# Agilent MGA-62563 Current-Adjustable, Low Noise Amplifier

Data Sheet

**Features**

- Single +3V or +5V supply
- High linearity
- Low noise figure
- Miniature package
- Lead-free option available

**Specifications at 500 MHz; 3V, 60 mA (Typ.)**

- 0.9 dB noise figure
- 32.9 dBm OIP3
- 22 dB gain
- 17.8 dBm $P_{1dB}$

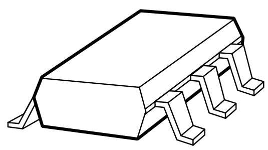
**Description**

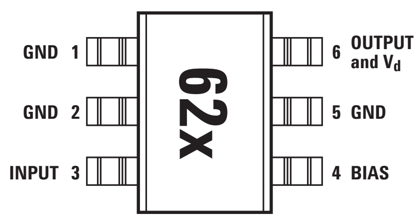
Agilent's MGA-62563 is an economical, easy-to-use GaAs MMIC amplifier that offers excellent linearity and low noise figure for applications from 0.1 to 3 GHz. Packaged in an miniature SOT-363 package, it requires half the board space of a SOT-143 package.

One external resistor is used to set the bias current taken by the device over a wide range. This allows the designer to use the same part in several circuit positions and tailor the linearity performance (and current consumption) to suit each position. The MGA-62563 is normally operating with Id set in the 20-80mA range

The output of the amplifier is matched to 50Ω (below 2:1 VSWR) across the entire bandwidth and only requires minimum input matching. The amplifier allows a wide dynamic range by offering a 0.9 dB NF coupled with a +32.9 dBm Output IP3. The circuit uses state-of-the-art E-pHEMT technology with proven reliability. On-chip bias circuitry allows operation from a single +3 V or +5V power supply.

**Pin Connections and Package Marking**






**Note:**
Package marking provides orientation and identification:

"62" = Device Code
"x" = Date code indicates the month of manufacture.

**Attention:**
**Observe precautions for handling electrostatic sensitive devices.**

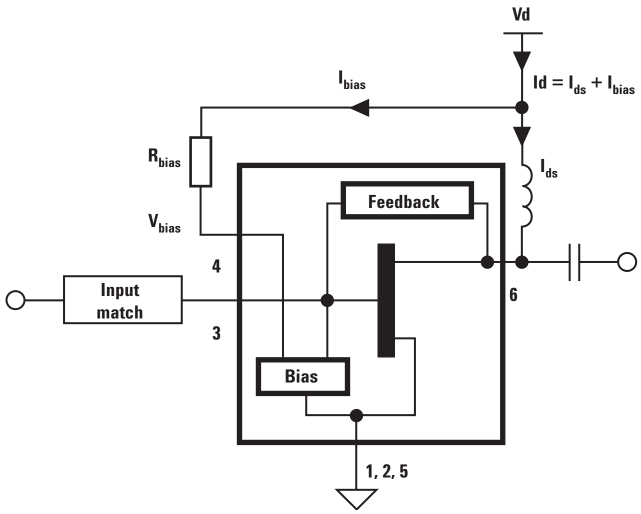
**ESD Machine Model (Class A)**

**ESD Human Body Model (Class 1A)**

**Refer to Agilent Application Note A004R: Electrostatic Discharge Damage and Control.**

Agilent Technologies

## Simplified Schematic




## MGA-62563 Absolute Maximum Ratings[1]

| Symbol | Parameter | Units | Absolute Maximum |
|---|---|---|---|
| $V_d$ | Device Voltage (pin 6)[2] | V | 6 |
| $I_d$ | Device Current (pin 6)[2] | mA | 100 |
| $P_{in}$ | CW RF Input Power (pin 3)[3] | dBm | 21 |
| $I_{ref}$ | Bias Reference Current (pin 4) | mA | 12 |
| $P_{diss}$ | Total Power Dissipation[4] | mW | 600 |
| $T_{CH}$ | Channel Temperature | °C | 150 |
| $T_{STG}$ | Storage Temperature | °C | 150 |
| $\theta_{ch\_b}$ | Thermal Resistance[5] | °C/W | 97 |

**Notes:**

1. Operation of this device above any one of these parameters may cause permanent damage.
2. Bias is assumed at DC quiescent conditions.
3. With the DC (typical bias) and RF applied to the device at board temperature $T_B$ = 25°C.
4. Total dissipation power is referred to lead "5" temperature. Tc=92°C, derate Pdiss at 10.3mW/°C for Tc>92°C.
5. Thermal resistance measured using 150°C Liquid Crystal Measurement method.

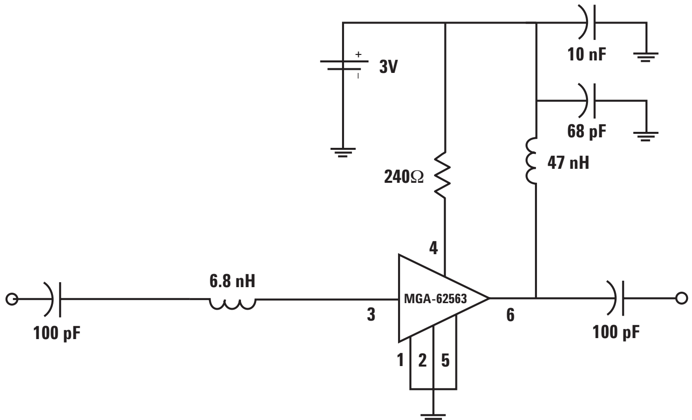



**Figure 1a. Test circuit of the 0.5 GHz production test board used for NF, Gain and OIP3 measurements. This circuit achieves a trade-off between optimal NF, Gain, OIP3 and input return loss. Circuit losses have been de-embedded from actual measurements.**

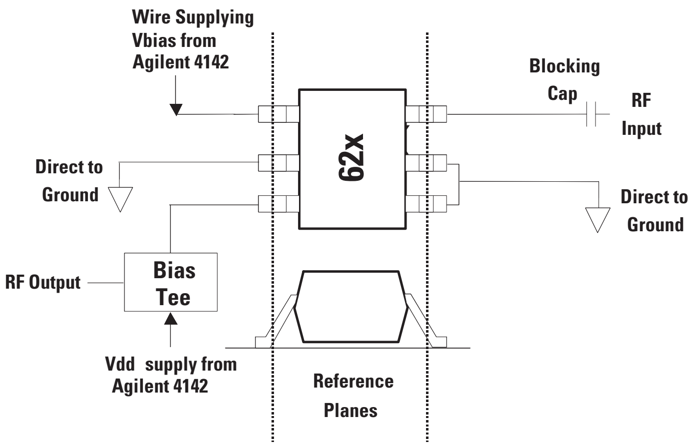



**Figure 1b. A diagram showing the connection to the DUT during an S and Noise parameter measurement using an automated tuner system.**

## Product Consistency Distribution Charts at 3 V, 0.5 GHz, $R_{bias}$ = 240Ω[1, 2]

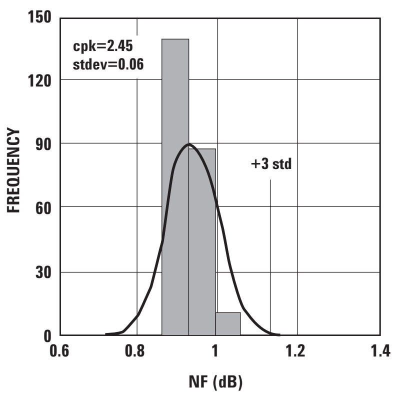



**Figure 2. NF @ 0.5 GHz 3V 60 mA. USL=1.4, Nominal=0.93.**

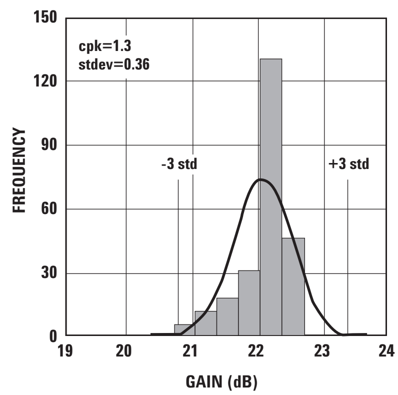



**Figure 3. Gain @ 0.5 GHz 3V 60 mA. USL=23.4, Nominal=20.4, USL=22.0.**

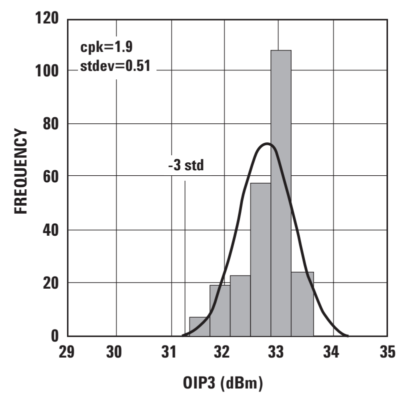



**Figure 4. OIP3 @ 0.5 GHz 3V 60 mA. LSL=30, Nominal=32.9.**

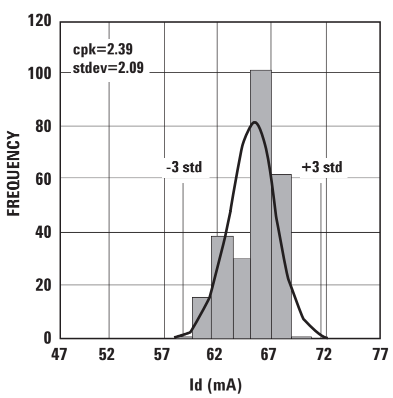



**Figure 5. Id @ 3V. LSL=47, Nominal=77, USL=62.0.**

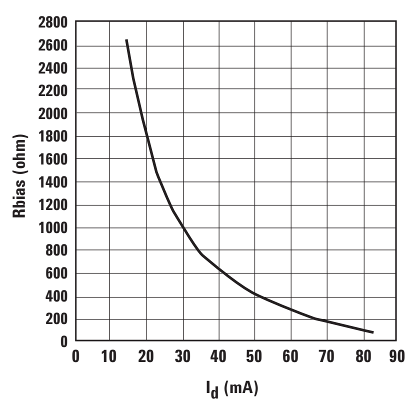



**Figure 6. Rbias vs. $I_d$ (3V supply).**

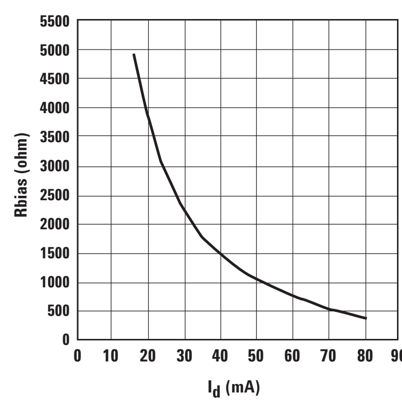



**Figure 7. Rbias vs. $I_d$ (5V supply).**

**Note:**

1. Measured on the production test circuit
2. Distribution data sample size is 250 samples taken from 5 different wafers. Future wafers allocated to this product may have nominal values anywhere between upper and lower limits

