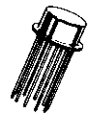
## ORDERING INFORMATION

| Device | Temperature Range | Package |
|---|---|---|
| MC1550F | −55°C to +125°C | Ceramic Flat |
| MC1550G | −55°C to +125°C | Metal Can |

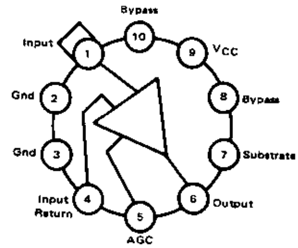
# MC1550G

## RF – IF AMPLIFIER

SILICON MONOLITHIC INTEGRATED CIRCUIT



G SUFFIX
METAL PACKAGE
CASE 603B




## RF – IF AMPLIFIER

. . . a versatile, common-emitter, common-base cascode circuit for use in communications applications. See Application Note AN-215A for additional information.

- Constant Input Impedance over entire AGC range
- Extremely Low $y_{12}$ – 4.3 µmhos at 60 MHz
- High Power Gain – 30 dB @ 60 MHz (0.5 MHz BW)
- Good Noise Figure – 5 dB @ 60 MHz

**MAXIMUM RATINGS** ($T_A$ = +25°C unless otherwise noted)

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Power Supply Voltage, Pin 9 | $V_{CC}$ | 20 | Vdc |
| AGC Supply Voltage | $V_{AGC}$ | 20 | Vdc |
| Input Differential Voltage, Pin 1 to Pin 4 ($R_S$ = 500 ohms) | $V_{ID}$ | ±5.0 | V(rms) |
| Power Dissipation (Package Limitation) | $P_D$ | | |
| Metal Can | | 680 | mW |
| Derate above $T_A$ = +25°C | | 4.6 | mW/°C |
| Flat Package | | 500 | mW |
| Derate above $T_A$ = +25°C | | 3.3 | mW/°C |
| Operating Ambient Temperature Range | $T_A$ | -55 to +125 | °C |
| Storage Temperature Range | $T_{stg}$ | -65 to +150 | °C |

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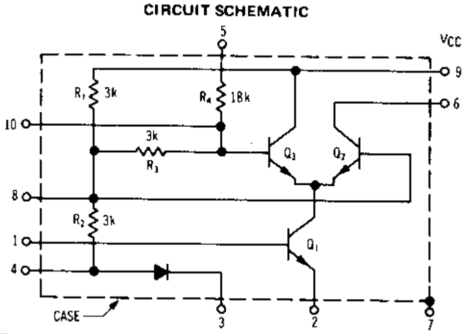
### CIRCUIT SCHEMATIC




### CIRCUIT DESCRIPTION

The MC1550 is built with monolithic fabrication techniques utilizing diffused resistors and small-geometry transistors. Excellent AGC performance is obtained by shunting the signal through the AGC transistor $Q_3$ maintaining the operating point of the input transistor $Q_1$. This keeps the input impedance constant over the entire AGC range.

The amplifier is intended to be used in a common-emitter, common-base configuration ($Q_1$ and $Q_2$) with $Q_3$ acting as an AGC transistor. The input signal is applied between pins 1 and 4, where pin 4 is ac-coupled to ground. DC source resistance between pins 1 and 4 should be small (less than 100 ohms). Pins 2 and 3 should be connected together and grounded. Pins 8 and 10 should be bypassed to ground. The positive supply voltage is applied at pin 9 and at higher frequencies, pin 9 should also be bypassed to ground. The output is taken between pins 6 and 9. The substrate is connected to pin 7 and should be grounded. AGC voltage is applied to pin 5.

**ELECTRICAL CHARACTERISTICS** ($V^+$ = +6 Vdc, $T_A$ = +25°C)

| Characteristic | Conditions | Figure | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| **DC CHARACTERISTICS** | | | | | | | |
| Output Voltage | $V_{AGC}$ = 0 Vdc<br>$V_{AGC}$ = +6 Vdc | 1 | $V_O$ | 3.80<br>5.90 | –<br>– | 4.65<br>6.00 | Vdc |
| Test Voltage | $V_{AGC}$ = 0 Vdc<br>$V_{AGC}$ = +6 Vdc | 1 | V8 | 2.85<br>3.25 | –<br>– | 3.40<br>3.80 | Vdc |
| Supply Drain Current | $V_{AGC}$ = 0 Vdc<br>$V_{AGC}$ = +6 Vdc | 1 | $I_D$ | –<br>– | –<br>– | 2.2<br>2.5 | mAdc |
| AGC Supply Drain Current | $V_{AGC}$ = 0 Vdc<br>$V_{AGC}$ = +6 Vdc | 1 | $I_{AGC}$ | –<br>– | –<br>– | -0.2<br>0.18 | mAdc |
| **SMALL-SIGNAL CHARACTERISTICS** | | | | | | | |
| Small-Signal Voltage Gain | f = 500 kHz | 2 | $A_V$ | 22 | – | 29 | dB |
| Bandwidth | -3.0 dB | 2 | BW | 22 | – | – | MHz |
| Transducer Power Gain | f = 60 MHz, BW = 6 MHz<br>f = 100 MHz, BW = 6 MHz | 3 | Ap | –<br>– | 25<br>21 | –<br>– | dB |

## TYPICAL CHARACTERISTICS

($V_{CC}$ = 6.0 Vdc, $T_A$ = +25°C unless otherwise noted.)

