA

| freq | S(1,1) | S(2,1) | S(1,2) | S(2,2) |
|----------|------------------|-----------------|----------------|------------------|
| 400.0MHz | 0.448 / -140.431 | 11.027 / 95.848 | 0.055 / 53.910 | 0.324 / -88.628 |
| 600.0MHz | 0.436 / -158.389 | 7.605 / 85.804 | 0.070 / 57.644 | 0.271 / -100.251 |
| 800.0MHz | 0.437 / -169.928 | 5.802 / 78.069 | 0.087 / 58.939 | 0.244 / -109.205 |
| 1.000GHz | 0.439 / -178.735 | 4.672 / 71.353 | 0.104 / 60.665 | 0.243 / -118.670 |
| 1.200GHz | 0.440 / 173.963 | 3.923 / 65.912 | 0.120 / 61.868 | 0.251 / -120.834 |
| 1.400GHz | 0.451 / 167.177 | 3.388 / 59.808 | 0.138 / 61.751 | 0.265 / -128.613 |
| 1.600GHz | 0.461 / 161.679 | 2.984 / 54.878 | 0.156 / 59.972 | 0.278 / -133.018 |
| 1.800GHz | 0.470 / 156.178 | 2.672 / 49.730 | 0.175 / 59.465 | 0.296 / -136.060 |
| 2.000GHz | 0.482 / 151.806 | 2.413 / 45.121 | 0.193 / 57.991 | 0.311 / -140.801 |
| 2.200GHz | 0.494 / 146.554 | 2.212 / 40.362 | 0.213 / 56.325 | 0.330 / -145.617 |
| 2.400GHz | 0.503 / 142.591 | 2.028 / 36.165 | 0.230 / 55.017 | 0.352 / -149.609 |
| 2.600GHz | 0.517 / 138.177 | 1.886 / 31.584 | 0.249 / 53.126 | 0.374 / -154.480 |
| 2.800GHz | 0.527 / 132.409 | 1.750 / 27.340 | 0.269 / 51.386 | 0.394 / -155.327 |
| 3.000GHz | 0.534 / 128.081 | 1.640 / 23.881 | 0.286 / 49.425 | 0.423 / -160.384 |

V_{CE} = 6V, I_{CC} = 20mA

| freq | S(1,1) | S(2,1) | S(1,2) | S(2,2) |
|----------|------------------|-----------------|----------------|------------------|
| 400.0MHz | 0.435 / -148.375 | 11.434 / 93.739 | 0.052 / 57.018 | 0.283 / -94.267 |
| 600.0MHz | 0.428 / -163.826 | 7.843 / 84.468 | 0.070 / 59.803 | 0.244 / -106.390 |
| 800.0MHz | 0.433 / -174.378 | 5.971 / 77.215 | 0.088 / 63.801 | 0.224 / -115.198 |
| 1.000GHz | 0.437 / 177.307 | 4.802 / 70.858 | 0.106 / 64.222 | 0.226 / -123.723 |
| 1.200GHz | 0.440 / 170.600 | 4.030 / 65.672 | 0.123 / 63.687 | 0.234 / -125.248 |
| 1.400GHz | 0.448 / 164.771 | 3.482 / 59.726 | 0.140 / 62.517 | 0.253 / -132.832 |
| 1.600GHz | 0.460 / 159.258 | 3.065 / 54.993 | 0.160 / 61.159 | 0.263 / -136.725 |
| 1.800GHz | 0.467 / 154.029 | 2.746 / 49.978 | 0.180 / 60.043 | 0.281 / -139.651 |
| 2.000GHz | 0.479 / 149.765 | 2.480 / 45.494 | 0.198 / 58.667 | 0.298 / -143.866 |
| 2.200GHz | 0.492 / 144.741 | 2.273 / 40.850 | 0.217 / 56.867 | 0.317 / -148.580 |
| 2.400GHz | 0.500 / 140.793 | 2.087 / 36.789 | 0.237 / 55.167 | 0.337 / -152.230 |
| 2.600GHz | 0.512 / 136.698 | 1.940 / 32.208 | 0.255 / 53.092 | 0.359 / -156.696 |
| 2.800GHz | 0.523 / 131.299 | 1.803 / 28.003 | 0.273 / 50.734 | 0.378 / -157.288 |
| 3.000GHz | 0.530 / 126.694 | 1.689 / 24.579 | 0.290 / 48.655 | 0.407 / -162.249 |