## MGA-62563 Electrical Specifications

Rbias=240ohm

$T_C$ = 25°C, $Z_O$ = 50Ω, $V_d$ = 3V (unless otherwise specified)

| Symbol | Parameters and Test Conditions | Freq | Units | Min. | Typ. | Max. | Std Dev |
|---|---|---|---|---|---|---|---|
| Id[1,2] | Device Current | | mA | 47 | 62 | 77 | 2.09 |
| $NF_{test}$ [1,2] | Noise Figure in test circuit[1] | f = 0.5 GHz | dB | | 0.93 | 1.4 | 0.06 |
| $G_{test}$ [1,2] | Associated Gain in test circuit[1] | f = 0.5 GHz | dB | 20.4 | 22 | 23.4 | 0.36 |
| $OIP3_{test}$ [1,2] | Ouput 3rd Order Intercept in test circuit[1] | f = 0.5 GHz | dBm | 30 | 32.9 | | 0.51 |
| $OIP3_{50\Omega}$[3] | Output 3rd Order Intercept Point in 50Ω system | f = 0.1 GHz | dBm | | 34.7 | | |
| | | f = 0.2 GHz | | | 34.7 | | |
| | | f = 0.5 GHz | | | 34.8 | | |
| | | f = 1.0 GHz | | | 33.5 | | 0.51 |
| | | f = 1.5 GHz | | | 33 | | |
| | | f = 2.0 GHz | | | 32.3 | | |
| | | f = 2.5 GHz | | | 32 | | |
| | | f = 3.0 GHz | | | 31 | | |
| $P1dB_{50\Omega}$[3] | Output Power at 1dB Gain Compression in 50Ω system | f = 0.1 GHz | dBm | | 18 | | |
| | | f = 0.2 GHz | | | 18 | | |
| | | f =0.5 GHz | | | 18 | | |
| | | f = 1.0 GHz | | | 17.6 | | |
| | | f = 1.5 GHz | | | 17.6 | | |
| | | f = 2.0 GHz | | | 17.7 | | |
| | | f = 2.5 GHz | | | 17.9 | | |
| | | f = 3.0 GHz | | | 17.7 | | |

**Notes:**

1. Guaranteed specifications are 100% tested in the production test circuit as shown in Figure 1, the typical value is based on measurement of at least 500 parts from three non-consecutive wafer lots during initial characterization of this product.
2. Circuit achieved a trade-off between optimal NF, Gain, OIP3 and input return loss.
3. Parameter quoted at 50Ω is based on measurement of selected typical parts tested on a 50Ω input and output test fixture.

## MGA-62563 Typical Performance, $V_d$ = 3V, $I_{ds}$ = 60 mA at 50Ω Input and Output

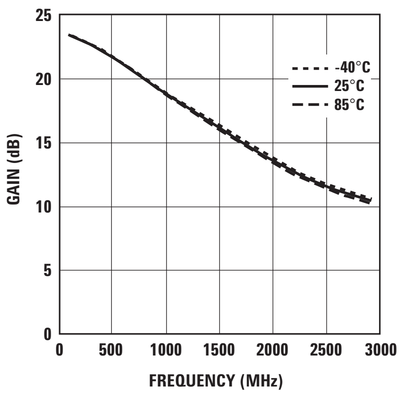



Figure 8. Gain vs. Frequency (3V 60 mA).

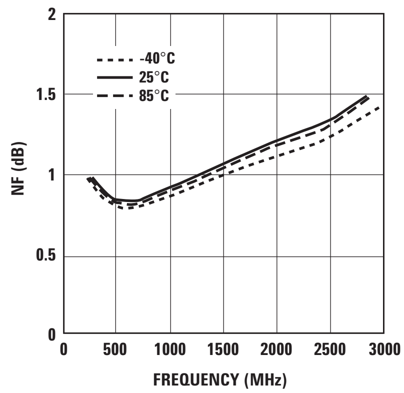



Figure 9. NF vs. Frequency (3V 60 mA).

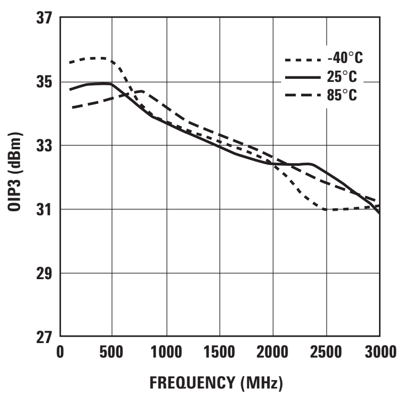



Figure 10. OIP3 vs Frequency (3V 60mA)

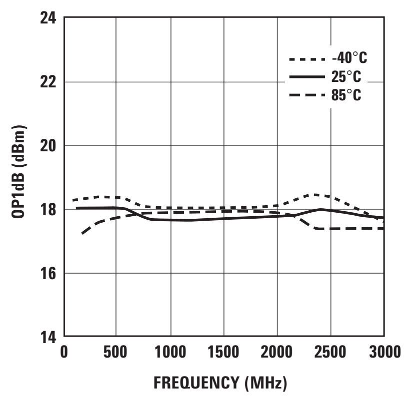



Figure 11. OP1dB vs. Frequency (3V 60 mA).

## MGA-62563 Typical Performance, $V_d$ = 3V, $I_{ds}$ = 30 mA at 50Ω Input and Output



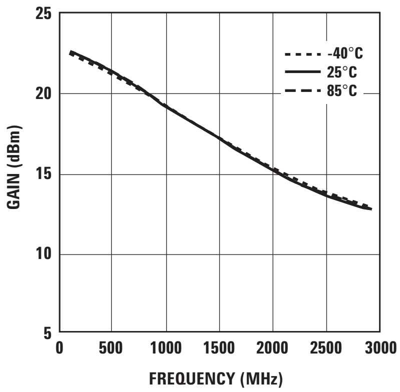



Figure 12. Gain vs. Frequency (3V 30 mA).

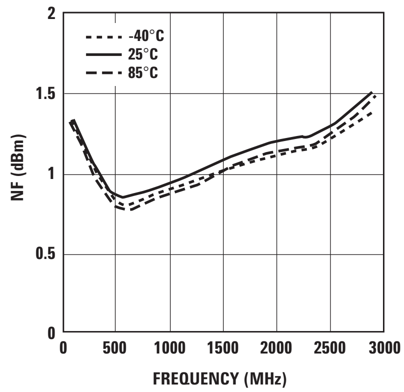



Figure 13. NF vs. Frequency (3V 30 mA).

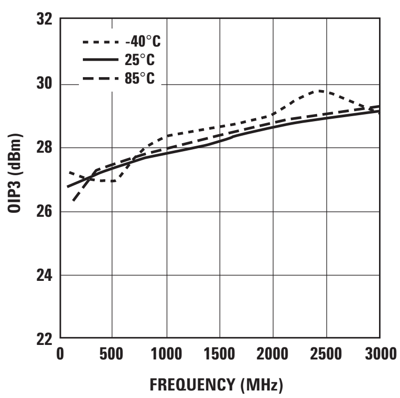



Figure 14. OIP3 vs. Frequency (3V 30 mA).

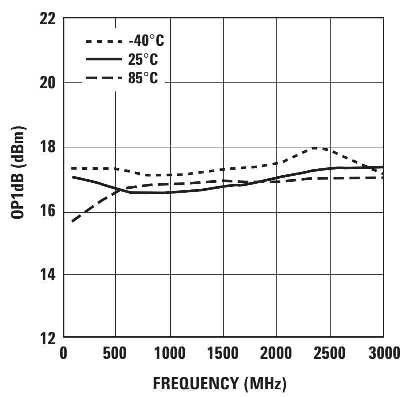



Figure 15. OP1dB vs. Frequency (3V 30 mA).

## MGA-62563 Typical Performance, $V_d$ = 5V, $I_{ds}$ = 60 mA at 50Ω Input and Output

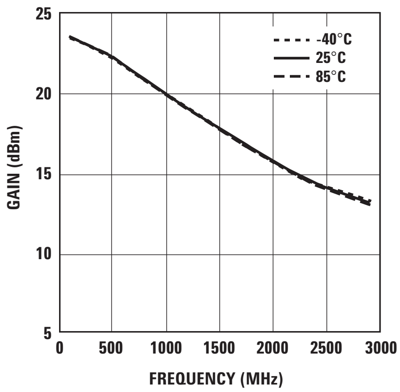


Figure 16. Gain vs. Frequency (5V 60 mA).

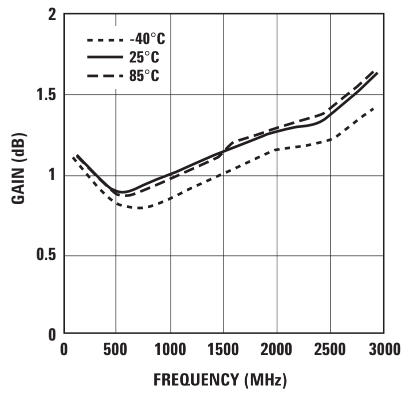


Figure 17. NF vs. Frequency (5V 60 mA).

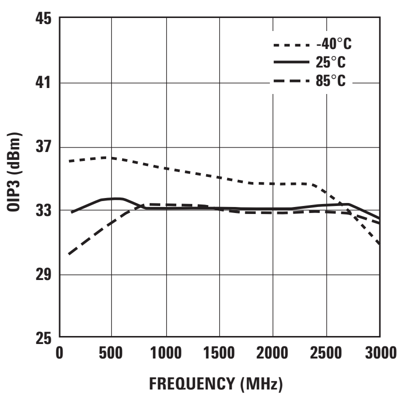


Figure 18. OIP3 vs. Frequency (5V 60 mA).

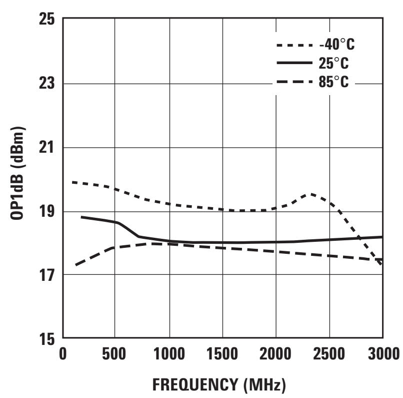


Figure 19. OP1dB vs. Frequency (5V 60 mA).

## MGA-62563 Typical Performance, $V_d = 5V$, $I_{ds} = 30$ mA at 50Ω Input and Output



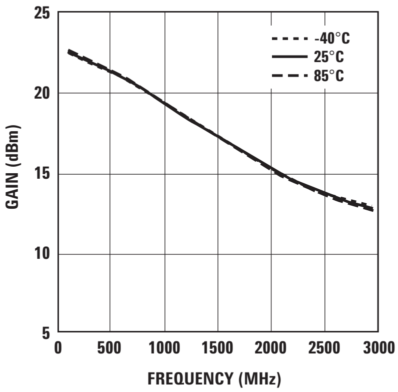



Figure 20. Gain vs. Frequency (5V 30 mA).

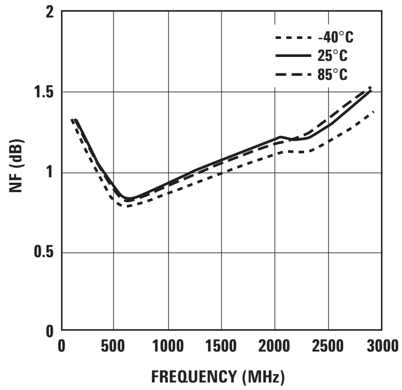



Figure 21. NF vs. Frequency (5V 30 mA).

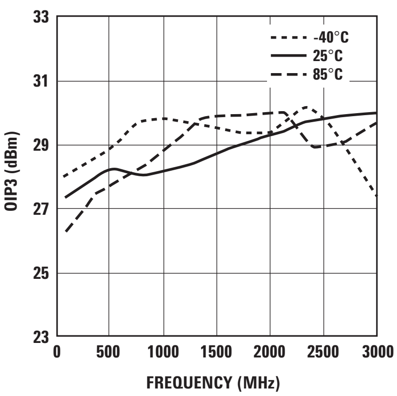



Figure 22. OIP3 vs. Frequency (5V 30 mA).

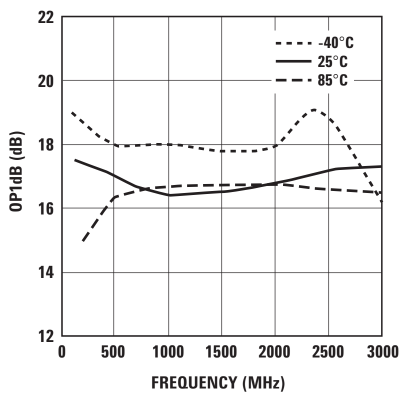



Figure 23. OP1dB vs. Frequency (5V 30 mA).

## MGA-62563 Typical Performance, Freq = 0.5 GHz, $T_C$ = 25°C at 50Ω Input and Output



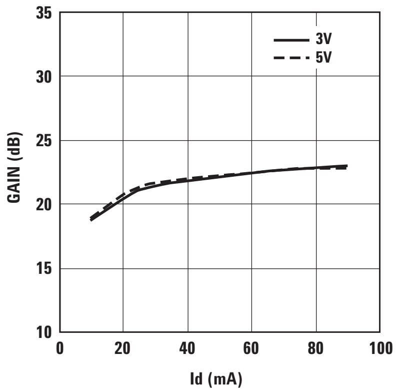



Figure 24. Gain vs. Id (500 MHz).

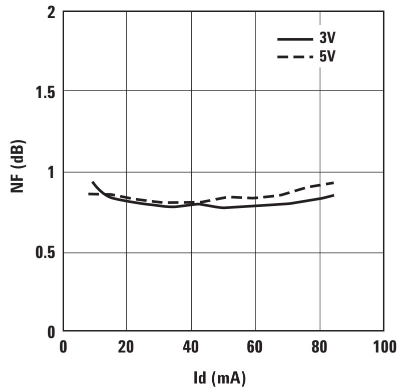



Figure 25. NF vs. Id (500 MHz).

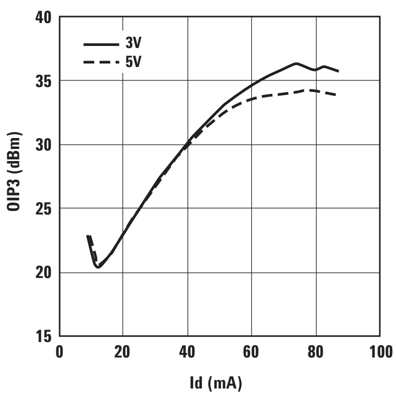



Figure 26. OIP3 vs. Id (500 MHz).

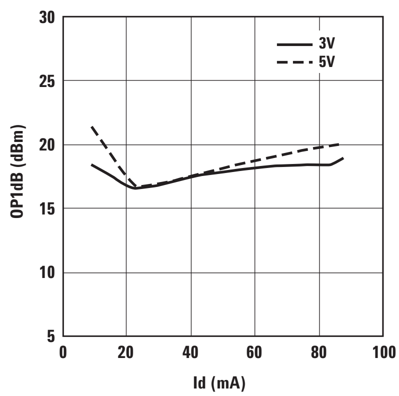



Figure 27. OP1dB vs. Id (500 MHz).

**MGA-62563 Typical Performance, Freq = 0.1 GHz, $T_C$ = 25°C at 50Ω Input and Output**

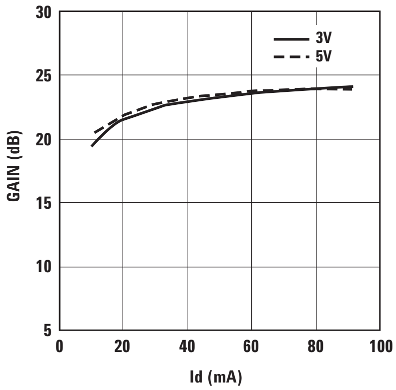



Figure 28. Gain vs. Id (100 MHz).

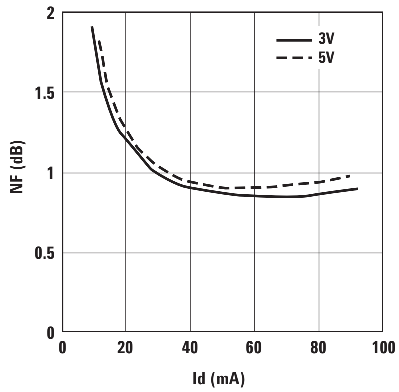



Figure 29. NF vs. Id (100 MHz).

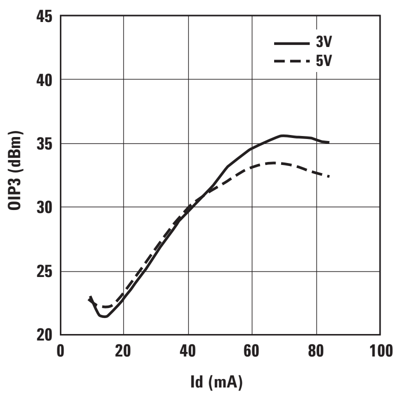



Figure 30. OIP3 vs. Id (100 MHz).

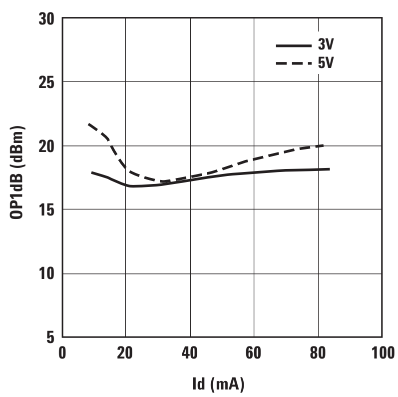



Figure 31. OP1dB vs. Id (100 MHz).

**MGA-62563 Typical Scattering Parameters,** $T_C$ = 25°C, $Z_0$ = 50Ω, $V_d$ = 3V, $I_{ds}$ = 60 mA

| Freq. | $S_{11}$ | | $S_{21}$ | | | $S_{12}$ | | $S_{22}$ | | K-factor |
|---|---|---|---|---|---|---|---|---|---|---|
| GHz | Mag. | Ang. | dB | Mag. | Ang. | Mag. | Ang. | Mag. | Ang. | |
| 0.1 | 0.185 | -82.272 | 22.91 | 13.982 | 155.827 | 0.042 | 5.4 | 0.129 | -164.437 | 1.09 |
| 0.2 | 0.187 | -90.11 | 22.63 | 13.537 | 153.346 | 0.042 | 5.474 | 0.135 | -168.363 | 1.1 |
| 0.3 | 0.193 | -98.147 | 22.31 | 13.054 | 150.578 | 0.042 | 5.636 | 0.141 | -172.09 | 1.12 |
| 0.4 | 0.203 | -106.14 | 21.97 | 12.545 | 147.524 | 0.042 | 5.912 | 0.148 | -175.737 | 1.15 |
| 0.5 | 0.217 | -114.27 | 21.57 | 11.986 | 143.942 | 0.042 | 6.346 | 0.154 | -179.503 | 1.17 |
| 0.6 | 0.233 | -121.367 | 21.18 | 11.459 | 140.212 | 0.041 | 6.892 | 0.159 | 177.105 | 1.22 |
| 0.7 | 0.252 | -127.882 | 20.78 | 10.945 | 136.065 | 0.041 | 7.583 | 0.163 | 173.986 | 1.25 |
| 0.8 | 0.272 | -133.795 | 20.39 | 10.457 | 131.465 | 0.041 | 8.43 | 0.167 | 171.256 | 1.27 |
| 0.9 | 0.295 | -138.842 | 20.02 | 10.021 | 126.434 | 0.041 | 9.417 | 0.171 | 168.886 | 1.3 |
| 1 | 0.317 | -143.232 | 19.66 | 9.611 | 121.342 | 0.042 | 10.645 | 0.173 | 167.409 | 1.3 |
| 1.1 | 0.34 | -147.643 | 19.26 | 9.179 | 116.107 | 0.042 | 12.083 | 0.175 | 166.393 | 1.32 |
| 1.2 | 0.358 | -151.668 | 18.87 | 8.78 | 111.387 | 0.042 | 13.52 | 0.177 | 165.719 | 1.35 |
| 1.3 | 0.371 | -154.625 | 18.48 | 8.397 | 106.965 | 0.043 | 14.99 | 0.172 | 164.894 | 1.36 |
| 1.4 | 0.378 | -156.903 | 18.1 | 8.035 | 102.832 | 0.044 | 16.437 | 0.163 | 164.215 | 1.38 |
| 1.5 | 0.385 | -159.101 | 17.71 | 7.684 | 98.886 | 0.045 | 17.798 | 0.153 | 164.02 | 1.4 |
| 1.6 | 0.392 | -161.727 | 17.32 | 7.349 | 95.185 | 0.046 | 19.056 | 0.144 | 163.07 | 1.42 |
| 1.7 | 0.397 | -164.752 | 16.92 | 7.015 | 91.424 | 0.048 | 20.227 | 0.132 | 162.822 | 1.42 |
| 1.8 | 0.4 | -167.685 | 16.55 | 6.72 | 88.093 | 0.049 | 21.207 | 0.122 | 162.927 | 1.44 |
| 1.9 | 0.4 | -170.686 | 16.19 | 6.446 | 84.931 | 0.051 | 22.085 | 0.113 | 163.177 | 1.44 |
| 2 | 0.4 | -173.615 | 15.84 | 6.195 | 81.892 | 0.052 | 22.821 | 0.104 | 163.203 | 1.47 |
| 2.5 | 0.401 | 171.986 | 14.29 | 5.184 | 67.423 | 0.063 | 24.202 | 0.059 | 160.575 | 1.46 |
| 3 | 0.391 | 153.64 | 12.93 | 4.432 | 53.871 | 0.074 | 22.323 | 0.029 | 162.52 | 1.46 |
| 3.5 | 0.418 | 141.02 | 11.87 | 3.923 | 39.725 | 0.088 | 16.919 | 0.024 | 14.44 | 1.37 |
| 4 | 0.461 | 127.008 | 10.81 | 3.472 | 26.244 | 0.099 | 11.289 | 0.043 | 17.922 | 1.32 |
| 4.5 | 0.548 | 119.58 | 9.83 | 3.1 | 11.923 | 0.108 | 4.074 | 0.083 | 3.197 | 1.22 |
| 5 | 0.615 | 105.771 | 8.73 | 2.733 | -1.958 | 0.119 | -3.141 | 0.057 | 18.181 | 1.14 |
| 5.5 | 0.674 | 97.228 | 7.69 | 2.425 | -13.281 | 0.126 | -10.835 | 0.026 | -8.344 | 1.05 |
| 6 | 0.701 | 85.967 | 7.26 | 2.308 | -24.509 | 0.131 | -17.126 | 0.096 | 123.432 | 1.01 |
| 6.5 | 0.698 | 77.659 | 6.44 | 2.099 | -35.324 | 0.138 | -24.617 | 0.165 | 105.103 | 1.06 |
| 7 | 0.69 | 66.448 | 6.33 | 2.072 | -47.318 | 0.145 | -31.049 | 0.259 | 92.547 | 1.06 |
| 7.5 | 0.677 | 55.492 | 5.55 | 1.895 | -59.77 | 0.15 | -39.087 | 0.284 | 78.001 | 1.14 |
| 8 | 0.673 | 45.318 | 5.18 | 1.816 | -68.839 | 0.157 | -45.822 | 0.294 | 70.774 | 1.14 |
| 9 | 0.718 | 26.713 | 4.61 | 1.701 | -88.8 | 0.167 | -62.304 | 0.323 | 48.33 | 1.07 |
| 10 | 0.778 | 15.285 | 4.14 | 1.61 | -104.215 | 0.168 | -76.006 | 0.364 | 24.415 | 0.99 |