V_{CE} = 6V, I_{CC} = 25mA

| freq | S(1,1) | S(2,1) | S(1,2) | S(2,2) |
|----------|------------------|-----------------|----------------|------------------|
| 400.0MHz | 0.424 / -152.995 | 11.650 / 92.373 | 0.049 / 60.411 | 0.265 / -98.864 |
| 600.0MHz | 0.426 / -167.503 | 7.963 / 83.649 | 0.068 / 62.815 | 0.225 / -109.762 |
| 800.0MHz | 0.432 / -177.284 | 6.057 / 76.668 | 0.087 / 63.669 | 0.212 / -118.788 |
| 1.000GHz | 0.437 / 175.123 | 4.866 / 70.508 | 0.106 / 65.483 | 0.216 / -127.075 |
| 1.200GHz | 0.438 / 168.693 | 4.087 / 65.452 | 0.123 / 64.512 | 0.226 / -128.344 |
| 1.400GHz | 0.448 / 162.832 | 3.527 / 59.635 | 0.144 / 63.814 | 0.244 / -135.269 |
| 1.600GHz | 0.460 / 157.650 | 3.104 / 54.971 | 0.164 / 61.859 | 0.257 / -138.969 |
| 1.800GHz | 0.469 / 152.729 | 2.783 / 50.052 | 0.182 / 60.773 | 0.275 / -141.893 |
| 2.000GHz | 0.480 / 148.631 | 2.512 / 45.630 | 0.200 / 58.806 | 0.290 / -146.042 |
| 2.200GHz | 0.491 / 143.675 | 2.304 / 41.016 | 0.220 / 56.944 | 0.310 / -150.091 |
| 2.400GHz | 0.499 / 139.822 | 2.115 / 37.009 | 0.238 / 55.000 | 0.330 / -153.872 |
| 2.600GHz | 0.514 / 135.498 | 1.968 / 32.513 | 0.259 / 53.021 | 0.350 / -158.209 |
| 2.800GHz | 0.524 / 130.208 | 1.828 / 28.311 | 0.275 / 50.714 | 0.370 / -158.697 |
| 3.000GHz | 0.529 / 125.835 | 1.715 / 24.929 | 0.291 / 48.466 | 0.399 / -163.195 |

V_{CE} = 6V, I_{CC} = 30mA

| freq | S(1,1) | S(2,1) | S(1,2) | S(2,2) |
|----------|------------------|-----------------|----------------|------------------|
| 400.0MHz | 0.421 / -156.682 | 11.763 / 91.439 | 0.048 / 64.883 | 0.246 / -101.370 |
| 600.0MHz | 0.427 / -170.180 | 8.026 / 83.016 | 0.070 / 64.603 | 0.214 / -112.828 |
| 800.0MHz | 0.432 / -179.228 | 6.099 / 76.231 | 0.087 / 66.352 | 0.206 / -120.980 |
| 1.000GHz | 0.437 / 173.532 | 4.899 / 70.181 | 0.106 / 65.850 | 0.212 / -129.300 |
| 1.200GHz | 0.441 / 167.394 | 4.113 / 65.255 | 0.126 / 65.811 | 0.220 / -129.986 |
| 1.400GHz | 0.450 / 161.533 | 3.551 / 59.503 | 0.145 / 63.904 | 0.240 / -136.730 |
| 1.600GHz | 0.461 / 156.749 | 3.126 / 54.851 | 0.164 / 61.966 | 0.253 / -140.468 |
| 1.800GHz | 0.470 / 151.705 | 2.801 / 50.015 | 0.184 / 60.899 | 0.268 / -143.137 |
| 2.000GHz | 0.482 / 147.724 | 2.530 / 45.644 | 0.201 / 59.201 | 0.287 / -146.812 |
| 2.200GHz | 0.493 / 142.776 | 2.318 / 41.097 | 0.222 / 57.112 | 0.305 / -151.264 |
| 2.400GHz | 0.501 / 139.063 | 2.129 / 37.101 | 0.242 / 55.366 | 0.326 / -154.761 |
| 2.600GHz | 0.514 / 134.989 | 1.982 / 32.641 | 0.260 / 53.237 | 0.348 / -159.167 |
| 2.800GHz | 0.524 / 129.462 | 1.842 / 28.455 | 0.278 / 51.022 | 0.364 / -159.315 |
| 3.000GHz | 0.530 / 125.297 | 1.728 / 25.111 | 0.294 / 48.601 | 0.395 / -163.945 |

V_{CE} = 8V, I_{CC} = 3mA

| freq | S(1,1) | S(2,1) | S(1,2) | S(2,2) |
|----------|------------------|-----------------|----------------|------------------|
| 400.0MHz | 0.673 / -88.966 | 6.488 / 114.927 | 0.096 / 42.239 | 0.667 / -55.457 |
| 600.0MHz | 0.596 / -113.638 | 4.902 / 98.721 | 0.105 / 36.029 | 0.566 / -68.579 |
| 800.0MHz | 0.550 / -131.873 | 3.891 / 86.410 | 0.109 / 33.079 | 0.499 / -78.497 |
| 1.000GHz | 0.527 / -146.478 | 3.204 / 76.266 | 0.110 / 33.218 | 0.467 / -87.422 |
| 1.200GHz | 0.517 / -157.284 | 2.710 / 68.186 | 0.113 / 35.593 | 0.460 / -93.585 |
| 1.400GHz | 0.520 / -167.659 | 2.358 / 59.850 | 0.117 / 40.147 | 0.463 / -102.425 |
| 1.600GHz | 0.526 / -175.958 | 2.076 / 53.153 | 0.122 / 45.549 | 0.467 / -109.046 |
| 1.800GHz | 0.537 / 176.060 | 1.858 / 46.581 | 0.133 / 49.168 | 0.481 / -115.067 |
| 2.000GHz | 0.549 / 169.482 | 1.670 / 40.764 | 0.146 / 52.678 | 0.499 / -121.599 |
| 2.200GHz | 0.560 / 162.421 | 1.523 / 35.107 | 0.165 / 54.804 | 0.514 / -128.361 |
| 2.400GHz | 0.573 / 156.431 | 1.391 / 30.308 | 0.185 / 56.651 | 0.532 / -134.382 |
| 2.600GHz | 0.588 / 150.764 | 1.281 / 25.128 | 0.206 / 56.582 | 0.553 / -141.198 |
| 2.800GHz | 0.600 / 143.749 | 1.179 / 20.624 | 0.230 / 55.688 | 0.572 / -144.613 |
| 3.000GHz | 0.607 / 138.133 | 1.094 / 17.198 | 0.252 / 54.440 | 0.600 / -150.958 |