**Typical Noise Parameters at 25°C,**
$T_C$ = 25°C, $Z_0$ = 50Ω, $V_d$ = 3V, $I_{ds}$ = 60 mA

| Freq | $F_{min}$ | $\Gamma_{opt}$ | $\Gamma_{opt}$ | $R_{n/50}$ | NF@50Ω |
|---|---|---|---|---|---|
| GHz | dB | Mag. | Ang. | | dB |
| 0.5 | 0.79 | 0.08 | 57.8 | 0.12 | 0.8 |
| 1 | 0.65 | 0.07 | 168.2 | 0.07 | 0.65 |
| 1.5 | 0.76 | 0.12 | -176.7 | 0.07 | 0.77 |
| 2 | 0.87 | 0.13 | 149.3 | 0.08 | 0.89 |
| 2.5 | 0.93 | 0.16 | -179 | 0.08 | 0.97 |
| 3 | 0.96 | 0.23 | -164.8 | 0.08 | 1.06 |
| 3.5 | 1.11 | 0.24 | -150 | 0.09 | 1.22 |
| 4 | 1.28 | 0.27 | -142.7 | 0.11 | 1.43 |
| 4.5 | 1.36 | 0.33 | -133.7 | 0.12 | 1.61 |
| 5 | 1.44 | 0.38 | -123 | 0.15 | 1.79 |
| 5.5 | 1.47 | 0.43 | -114 | 0.19 | 1.97 |
| 6 | 1.63 | 0.45 | -103.6 | 0.25 | 2.2 |
| 6.5 | 1.69 | 0.5 | -94.5 | 0.34 | 2.47 |
| 7 | 1.77 | 0.54 | -85.3 | 0.43 | 2.71 |
| 7.5 | 1.94 | 0.58 | -75.1 | 0.57 | 3.08 |
| 8 | 2.07 | 0.6 | -64.9 | 0.77 | 3.42 |
| 8.5 | 2.25 | 0.64 | -54.6 | 1 | 3.89 |
| 9 | 2.4 | 0.67 | -45.9 | 1.28 | 4.31 |
| 9.5 | 2.25 | 0.75 | -39.2 | 1.6 | 4.77 |
| 10 | 2.44 | 0.74 | -34 | 1.91 | 5.14 |

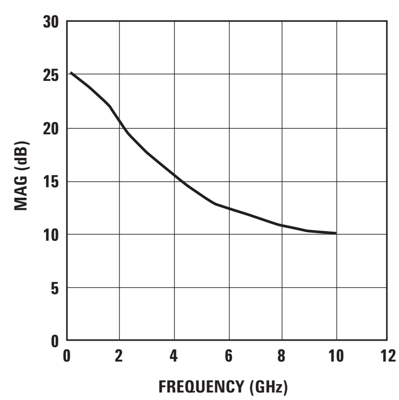



**Figure 32. MAG vs. Frequency.**

**MGA-62563 Typical Scattering Parameters,** $T_C$ = 25°C, $Z_0$ = 50Ω, $V_d$ = 3V, $I_{ds}$ = 30 mA

| Freq. | $S_{11}$ | | $S_{21}$ | | | $S_{12}$ | | $S_{22}$ | | K-factor |
|---|---|---|---|---|---|---|---|---|---|---|
| GHz | Mag. | Ang. | dB | Mag. | Ang. | Mag. | Ang. | Mag. | Ang. | |
| 0.1 | 0.229 | -64.839 | 21.81 | 12.314 | 156.524 | 0.049 | 5.851 | 0.088 | -127.44 | 1.06 |
| 0.2 | 0.225 | -72.068 | 21.54 | 11.942 | 153.986 | 0.049 | 5.688 | 0.093 | -135.628 | 1.08 |
| 0.3 | 0.224 | -80.018 | 21.24 | 11.537 | 151.158 | 0.049 | 5.569 | 0.1 | -143.242 | 1.09 |
| 0.4 | 0.227 | -88.494 | 20.91 | 11.11 | 148.033 | 0.049 | 5.526 | 0.108 | -150.147 | 1.11 |
| 0.5 | 0.234 | -97.66 | 20.54 | 10.643 | 144.386 | 0.048 | 5.588 | 0.116 | -156.622 | 1.15 |
| 0.6 | 0.246 | -106.065 | 20.17 | 10.202 | 140.583 | 0.048 | 5.738 | 0.125 | -161.903 | 1.17 |
| 0.7 | 0.261 | -113.999 | 19.8 | 9.774 | 136.408 | 0.048 | 6.002 | 0.133 | -166.307 | 1.19 |
| 0.8 | 0.28 | -121.285 | 19.43 | 9.369 | 131.811 | 0.048 | 6.379 | 0.141 | -169.879 | 1.22 |
| 0.9 | 0.302 | -127.551 | 19.1 | 9.012 | 126.834 | 0.048 | 6.887 | 0.15 | -172.861 | 1.23 |
| 1 | 0.324 | -133.004 | 18.77 | 8.676 | 121.818 | 0.049 | 7.629 | 0.158 | -174.888 | 1.23 |
| 1.1 | 0.348 | -138.366 | 18.4 | 8.322 | 116.64 | 0.049 | 8.559 | 0.166 | -176.589 | 1.24 |
| 1.2 | 0.367 | -143.111 | 18.05 | 7.993 | 111.957 | 0.049 | 9.506 | 0.174 | -178.07 | 1.26 |
| 1.3 | 0.38 | -146.63 | 17.69 | 7.669 | 107.573 | 0.05 | 10.548 | 0.174 | -179.151 | 1.27 |
| 1.4 | 0.39 | -149.336 | 17.33 | 7.356 | 103.466 | 0.051 | 11.645 | 0.168 | -179.685 | 1.28 |
| 1.5 | 0.399 | -151.941 | 16.97 | 7.052 | 99.534 | 0.052 | 12.668 | 0.162 | -179.868 | 1.29 |
| 1.6 | 0.407 | -154.928 | 16.6 | 6.758 | 95.851 | 0.053 | 13.646 | 0.156 | 179.214 | 1.31 |
| 1.7 | 0.413 | -158.278 | 16.21 | 6.466 | 92.108 | 0.054 | 14.581 | 0.148 | 179.163 | 1.33 |
| 1.8 | 0.416 | -161.47 | 15.86 | 6.207 | 88.778 | 0.055 | 15.393 | 0.141 | 179.311 | 1.35 |
| 1.9 | 0.418 | -164.666 | 15.51 | 5.965 | 85.613 | 0.057 | 16.142 | 0.134 | 179.509 | 1.36 |
| 2 | 0.417 | -167.751 | 15.18 | 5.744 | 82.561 | 0.058 | 16.791 | 0.128 | 179.436 | 1.38 |
| 2.5 | 0.422 | 177.274 | 13.71 | 4.848 | 67.999 | 0.068 | 18.161 | 0.089 | 176.954 | 1.4 |
| 3 | 0.412 | 158.337 | 12.41 | 4.174 | 54.232 | 0.079 | 16.464 | 0.062 | 176.77 | 1.42 |
| 3.5 | 0.442 | 144.969 | 11.39 | 3.71 | 39.961 | 0.092 | 11.54 | 0.015 | 130.879 | 1.35 |
| 4 | 0.486 | 129.994 | 10.34 | 3.287 | 26.316 | 0.102 | 6.16 | 0.028 | 68.898 | 1.32 |
| 4.5 | 0.573 | 121.597 | 9.35 | 2.935 | 11.973 | 0.111 | -0.792 | 0.063 | 24.183 | 1.21 |
| 5 | 0.638 | 107.123 | 8.25 | 2.585 | -2.051 | 0.122 | -7.727 | 0.057 | 50.418 | 1.13 |
| 5.5 | 0.696 | 98.232 | 7.18 | 2.285 | -13.425 | 0.128 | -15.159 | 0.026 | 55.253 | 1.05 |
| 6 | 0.721 | 86.681 | 6.73 | 2.169 | -24.666 | 0.131 | -21.346 | 0.124 | 119.497 | 1 |
| 6.5 | 0.713 | 78.214 | 5.85 | 1.961 | -35.535 | 0.139 | -28.725 | 0.191 | 103.907 | 1.06 |
| 7 | 0.704 | 66.96 | 5.7 | 1.927 | -47.61 | 0.146 | -34.963 | 0.287 | 91.799 | 1.06 |
| 7.5 | 0.687 | 55.912 | 4.88 | 1.753 | -60.15 | 0.15 | -42.644 | 0.31 | 77.221 | 1.16 |
| 8 | 0.68 | 45.807 | 4.47 | 1.673 | -69.283 | 0.156 | -49.076 | 0.318 | 69.627 | 1.18 |
| 9 | 0.725 | 27.162 | 3.85 | 1.558 | -89.513 | 0.166 | -65.125 | 0.343 | 47.128 | 1.1 |
| 10 | 0.787 | 15.674 | 3.34 | 1.469 | -105.215 | 0.168 | -78.788 | 0.382 | 23.467 | 1 |