V_{CE} = 8V, I_{CC} = 5mA

| freq | S(1,1) | S(2,1) | S(1,2) | S(2,2) |
|----------|------------------|-----------------|----------------|------------------|
| 400.0MHz | 0.587 / -104.383 | 8.268 / 108.169 | 0.079 / 41.010 | 0.546 / -64.715 |
| 600.0MHz | 0.523 / -128.558 | 5.994 / 93.909 | 0.090 / 38.684 | 0.448 / -77.605 |
| 800.0MHz | 0.493 / -145.158 | 4.670 / 83.299 | 0.095 / 40.644 | 0.395 / -86.835 |
| 1.000GHz | 0.481 / -158.010 | 3.801 / 74.428 | 0.103 / 43.416 | 0.375 / -95.834 |
| 1.200GHz | 0.476 / -167.656 | 3.205 / 67.401 | 0.111 / 46.814 | 0.372 / -100.271 |
| 1.400GHz | 0.482 / -176.935 | 2.778 / 59.940 | 0.124 / 49.424 | 0.377 / -109.142 |
| 1.600GHz | 0.493 / 175.887 | 2.443 / 53.960 | 0.133 / 51.806 | 0.386 / -115.128 |
| 1.800GHz | 0.501 / 168.820 | 2.188 / 47.913 | 0.150 / 54.189 | 0.402 / -120.486 |
| 2.000GHz | 0.515 / 163.091 | 1.971 / 42.530 | 0.165 / 55.212 | 0.417 / -126.445 |
| 2.200GHz | 0.527 / 156.753 | 1.801 / 37.168 | 0.183 / 55.606 | 0.436 / -132.466 |
| 2.400GHz | 0.539 / 151.629 | 1.649 / 32.558 | 0.203 / 55.748 | 0.456 / -137.746 |
| 2.600GHz | 0.555 / 146.498 | 1.523 / 27.499 | 0.224 / 54.896 | 0.477 / -144.079 |
| 2.800GHz | 0.565 / 140.049 | 1.408 / 22.884 | 0.242 / 53.545 | 0.501 / -146.776 |
| 3.000GHz | 0.572 / 134.882 | 1.312 / 19.321 | 0.264 / 52.174 | 0.527 / -152.562 |

V_{CE} = 8V, I_{CC} = 10mA

| freq | S(1,1) | S(2,1) | S(1,2) | S(2,2) |
|----------|------------------|-----------------|----------------|------------------|
| 400.0MHz | 0.487 / -127.356 | 10.294 / 99.888 | 0.062 / 52.361 | 0.399 / -79.072 |
| 600.0MHz | 0.455 / -148.065 | 7.196 / 88.392 | 0.077 / 51.185 | 0.323 / -92.252 |
| 800.0MHz | 0.445 / -161.946 | 5.520 / 79.807 | 0.087 / 53.391 | 0.288 / -100.818 |
| 1.000GHz | 0.443 / -172.275 | 4.456 / 72.461 | 0.101 / 54.514 | 0.278 / -109.767 |
| 1.200GHz | 0.444 / 179.756 | 3.745 / 66.567 | 0.116 / 58.511 | 0.281 / -112.788 |
| 1.400GHz | 0.452 / 172.294 | 3.239 / 60.064 | 0.134 / 58.350 | 0.293 / -121.242 |
| 1.600GHz | 0.463 / 166.104 | 2.851 / 54.847 | 0.149 / 57.998 | 0.302 / -126.016 |
| 1.800GHz | 0.473 / 160.132 | 2.553 / 49.446 | 0.167 / 58.028 | 0.320 / -130.036 |
| 2.000GHz | 0.485 / 155.505 | 2.304 / 44.606 | 0.183 / 57.305 | 0.338 / -135.183 |
| 2.200GHz | 0.496 / 149.819 | 2.110 / 39.629 | 0.202 / 56.310 | 0.355 / -140.406 |
| 2.400GHz | 0.507 / 145.453 | 1.934 / 35.355 | 0.222 / 55.080 | 0.377 / -144.953 |
| 2.600GHz | 0.523 / 141.058 | 1.796 / 30.589 | 0.239 / 53.724 | 0.398 / -150.373 |
| 2.800GHz | 0.533 / 135.234 | 1.666 / 26.235 | 0.259 / 51.708 | 0.420 / -151.735 |
| 3.000GHz | 0.539 / 130.357 | 1.558 / 22.611 | 0.278 / 49.919 | 0.448 / -157.017 |