**Typical Noise Parameters at 25°C,**
$T_C$ = 25°C, $Z_0$ = 50Ω, $V_d$ = 3V, $I_{ds}$ = 30 mA

| Freq GHz | $F_{min}$ dB | $\Gamma_{opt}$ Mag. | $\Gamma_{opt}$ Ang. | $R_{n/50}$ | NF@50Ω dB |
|---|---|---|---|---|---|
| 0.5 | 0.76 | 0.07 | 92.8 | 0.1 | 0.77 |
| 1 | 0.66 | 0.06 | 149.8 | 0.08 | 0.67 |
| 1.5 | 0.79 | 0.09 | 167.2 | 0.07 | 0.8 |
| 2 | 0.86 | 0.14 | 142.8 | 0.08 | 0.88 |
| 2.5 | 0.91 | 0.15 | 167.5 | 0.08 | 0.95 |
| 3 | 0.94 | 0.23 | -174.7 | 0.07 | 1.03 |
| 3.5 | 1.07 | 0.24 | -159.3 | 0.08 | 1.17 |
| 4 | 1.21 | 0.27 | -148.9 | 0.09 | 1.35 |
| 4.5 | 1.28 | 0.32 | -140.7 | 0.11 | 1.51 |
| 5 | 1.39 | 0.36 | -129.5 | 0.13 | 1.69 |
| 5.5 | 1.43 | 0.4 | -119.9 | 0.17 | 1.85 |
| 6 | 1.58 | 0.42 | -109.1 | 0.21 | 2.05 |
| 6.5 | 1.63 | 0.48 | -100.3 | 0.28 | 2.31 |
| 7 | 1.68 | 0.53 | -91 | 0.35 | 2.51 |
| 7.5 | 1.86 | 0.56 | -80.2 | 0.48 | 2.87 |
| 8 | 1.96 | 0.59 | -69.4 | 0.65 | 3.18 |
| 8.5 | 2.15 | 0.63 | -58.6 | 0.85 | 3.61 |
| 9 | 2.26 | 0.64 | -51.5 | 1.12 | 4.02 |
| 9.5 | 2.15 | 0.75 | -42.4 | 1.4 | 4.49 |
| 10 | 2.32 | 0.74 | -37.5 | 1.69 | 4.87 |

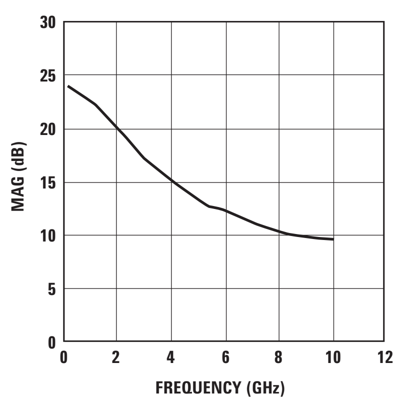



**Figure 33. MAG vs. Frequency.**

**MGA-62563 Typical Scattering Parameters,** $T_C$ = 25°C, $Z_0$ = 50Ω, $V_d$ = 3V, $I_{ds}$ = 20 mA

| Freq. | $S_{11}$ | | $S_{21}$ | | | $S_{12}$ | | $S_{22}$ | | K-factor |
|---|---|---|---|---|---|---|---|---|---|---|
| GHz | Mag. | Ang. | dB | Mag. | Ang. | Mag. | Ang. | Mag. | Ang. | |
| 0.1 | 0.274 | -53.949 | 20.92 | 11.121 | 157.035 | 0.054 | 5.715 | 0.094 | -80.83 | 1.05 |
| 0.2 | 0.265 | -60.28 | 20.67 | 10.806 | 154.512 | 0.054 | 5.383 | 0.09 | -91.02 | 1.07 |
| 0.3 | 0.259 | -67.514 | 20.39 | 10.459 | 151.71 | 0.054 | 5.086 | 0.089 | -102.192 | 1.08 |
| 0.4 | 0.257 | -75.557 | 20.08 | 10.093 | 148.613 | 0.054 | 4.833 | 0.091 | -113.483 | 1.1 |
| 0.5 | 0.258 | -84.672 | 19.72 | 9.687 | 144.952 | 0.054 | 4.637 | 0.095 | -124.7 | 1.12 |
| 0.6 | 0.264 | -93.431 | 19.37 | 9.304 | 141.158 | 0.054 | 4.525 | 0.101 | -133.965 | 1.14 |
| 0.7 | 0.275 | -102.057 | 19.02 | 8.932 | 137.004 | 0.054 | 4.504 | 0.109 | -141.605 | 1.16 |
| 0.8 | 0.29 | -110.18 | 18.67 | 8.581 | 132.446 | 0.054 | 4.576 | 0.118 | -147.841 | 1.18 |
| 0.9 | 0.31 | -117.309 | 18.35 | 8.271 | 127.543 | 0.054 | 4.783 | 0.129 | -152.991 | 1.19 |
| 1 | 0.331 | -123.571 | 18.04 | 7.983 | 122.588 | 0.054 | 5.195 | 0.139 | -156.749 | 1.2 |
| 1.1 | 0.354 | -129.682 | 17.71 | 7.679 | 117.464 | 0.054 | 5.763 | 0.15 | -160.026 | 1.21 |
| 1.2 | 0.372 | -134.998 | 17.38 | 7.396 | 112.827 | 0.054 | 6.374 | 0.16 | -162.849 | 1.22 |
| 1.3 | 0.387 | -138.974 | 17.04 | 7.11 | 108.473 | 0.055 | 7.105 | 0.163 | -164.481 | 1.22 |
| 1.4 | 0.397 | -142.056 | 16.69 | 6.828 | 104.388 | 0.055 | 7.939 | 0.16 | -165.092 | 1.25 |
| 1.5 | 0.407 | -145.03 | 16.33 | 6.555 | 100.473 | 0.056 | 8.736 | 0.157 | -165.37 | 1.26 |
| 1.6 | 0.416 | -148.334 | 15.97 | 6.289 | 96.786 | 0.057 | 9.514 | 0.152 | -166.308 | 1.28 |
| 1.7 | 0.423 | -151.951 | 15.6 | 6.025 | 93.017 | 0.058 | 10.294 | 0.146 | -166.218 | 1.3 |
| 1.8 | 0.427 | -155.37 | 15.25 | 5.789 | 89.657 | 0.059 | 10.984 | 0.141 | -166.034 | 1.32 |
| 1.9 | 0.428 | -158.764 | 14.91 | 5.568 | 86.471 | 0.06 | 11.651 | 0.137 | -165.814 | 1.34 |
| 2 | 0.428 | -161.995 | 14.59 | 5.365 | 83.402 | 0.062 | 12.246 | 0.132 | -165.841 | 1.35 |
| 2.5 | 0.432 | -177.573 | 13.16 | 4.549 | 68.702 | 0.07 | 13.701 | 0.098 | -166.888 | 1.41 |
| 3 | 0.422 | 162.92 | 11.89 | 3.933 | 54.632 | 0.08 | 12.332 | 0.073 | -164.868 | 1.45 |
| 3.5 | 0.453 | 148.816 | 10.89 | 3.503 | 40.096 | 0.092 | 7.985 | 0.024 | -165.023 | 1.39 |
| 4 | 0.497 | 133.003 | 9.85 | 3.108 | 26.107 | 0.102 | 3.027 | 0.013 | 108.515 | 1.35 |
| 4.5 | 0.584 | 123.794 | 8.87 | 2.777 | 11.49 | 0.111 | -3.486 | 0.044 | 23.417 | 1.24 |
| 5 | 0.648 | 108.792 | 7.8 | 2.455 | -2.939 | 0.121 | -9.998 | 0.044 | 61.186 | 1.15 |
| 5.5 | 0.705 | 99.614 | 6.75 | 2.174 | -14.677 | 0.128 | -17.142 | 0.019 | 83.666 | 1.05 |
| 6 | 0.729 | 87.836 | 6.32 | 2.07 | -26.088 | 0.131 | -23.178 | 0.129 | 125.118 | 1 |
| 6.5 | 0.719 | 79.179 | 5.46 | 1.875 | -37.227 | 0.138 | -30.431 | 0.194 | 108.15 | 1.06 |
| 7 | 0.709 | 67.879 | 5.33 | 1.847 | -49.36 | 0.144 | -36.508 | 0.289 | 94.828 | 1.06 |
| 7.5 | 0.69 | 56.687 | 4.54 | 1.686 | -62.033 | 0.148 | -43.977 | 0.312 | 79.896 | 1.17 |
| 8 | 0.682 | 46.564 | 4.15 | 1.613 | -71.166 | 0.155 | -50.351 | 0.321 | 72.003 | 1.19 |
| 9 | 0.725 | 27.786 | 3.57 | 1.508 | -91.211 | 0.164 | -66.308 | 0.344 | 49.405 | 1.11 |
| 10 | 0.791 | 15.826 | 3.07 | 1.424 | -106.691 | 0.166 | -79.9 | 0.382 | 25.395 | 1 |

**Typical Noise Parameters at 25°C,**
$T_C$ = 25°C, $Z_0$ = 50Ω, $V_d$ = 3V, $I_{ds}$ = 20 mA

| Freq | $F_{min}$ | $\Gamma_{opt}$ | $\Gamma_{opt}$ | $R_{n/50}$ | NF@50Ω |
|---|---|---|---|---|---|
| GHz | dB | Mag. | Ang. | | dB |
| 0.5 | 0.83 | 0.1 | 83.2 | 0.11 | 0.85 |
| 1 | 0.71 | 0.06 | 133.5 | 0.08 | 0.71 |
| 1.5 | 0.81 | 0.09 | 151.9 | 0.07 | 0.82 |
| 2 | 0.88 | 0.15 | 133.2 | 0.08 | 0.91 |
| 2.5 | 0.93 | 0.16 | 160.2 | 0.08 | 0.97 |
| 3 | 0.98 | 0.23 | 179.7 | 0.07 | 1.07 |
| 3.5 | 1.1 | 0.24 | -164.5 | 0.08 | 1.2 |
| 4 | 1.2 | 0.28 | -154 | 0.09 | 1.36 |
| 4.5 | 1.29 | 0.33 | -143.9 | 0.1 | 1.52 |
| 5 | 1.4 | 0.36 | -132.8 | 0.12 | 1.71 |
| 5.5 | 1.46 | 0.4 | -122.9 | 0.16 | 1.88 |
| 6 | 1.62 | 0.42 | -112 | 0.21 | 2.1 |
| 6.5 | 1.68 | 0.47 | -102.3 | 0.28 | 2.34 |
| 7 | 1.74 | 0.52 | -92.9 | 0.35 | 2.56 |
| 7.5 | 1.92 | 0.55 | -82.2 | 0.47 | 2.91 |
| 8 | 2.04 | 0.57 | -71.5 | 0.65 | 3.23 |
| 8.5 | 2.22 | 0.61 | -60 | 0.85 | 3.65 |
| 9 | 2.32 | 0.65 | -52.5 | 1.13 | 4.09 |
| 9.5 | 2.2 | 0.75 | -43.5 | 1.41 | 4.55 |
| 10 | 2.39 | 0.74 | -38.6 | 1.71 | 4.94 |

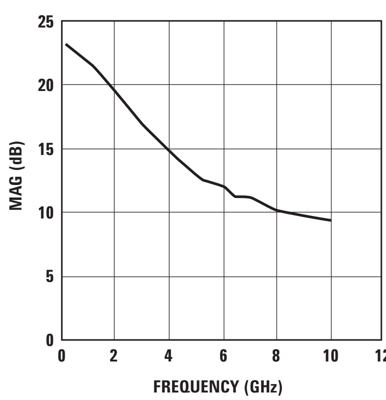



**Figure 34. MAG vs. Frequency.**

**MGA-62563 Typical Scattering Parameters,** $T_C = 25°C$, $Z_0 = 50\Omega$, $V_d = 5V$, $I_{ds} = 40$ mA

| Freq. | $S_{11}$ | | $S_{21}$ | | | $S_{12}$ | | $S_{22}$ | | K-factor |
|---|---|---|---|---|---|---|---|---|---|---|
| GHz | Mag. | Ang. | dB | Mag. | Ang. | Mag. | Ang. | Mag. | Ang. | |
| 0.1 | 0.22 | -62.539 | 22.22 | 12.911 | 155.715 | 0.046 | 2.6 | 0.041 | -117.254 | 1.09 |
| 0.2 | 0.214 | -69.644 | 21.94 | 12.502 | 153.158 | 0.045 | 2.081 | 0.038 | -129.6 | 1.12 |
| 0.3 | 0.212 | -77.541 | 21.62 | 12.057 | 150.317 | 0.045 | 1.608 | 0.038 | -142.653 | 1.14 |
| 0.4 | 0.214 | -86.029 | 21.28 | 11.588 | 147.183 | 0.044 | 1.201 | 0.039 | -155.322 | 1.18 |
| 0.5 | 0.22 | -95.298 | 20.89 | 11.075 | 143.514 | 0.043 | 0.89 | 0.041 | -167.419 | 1.23 |
| 0.6 | 0.229 | -103.863 | 20.5 | 10.59 | 139.683 | 0.043 | 0.698 | 0.043 | -177.186 | 1.26 |
| 0.7 | 0.243 | -112.001 | 20.1 | 10.12 | 135.429 | 0.042 | 0.643 | 0.045 | 174.82 | 1.31 |
| 0.8 | 0.259 | -119.5 | 19.71 | 9.675 | 130.731 | 0.041 | 0.734 | 0.047 | 168.782 | 1.37 |
| 0.9 | 0.279 | -125.972 | 19.35 | 9.281 | 125.639 | 0.041 | 1.042 | 0.048 | 164.393 | 1.4 |
| 1 | 0.299 | -131.628 | 19 | 8.911 | 120.513 | 0.04 | 1.762 | 0.049 | 163.524 | 1.45 |
| 1.1 | 0.32 | -137.177 | 18.61 | 8.521 | 115.245 | 0.039 | 2.85 | 0.048 | 164.901 | 1.51 |
| 1.2 | 0.336 | -142.073 | 18.23 | 8.159 | 110.507 | 0.039 | 4.1 | 0.049 | 167.544 | 1.55 |
| 1.3 | 0.348 | -145.665 | 17.84 | 7.801 | 106.06 | 0.039 | 5.603 | 0.043 | 170.928 | 1.59 |
| 1.4 | 0.356 | -148.38 | 17.45 | 7.455 | 101.898 | 0.039 | 7.304 | 0.032 | 178.48 | 1.64 |
| 1.5 | 0.363 | -150.989 | 17.05 | 7.121 | 97.936 | 0.039 | 9.091 | 0.024 | -165.089 | 1.7 |
| 1.6 | 0.37 | -154.012 | 16.65 | 6.8 | 94.219 | 0.039 | 10.88 | 0.019 | -143.445 | 1.75 |
| 1.7 | 0.374 | -157.396 | 16.23 | 6.481 | 90.464 | 0.04 | 12.735 | 0.02 | -106.9 | 1.78 |
| 1.8 | 0.376 | -160.639 | 15.85 | 6.2 | 87.131 | 0.04 | 14.442 | 0.027 | -86.207 | 1.84 |
| 1.9 | 0.376 | -163.914 | 15.47 | 5.939 | 83.969 | 0.041 | 16.084 | 0.035 | -75.973 | 1.87 |
| 2 | 0.375 | -167.082 | 15.12 | 5.699 | 80.94 | 0.042 | 17.612 | 0.043 | -70.287 | 1.9 |
| 2.5 | 0.372 | 177.387 | 13.51 | 4.736 | 66.672 | 0.05 | 22.955 | 0.081 | -58.59 | 1.9 |
| 3 | 0.356 | 158.01 | 12.14 | 4.047 | 53.37 | 0.059 | 24.196 | 0.112 | -56.813 | 1.89 |
| 3.5 | 0.381 | 144.376 | 11.06 | 3.573 | 39.369 | 0.07 | 21.054 | 0.14 | -52.546 | 1.75 |
| 4 | 0.423 | 129.789 | 10.03 | 3.175 | 25.905 | 0.08 | 17.196 | 0.146 | -53.692 | 1.66 |
| 4.5 | 0.508 | 121.918 | 9.07 | 2.842 | 11.472 | 0.09 | 11.517 | 0.155 | -54.803 | 1.49 |
| 5 | 0.576 | 107.907 | 8.06 | 2.528 | -2.535 | 0.102 | 5.225 | 0.123 | -67.978 | 1.35 |
| 5.5 | 0.639 | 99.362 | 7.06 | 2.255 | -14.4 | 0.11 | -2.316 | 0.122 | -90.136 | 1.23 |
| 6 | 0.672 | 88.277 | 6.69 | 2.16 | -25.888 | 0.122 | -8.464 | 0.105 | -150.094 | 1.1 |
| 6.5 | 0.672 | 79.728 | 5.92 | 1.976 | -37.199 | 0.125 | -15.947 | 0.121 | 162.804 | 1.18 |
| 7 | 0.668 | 68.454 | 5.81 | 1.953 | -49.487 | 0.135 | -22.415 | 0.187 | 127.855 | 1.15 |
| 7.5 | 0.657 | 57.275 | 5.12 | 1.803 | -62.284 | 0.142 | -30.896 | 0.213 | 108.129 | 1.22 |
| 8 | 0.655 | 47.003 | 4.75 | 1.728 | -71.76 | 0.151 | -38.436 | 0.231 | 98.412 | 1.2 |
| 9 | 0.704 | 28.227 | 4.24 | 1.629 | -91.789 | 0.161 | -55.934 | 0.261 | 73.264 | 1.09 |
| 10 | 0.772 | 16.7 | 3.85 | 1.558 | -107.404 | 0.162 | -68.84 | 0.298 | 44.421 | 0.98 |

**Typical Noise Parameters at 25°C,**
$T_C = 25°C$, $Z_0 = 50\Omega$, $V_d = 5V$, $I_{ds} = 40$ mA

| Freq GHz | $F_{min}$ dB | $\Gamma_{opt}$ Mag. | $\Gamma_{opt}$ Ang. | $R_{n/50}$ | NF@50Ω dB |
|---|---|---|---|---|---|
| 0.5 | 0.75 | 0.05 | 89.7 | 0.1 | 0.75 |
| 1 | 0.67 | 0.06 | 157.9 | 0.08 | 0.67 |
| 1.5 | 0.78 | 0.1 | 174 | 0.07 | 0.79 |
| 2 | 0.87 | 0.13 | 147.1 | 0.08 | 0.9 |
| 2.5 | 0.95 | 0.15 | 174.2 | 0.08 | 0.98 |
| 3 | 0.98 | 0.22 | -169.9 | 0.08 | 1.07 |
| 3.5 | 1.1 | 0.23 | -153.6 | 0.09 | 1.2 |
| 4 | 1.25 | 0.26 | -146.3 | 0.1 | 1.4 |
| 4.5 | 1.33 | 0.31 | -138.5 | 0.12 | 1.54 |
| 5 | 1.42 | 0.36 | -127.2 | 0.14 | 1.73 |
| 5.5 | 1.44 | 0.4 | -117.8 | 0.18 | 1.88 |
| 6 | 1.61 | 0.43 | -107.4 | 0.22 | 2.1 |
| 6.5 | 1.66 | 0.48 | -97.8 | 0.3 | 2.36 |
| 7 | 1.7 | 0.53 | -89.1 | 0.38 | 2.57 |
| 7.5 | 1.92 | 0.56 | -78.4 | 0.51 | 2.94 |
| 8 | 2.03 | 0.58 | -68.2 | 0.69 | 3.27 |
| 8.5 | 2.21 | 0.62 | -57.2 | 0.91 | 3.7 |
| 9 | 2.34 | 0.65 | -50.2 | 1.18 | 4.15 |
| 9.5 | 2.23 | 0.75 | -41.6 | 1.48 | 4.64 |
| 10 | 2.43 | 0.75 | -36.6 | 1.8 | 5.06 |