V_{CE} = 8V, I_{CC} = 15mA

| freq | S(1,1) | S(2,1) | S(1,2) | S(2,2) |
|----------|------------------|-----------------|----------------|------------------|
| 400.0MHz | 0.448 / -138.632 | 11.066 / 96.402 | 0.057 / 55.248 | 0.332 / -87.507 |
| 600.0MHz | 0.435 / -156.751 | 7.644 / 86.220 | 0.071 / 57.290 | 0.275 / -99.732 |
| 800.0MHz | 0.434 / -169.026 | 5.836 / 78.414 | 0.089 / 58.168 | 0.249 / -108.653 |
| 1.000GHz | 0.433 / -177.810 | 4.699 / 71.641 | 0.104 / 60.383 | 0.243 / -117.329 |
| 1.200GHz | 0.435 / 174.780 | 3.949 / 66.173 | 0.120 / 60.926 | 0.251 / -119.675 |
| 1.400GHz | 0.446 / 167.826 | 3.411 / 60.075 | 0.138 / 60.617 | 0.266 / -127.718 |
| 1.600GHz | 0.456 / 162.162 | 3.002 / 55.105 | 0.156 / 60.099 | 0.279 / -132.138 |
| 1.800GHz | 0.465 / 156.661 | 2.691 / 49.975 | 0.174 / 59.047 | 0.296 / -135.428 |
| 2.000GHz | 0.478 / 152.143 | 2.429 / 45.363 | 0.193 / 57.902 | 0.310 / -140.124 |
| 2.200GHz | 0.489 / 146.938 | 2.227 / 40.607 | 0.211 / 56.374 | 0.330 / -144.828 |
| 2.400GHz | 0.500 / 142.769 | 2.042 / 36.460 | 0.230 / 54.908 | 0.350 / -148.862 |
| 2.600GHz | 0.512 / 138.517 | 1.899 / 31.807 | 0.248 / 53.412 | 0.372 / -153.815 |
| 2.800GHz | 0.522 / 132.686 | 1.763 / 27.522 | 0.269 / 51.013 | 0.390 / -154.929 |
| 3.000GHz | 0.528 / 128.194 | 1.651 / 24.071 | 0.286 / 48.900 | 0.421 / -159.921 |

V_{CE} = 8V, I_{CC} = 20mA

| freq | S(1,1) | S(2,1) | S(1,2) | S(2,2) |
|----------|------------------|-----------------|----------------|------------------|
| 400.0MHz | 0.430 / -147.021 | 11.508 / 94.168 | 0.055 / 58.583 | 0.294 / -93.407 |
| 600.0MHz | 0.425 / -162.893 | 7.900 / 84.828 | 0.073 / 61.326 | 0.248 / -105.520 |
| 800.0MHz | 0.428 / -173.516 | 6.017 / 77.526 | 0.089 / 62.785 | 0.226 / -114.372 |
| 1.000GHz | 0.432 / 178.041 | 4.837 / 71.117 | 0.104 / 62.201 | 0.228 / -123.576 |
| 1.200GHz | 0.434 / 171.260 | 4.061 / 65.916 | 0.124 / 63.765 | 0.237 / -124.786 |
| 1.400GHz | 0.443 / 164.956 | 3.511 / 60.000 | 0.141 / 62.553 | 0.252 / -132.071 |
| 1.600GHz | 0.453 / 159.738 | 3.089 / 55.258 | 0.159 / 60.916 | 0.263 / -136.403 |
| 1.800GHz | 0.463 / 154.311 | 2.770 / 50.254 | 0.179 / 59.841 | 0.279 / -138.592 |
| 2.000GHz | 0.476 / 150.158 | 2.500 / 45.780 | 0.197 / 58.495 | 0.297 / -143.196 |
| 2.200GHz | 0.486 / 144.964 | 2.292 / 41.167 | 0.216 / 56.496 | 0.315 / -148.038 |
| 2.400GHz | 0.494 / 141.120 | 2.104 / 37.072 | 0.235 / 54.894 | 0.334 / -151.841 |
| 2.600GHz | 0.508 / 136.954 | 1.958 / 32.486 | 0.254 / 53.022 | 0.357 / -156.330 |
| 2.800GHz | 0.518 / 131.166 | 1.818 / 28.299 | 0.272 / 50.824 | 0.376 / -156.889 |
| 3.000GHz | 0.523 / 126.816 | 1.706 / 24.851 | 0.287 / 48.868 | 0.406 / -161.698 |