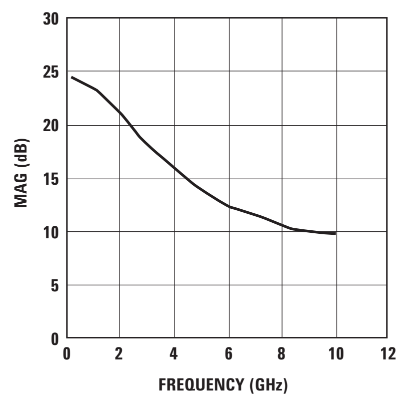



**Figure 35. MAG vs. Frequency.**

**MGA-62563 Typical Scattering Parameters,** $T_C = 25°C$, $Z_0 = 50\Omega$, $V_d = 5V$, $I_{ds} = 30$ mA

| Freq. GHz | $S_{11}$ Mag. | $S_{11}$ Ang. | $S_{21}$ dB | $S_{21}$ Mag. | $S_{21}$ Ang. | $S_{12}$ Mag. | $S_{12}$ Ang. | $S_{22}$ Mag. | $S_{22}$ Ang. | K-factor |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.1 | 0.237 | -58.467 | 21.8 | 12.306 | 156.126 | 0.048 | 2.335 | 0.051 | -78.66 | 1.09 |
| 0.2 | 0.23 | -65.183 | 21.53 | 11.928 | 153.564 | 0.048 | 1.765 | 0.045 | -87.521 | 1.11 |
| 0.3 | 0.227 | -72.749 | 21.23 | 11.518 | 150.716 | 0.047 | 1.228 | 0.039 | -99.059 | 1.14 |
| 0.4 | 0.226 | -81.026 | 20.89 | 11.082 | 147.575 | 0.047 | 0.749 | 0.036 | -112.979 | 1.16 |
| 0.5 | 0.23 | -90.235 | 20.51 | 10.603 | 143.898 | 0.046 | 0.336 | 0.033 | -129.188 | 1.21 |
| 0.6 | 0.238 | -98.902 | 20.13 | 10.153 | 140.036 | 0.046 | 0.043 | 0.033 | -143.928 | 1.24 |
| 0.7 | 0.25 | -107.258 | 19.75 | 9.716 | 135.78 | 0.045 | -0.127 | 0.034 | -156.168 | 1.28 |
| 0.8 | 0.265 | -115.042 | 19.37 | 9.304 | 131.095 | 0.044 | -0.173 | 0.036 | -165.43 | 1.33 |
| 0.9 | 0.284 | -121.835 | 19.03 | 8.94 | 126.04 | 0.043 | -0.043 | 0.039 | -171.896 | 1.38 |
| 1 | 0.304 | -127.797 | 18.69 | 8.602 | 120.95 | 0.043 | 0.462 | 0.041 | -173.502 | 1.4 |
| 1.1 | 0.325 | -133.627 | 18.32 | 8.246 | 115.706 | 0.042 | 1.306 | 0.044 | -172.856 | 1.46 |
| 1.2 | 0.342 | -138.742 | 17.97 | 7.914 | 110.976 | 0.042 | 2.313 | 0.047 | -171.524 | 1.48 |
| 1.3 | 0.354 | -142.508 | 17.6 | 7.583 | 106.528 | 0.042 | 3.581 | 0.044 | -166.973 | 1.52 |
| 1.4 | 0.363 | -145.389 | 17.22 | 7.259 | 102.357 | 0.041 | 5.063 | 0.038 | -156.713 | 1.6 |
| 1.5 | 0.371 | -148.151 | 16.83 | 6.946 | 98.374 | 0.041 | 6.652 | 0.034 | -141.923 | 1.64 |
| 1.6 | 0.378 | -151.305 | 16.45 | 6.644 | 94.631 | 0.042 | 8.268 | 0.032 | -127.89 | 1.66 |
| 1.7 | 0.383 | -154.816 | 16.04 | 6.342 | 90.832 | 0.042 | 9.963 | 0.034 | -108.748 | 1.72 |
| 1.8 | 0.386 | -158.161 | 15.67 | 6.075 | 87.455 | 0.043 | 11.558 | 0.039 | -95.871 | 1.74 |
| 1.9 | 0.386 | -161.511 | 15.31 | 5.827 | 84.258 | 0.043 | 13.115 | 0.045 | -87.243 | 1.8 |
| 2 | 0.385 | -164.738 | 14.96 | 5.6 | 81.188 | 0.044 | 14.587 | 0.052 | -81.336 | 1.83 |
| 2.5 | 0.383 | 179.495 | 13.41 | 4.684 | 66.72 | 0.051 | 19.968 | 0.083 | -65.882 | 1.86 |
| 3 | 0.368 | 159.885 | 12.09 | 4.023 | 53.234 | 0.06 | 21.459 | 0.111 | -61.634 | 1.85 |
| 3.5 | 0.393 | 145.917 | 11.05 | 3.568 | 39.154 | 0.071 | 18.676 | 0.136 | -55.813 | 1.72 |
| 4 | 0.435 | 130.892 | 10.05 | 3.179 | 25.626 | 0.081 | 15.046 | 0.14 | -56.384 | 1.62 |
| 4.5 | 0.52 | 122.592 | 9.11 | 2.854 | 11.264 | 0.09 | 9.563 | 0.148 | -56.648 | 1.46 |
| 5 | 0.588 | 108.322 | 8.1 | 2.541 | -2.66 | 0.102 | 3.467 | 0.117 | -69.997 | 1.32 |
| 5.5 | 0.65 | 99.592 | 7.11 | 2.266 | -14.387 | 0.11 | -3.953 | 0.117 | -92.334 | 1.2 |
| 6 | 0.682 | 88.363 | 6.72 | 2.167 | -25.768 | 0.122 | -10.031 | 0.106 | -153.954 | 1.07 |
| 6.5 | 0.68 | 79.738 | 5.93 | 1.979 | -36.871 | 0.125 | -17.411 | 0.125 | 160.43 | 1.16 |
| 7 | 0.675 | 68.426 | 5.8 | 1.949 | -49 | 0.134 | -23.769 | 0.193 | 126.821 | 1.14 |
| 7.5 | 0.663 | 57.213 | 5.06 | 1.791 | -61.602 | 0.141 | -32.118 | 0.218 | 107.343 | 1.21 |
| 8 | 0.659 | 46.972 | 4.67 | 1.711 | -70.948 | 0.15 | -39.536 | 0.236 | 97.607 | 1.21 |
| 9 | 0.707 | 28.23 | 4.07 | 1.597 | -90.845 | 0.16 | -56.781 | 0.265 | 72.633 | 1.11 |
| 10 | 0.774 | 16.694 | 3.6 | 1.513 | -106.409 | 0.161 | -69.865 | 0.303 | 44.117 | 1 |

**Typical Noise Parameters at 25°C,**
$T_C = 25°C$, $Z_0 = 50\Omega$, $V_d = 5V$, $I_{ds} = 30$ mA

| Freq GHz | $F_{min}$ dB | $\Gamma_{opt}$ Mag. | $\Gamma_{opt}$ Ang. | $R_{n/50}$ | NF@50Ω dB |
|---|---|---|---|---|---|
| 0.5 | 0.77 | 0.08 | 83.8 | 0.11 | 0.78 |
| 1 | 0.67 | 0.05 | 149.4 | 0.08 | 0.68 |
| 1.5 | 0.79 | 0.09 | 168.8 | 0.07 | 0.8 |
| 2 | 0.87 | 0.13 | 142.3 | 0.08 | 0.9 |
| 2.5 | 0.95 | 0.14 | 169.1 | 0.08 | 0.98 |
| 3 | 0.98 | 0.22 | -173.6 | 0.08 | 1.06 |
| 3.5 | 1.09 | 0.23 | -159.3 | 0.08 | 1.19 |
| 4 | 1.21 | 0.26 | -148.7 | 0.1 | 1.35 |
| 4.5 | 1.29 | 0.31 | -140.3 | 0.11 | 1.51 |
| 5 | 1.39 | 0.35 | -129.6 | 0.13 | 1.68 |
| 5.5 | 1.42 | 0.39 | -120.3 | 0.17 | 1.82 |
| 6 | 1.58 | 0.41 | -109.2 | 0.21 | 2.03 |
| 6.5 | 1.62 | 0.47 | -100 | 0.28 | 2.28 |
| 7 | 1.68 | 0.52 | -90.7 | 0.35 | 2.49 |
| 7.5 | 1.88 | 0.55 | -79.9 | 0.48 | 2.85 |
| 8 | 2 | 0.57 | -69.8 | 0.65 | 3.17 |
| 8.5 | 2.17 | 0.62 | -58.8 | 0.85 | 3.59 |
| 9 | 2.3 | 0.64 | -51.3 | 1.12 | 4.03 |
| 9.5 | 2.25 | 0.72 | -42.6 | 1.41 | 4.48 |
| 10 | 2.37 | 0.74 | -37.8 | 1.7 | 4.91 |

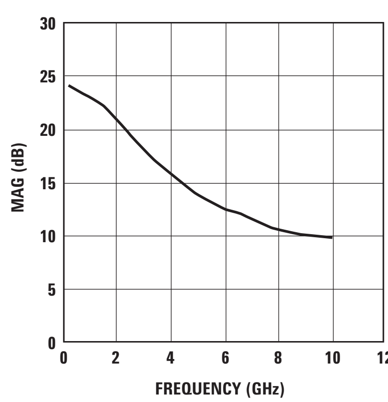



**Figure 36. MAG vs. Frequency.**

**MGA-62563 Typical Scattering Parameters,** $T_C = 25°C$, $Z_0 = 50\Omega$, $V_d = 5V$, $I_{ds} = 20$ mA

| Freq. | $S_{11}$ | | $S_{21}$ | | | $S_{12}$ | | $S_{22}$ | | K-factor |
|---|---|---|---|---|---|---|---|---|---|---|
| GHz | Mag. | Ang. | dB | Mag. | Ang. | Mag. | Ang. | Mag. | Ang. | |
| 0.1 | 0.276 | -50.781 | 20.99 | 11.213 | 156.884 | 0.053 | 3.086 | 0.093 | -52.766 | 1.07 |
| 0.2 | 0.266 | -56.676 | 20.74 | 10.894 | 154.329 | 0.053 | 2.41 | 0.083 | -58.024 | 1.09 |
| 0.3 | 0.259 | -63.497 | 20.46 | 10.544 | 151.483 | 0.052 | 1.753 | 0.074 | -64.698 | 1.12 |
| 0.4 | 0.255 | -71.17 | 20.15 | 10.174 | 148.356 | 0.052 | 1.131 | 0.065 | -72.808 | 1.14 |
| 0.5 | 0.254 | -80.022 | 19.79 | 9.763 | 144.671 | 0.051 | 0.542 | 0.058 | -83.072 | 1.18 |
| 0.6 | 0.257 | -88.677 | 19.44 | 9.375 | 140.845 | 0.051 | 0.052 | 0.052 | -94.078 | 1.2 |
| 0.7 | 0.265 | -97.315 | 19.08 | 8.997 | 136.657 | 0.05 | -0.34 | 0.05 | -105.431 | 1.24 |
| 0.8 | 0.277 | -105.608 | 18.73 | 8.641 | 132.057 | 0.05 | -0.641 | 0.05 | -116.715 | 1.27 |
| 0.9 | 0.294 | -113.01 | 18.41 | 8.327 | 127.118 | 0.049 | -0.769 | 0.052 | -126.861 | 1.31 |
| 1 | 0.313 | -119.584 | 18.1 | 8.038 | 122.134 | 0.049 | -0.568 | 0.056 | -133.663 | 1.32 |
| 1.1 | 0.332 | -125.983 | 17.77 | 7.732 | 117 | 0.048 | -0.093 | 0.062 | -138.752 | 1.36 |
| 1.2 | 0.349 | -131.536 | 17.44 | 7.446 | 112.349 | 0.048 | 0.54 | 0.067 | -142.695 | 1.38 |
| 1.3 | 0.362 | -135.667 | 17.09 | 7.154 | 107.971 | 0.047 | 1.412 | 0.068 | -141.888 | 1.43 |
| 1.4 | 0.371 | -138.843 | 16.73 | 6.864 | 103.851 | 0.047 | 2.497 | 0.066 | -137.128 | 1.47 |
| 1.5 | 0.38 | -141.9 | 16.37 | 6.583 | 99.905 | 0.047 | 3.676 | 0.065 | -131.552 | 1.51 |
| 1.6 | 0.389 | -145.323 | 16 | 6.311 | 96.172 | 0.047 | 4.908 | 0.063 | -126.926 | 1.55 |
| 1.7 | 0.394 | -149.051 | 15.62 | 6.037 | 92.39 | 0.047 | 6.242 | 0.063 | -119.49 | 1.6 |
| 1.8 | 0.397 | -152.57 | 15.26 | 5.794 | 89.022 | 0.048 | 7.499 | 0.065 | -113.329 | 1.62 |
| 1.9 | 0.397 | -156.063 | 14.91 | 5.566 | 85.817 | 0.048 | 8.774 | 0.067 | -107.935 | 1.68 |
| 2 | 0.396 | -159.406 | 14.58 | 5.357 | 82.739 | 0.049 | 10.021 | 0.07 | -103.352 | 1.7 |
| 2.5 | 0.395 | -175.583 | 13.08 | 4.508 | 68.14 | 0.055 | 14.801 | 0.083 | -84.66 | 1.78 |
| 3 | 0.38 | 164.391 | 11.79 | 3.888 | 54.386 | 0.063 | 16.272 | 0.102 | -74.77 | 1.81 |
| 3.5 | 0.407 | 149.754 | 10.77 | 3.454 | 40.091 | 0.074 | 13.807 | 0.118 | -63.62 | 1.7 |
| 4 | 0.449 | 133.82 | 9.76 | 3.075 | 26.308 | 0.083 | 10.436 | 0.118 | -61.976 | 1.63 |
| 4.5 | 0.534 | 124.633 | 8.8 | 2.753 | 11.752 | 0.092 | 5.262 | 0.123 | -58.73 | 1.47 |
| 5 | 0.6 | 109.771 | 7.78 | 2.448 | -2.529 | 0.104 | -0.451 | 0.093 | -72.766 | 1.33 |
| 5.5 | 0.661 | 100.709 | 6.77 | 2.179 | -14.499 | 0.111 | -7.532 | 0.097 | -96.992 | 1.22 |
| 6 | 0.692 | 89.216 | 6.37 | 2.083 | -26.054 | 0.122 | -13.423 | 0.102 | -166.868 | 1.09 |
| 6.5 | 0.688 | 80.407 | 5.56 | 1.897 | -37.379 | 0.125 | -20.653 | 0.134 | 151.132 | 1.18 |
| 7 | 0.681 | 69.043 | 5.43 | 1.868 | -49.653 | 0.134 | -26.784 | 0.209 | 121.656 | 1.16 |
| 7.5 | 0.666 | 57.717 | 4.69 | 1.716 | -62.476 | 0.141 | -34.82 | 0.234 | 103.118 | 1.24 |
| 8 | 0.661 | 47.473 | 4.3 | 1.641 | -71.899 | 0.149 | -41.982 | 0.25 | 93.688 | 1.24 |
| 9 | 0.708 | 28.579 | 3.73 | 1.537 | -92 | 0.159 | -58.934 | 0.278 | 69.322 | 1.13 |
| 10 | 0.774 | 16.789 | 3.28 | 1.459 | -107.719 | 0.161 | -72.037 | 0.315 | 41.449 | 1.02 |

**Typical Noise Parameters at 25°C,**
$T_C = 25°C$, $Z_0 = 50\Omega$, $V_d = 5V$, $I_{ds} = 20$ mA

| Freq GHz | $F_{min}$ dB | $\Gamma_{opt}$ Mag. | $\Gamma_{opt}$ Ang. | $R_{n/50}$ | NF@50Ω dB |
|---|---|---|---|---|---|
| 0.5 | 0.81 | 0.1 | 90 | 0.11 | 0.83 |
| 1 | 0.7 | 0.05 | 129.3 | 0.08 | 0.71 |
| 1.5 | 0.82 | 0.08 | 150.1 | 0.08 | 0.83 |
| 2 | 0.9 | 0.13 | 132.1 | 0.08 | 0.92 |
| 2.5 | 0.94 | 0.15 | 158.4 | 0.08 | 0.98 |
| 3 | 0.98 | 0.22 | 180 | 0.07 | 1.06 |
| 3.5 | 1.1 | 0.23 | -165 | 0.08 | 1.19 |
| 4 | 1.19 | 0.27 | -153.6 | 0.09 | 1.34 |
| 4.5 | 1.28 | 0.31 | -144.2 | 0.1 | 1.49 |
| 5 | 1.39 | 0.35 | -132.9 | 0.12 | 1.66 |
| 5.5 | 1.42 | 0.39 | -122.5 | 0.16 | 1.81 |
| 6 | 1.58 | 0.4 | -112 | 0.2 | 2.01 |
| 6.5 | 1.64 | 0.46 | -102.7 | 0.27 | 2.26 |
| 7 | 1.7 | 0.51 | -93.5 | 0.33 | 2.47 |
| 7.5 | 1.9 | 0.54 | -82.5 | 0.45 | 2.82 |
| 8 | 1.99 | 0.57 | -71.3 | 0.62 | 3.15 |
| 8.5 | 2.17 | 0.6 | -60.2 | 0.82 | 3.54 |
| 9 | 2.3 | 0.63 | -52.6 | 1.09 | 3.98 |
| 9.5 | 2.11 | 0.75 | -44 | 1.36 | 4.45 |
| 10 | 2.41 | 0.73 | -38.5 | 1.67 | 4.85 |

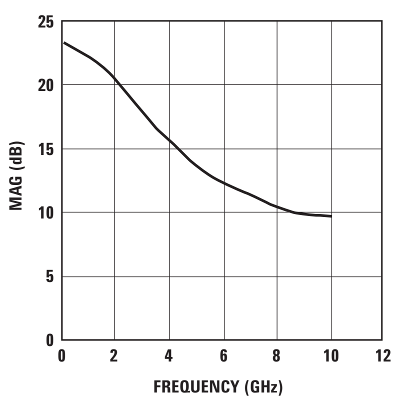



Figure 37. MAG vs. Frequency.

Refer to Agilent's Web Site for S-parameters at different biases.
www.agilent.com/view/rf

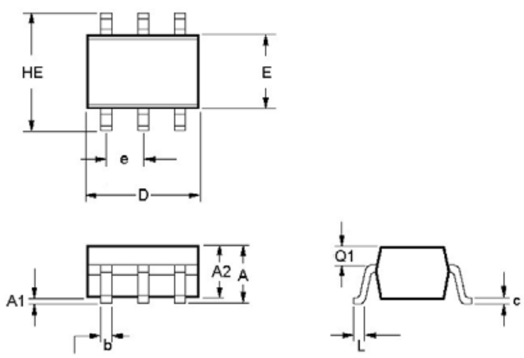
**Device Models**

Refer to Agilent's Web Site
www.agilent.com/view/rf

**Ordering Information**

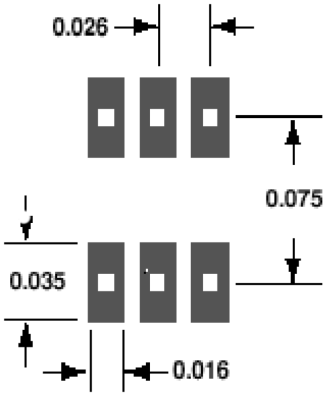
| Part Number | No. of Devices | Container |
|---|---|---|
| MGA-62563-TR1 | 3000 | 7″ Reel |
| MGA-62563-TR2 | 10000 | 13″Reel |
| MGA-62563-BLK | 100 | antistatic bag |
| MGA-62563-TR1G | 3000 | 7" Reel |
| MGA-62563-TR2G | 10000 | 13" Reel |
| MGA-62563-BLKG | 100 | antistatic bag |

**SOT-363/SC-70 (JEDEC DFP-N) Package Dimensions**



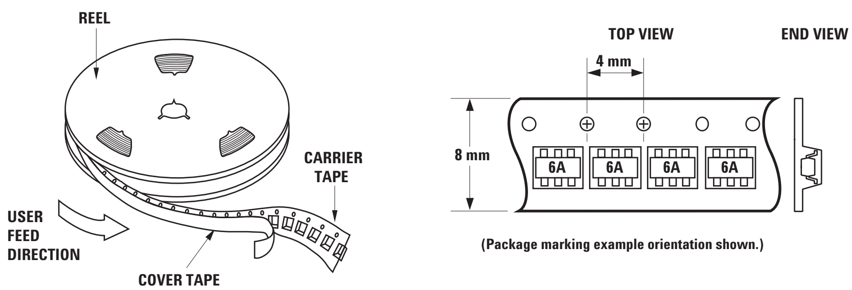

| | Dimensions | |
|---|---|---|
| **Symbol** | **Min (mm)** | **Max (mm)** |
| E | 1.15 | 1.35 |
| D | 1.80 | 2.25 |
| HE | 1.80 | 2.40 |
| A | 0.80 | 1.10 |
| A2 | 0.80 | 1.00 |
| A1 | 0.00 | 0.10 |
| e | 0.650 BCS | 0.650 BCS |
| b | 0.15 | 0.30 |
| c | 0.10 | 0.20 |
| L | 0.10 | 0.30 |

**Recommended PCB Pad Layout for Agilent's SC70 6L/SOT-363 Products**



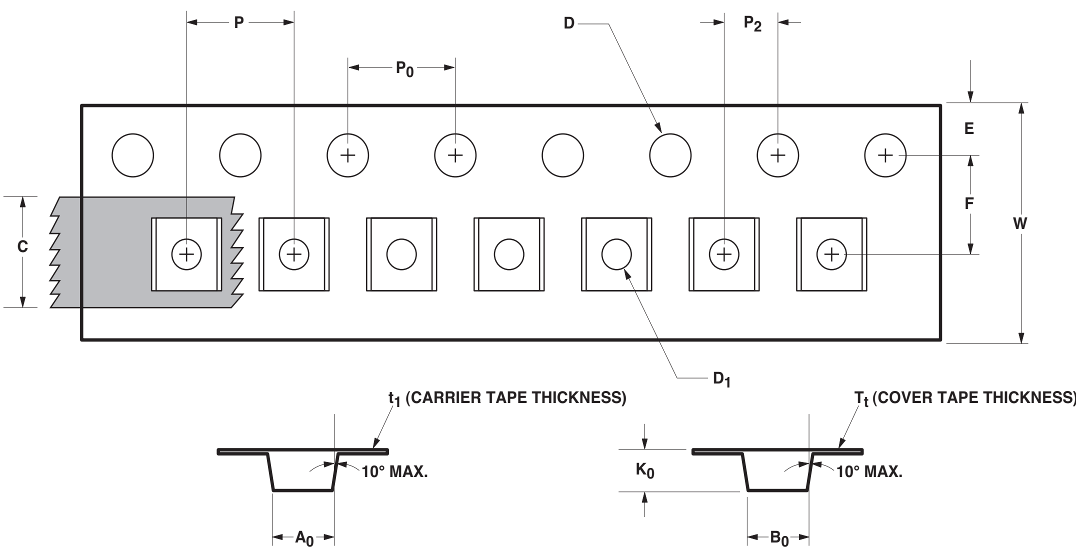

**(dimensions in inches)**

**Device Orientation**




(Package marking example orientation shown.)

## Tape Dimensions




| DESCRIPTION | | SYMBOL | SIZE (mm) | SIZE (INCHES) |
|---|---|---|---|---|
| CAVITY | LENGTH | $A_0$ | 2.40 ± 0.10 | 0.094 ± 0.004 |
| | WIDTH | $B_0$ | 2.40 ± 0.10 | 0.094 ± 0.004 |
| | DEPTH | $K_0$ | 1.20 ± 0.10 | 0.047 ± 0.004 |
| | PITCH | P | 4.00 ± 0.10 | 0.157 ± 0.004 |
| | BOTTOM HOLE DIAMETER | $D_1$ | 1.00 + 0.25 | 0.039 + 0.010 |
| PERFORATION | DIAMETER | D | 1.50 ± 0.10 | 0.061 ± 0.002 |
| | PITCH | $P_0$ | 4.00 ± 0.10 | 0.157 ± 0.004 |
| | POSITION | E | 1.75 ± 0.10 | 0.069 ± 0.004 |
| CARRIER TAPE | WIDTH | W | 8.00 ± 0.30 - 0.10 | 0.315 ± 0.012 |
| | THICKNESS | $t_1$ | 0.254 ± 0.02 | 0.010 ± 0.0005 |
| COVER TAPE | WIDTH | C | 5.40 ± 0.10 | 0.205 ± 0.004 |
| | TAPE THICKNESS | $T_t$ | 0.062 ± 0.001 | 0.0025 ± 0.00004 |
| DISTANCE | CAVITY TO PERFORATION (WIDTH DIRECTION) | F | 3.50 ± 0.05 | 0.138 ± 0.002 |
| | CAVITY TO PERFORATION (LENGTH DIRECTION) | $P_2$ | 2.00 ± 0.05 | 0.079 ± 0.002 |

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