V_{CE} = 8V, I_{CC} = 25mA

| freq | S(1,1) | S(2,1) | S(1,2) | S(2,2) |
|----------|------------------|-----------------|----------------|------------------|
| 400.0MHz | 0.423 / -151.150 | 11.721 / 92.863 | 0.054 / 64.728 | 0.269 / -97.125 |
| 600.0MHz | 0.421 / -166.628 | 8.024 / 83.980 | 0.069 / 63.276 | 0.233 / -108.723 |
| 800.0MHz | 0.427 / -176.501 | 6.104 / 76.967 | 0.086 / 63.817 | 0.214 / -117.530 |
| 1.000GHz | 0.432 / 175.834 | 4.905 / 70.766 | 0.106 / 64.543 | 0.217 / -126.252 |
| 1.200GHz | 0.432 / 169.194 | 4.120 / 65.701 | 0.125 / 64.213 | 0.225 / -127.178 |
| 1.400GHz | 0.444 / 163.190 | 3.557 / 59.885 | 0.144 / 63.037 | 0.243 / -134.788 |
| 1.600GHz | 0.454 / 158.111 | 3.131 / 55.231 | 0.162 / 61.687 | 0.257 / -138.421 |
| 1.800GHz | 0.462 / 153.184 | 2.808 / 50.324 | 0.181 / 60.660 | 0.273 / -141.027 |
| 2.000GHz | 0.474 / 148.929 | 2.534 / 45.924 | 0.201 / 58.584 | 0.290 / -145.149 |
| 2.200GHz | 0.485 / 143.958 | 2.324 / 41.346 | 0.219 / 56.867 | 0.306 / -149.515 |
| 2.400GHz | 0.494 / 140.118 | 2.133 / 37.324 | 0.237 / 54.983 | 0.328 / -153.313 |
| 2.600GHz | 0.508 / 135.985 | 1.986 / 32.750 | 0.256 / 53.041 | 0.348 / -157.957 |
| 2.800GHz | 0.516 / 130.228 | 1.845 / 28.664 | 0.274 / 50.735 | 0.367 / -157.912 |
| 3.000GHz | 0.523 / 126.127 | 1.733 / 25.250 | 0.291 / 48.498 | 0.398 / -162.802 |

V_{CE} = 8V, I_{CC} = 30mA

| freq | S(1,1) | S(2,1) | S(1,2) | S(2,2) |
|----------|------------------|-----------------|----------------|------------------|
| 400.0MHz | 0.421 / -155.369 | 11.835 / 91.953 | 0.051 / 61.677 | 0.255 / -99.650 |
| 600.0MHz | 0.420 / -169.141 | 8.086 / 83.398 | 0.068 / 63.447 | 0.221 / -111.126 |
| 800.0MHz | 0.427 / -178.471 | 6.150 / 76.546 | 0.088 / 65.979 | 0.207 / -119.209 |
| 1.000GHz | 0.431 / 174.110 | 4.939 / 70.480 | 0.106 / 66.256 | 0.211 / -128.193 |
| 1.200GHz | 0.433 / 167.968 | 4.147 / 65.508 | 0.125 / 65.636 | 0.221 / -128.835 |
| 1.400GHz | 0.444 / 162.097 | 3.580 / 59.776 | 0.144 / 64.234 | 0.240 / -136.506 |
| 1.600GHz | 0.455 / 157.121 | 3.152 / 55.153 | 0.164 / 62.022 | 0.251 / -139.709 |
| 1.800GHz | 0.462 / 152.087 | 2.826 / 50.309 | 0.183 / 60.777 | 0.268 / -141.887 |
| 2.000GHz | 0.476 / 147.990 | 2.551 / 45.927 | 0.202 / 58.903 | 0.284 / -146.346 |
| 2.200GHz | 0.487 / 143.234 | 2.338 / 41.379 | 0.220 / 56.962 | 0.303 / -150.476 |
| 2.400GHz | 0.495 / 139.284 | 2.148 / 37.407 | 0.240 / 55.042 | 0.324 / -154.203 |
| 2.600GHz | 0.508 / 135.299 | 1.999 / 32.937 | 0.258 / 53.054 | 0.345 / -158.480 |
| 2.800GHz | 0.515 / 129.622 | 1.859 / 28.768 | 0.277 / 50.507 | 0.364 / -158.627 |
| 3.000GHz | 0.523 / 125.413 | 1.744 / 25.362 | 0.293 / 48.447 | 0.393 / -163.494 |