**FIGURE 1 – DC CHARACTERISTICS TEST CIRCUIT**

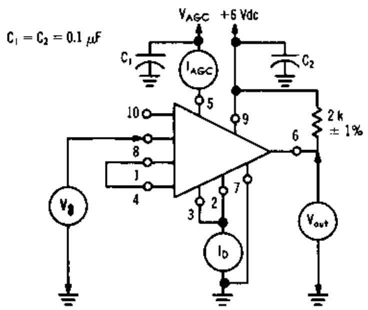



**FIGURE 2 – VOLTAGE GAIN AND BANDWIDTH TEST CIRCUIT**

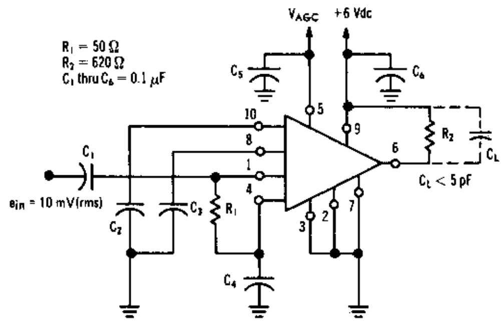



**FIGURE 3 – POWER GAIN TEST CIRCUIT @ 60 MHz**

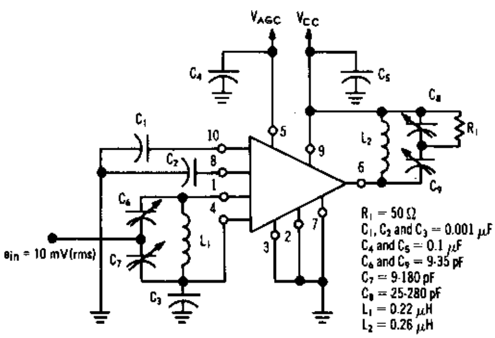
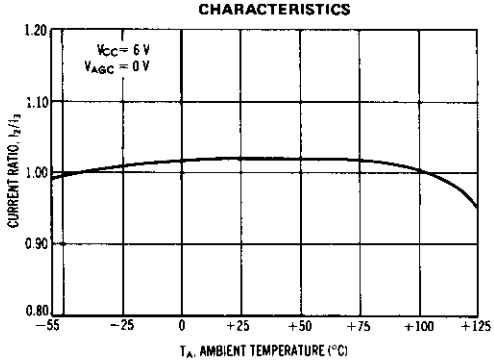



**FIGURE 4 – DRAIN CURRENT TEMPERATURE CHARACTERISTICS**

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## TYPICAL CHARACTERISTICS (continued)

**FIGURE 5 – INPUT RESISTANCE AND CAPACITANCE versus FREQUENCY**

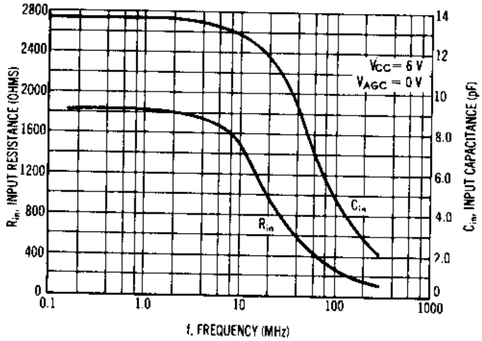



**FIGURE 6 – INPUT RESISTANCE AND CAPACITANCE versus AGC VOLTAGE**

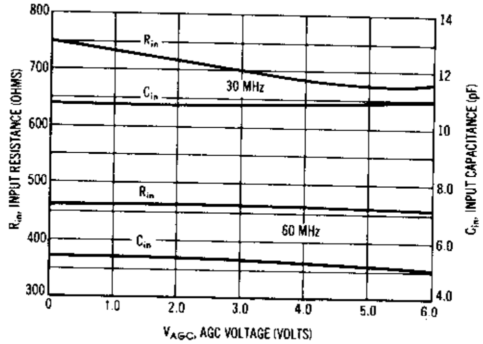



**FIGURE 7 – OUTPUT RESISTANCE AND CAPACITANCE versus FREQUENCY**

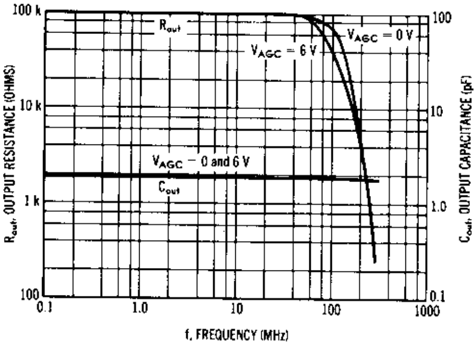



**FIGURE 8 – OUTPUT RESISTANCE AND CAPACITANCE versus AGC VOLTAGE**

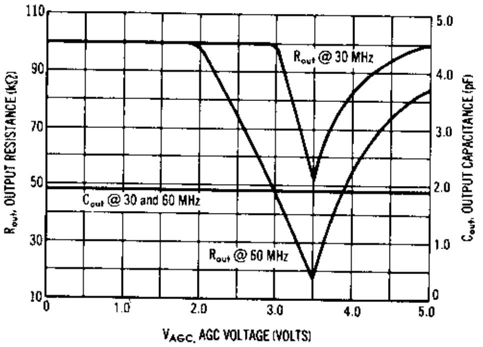



**FIGURE 9 – MAXIMUM TRANSDUCER POWER GAIN versus FREQUENCY**

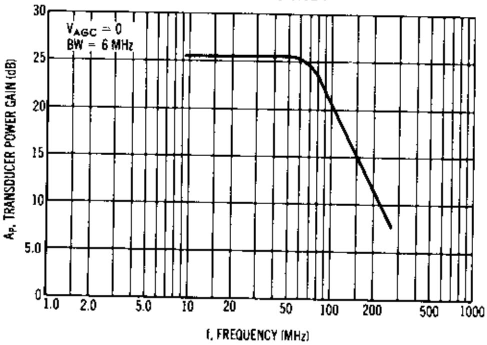
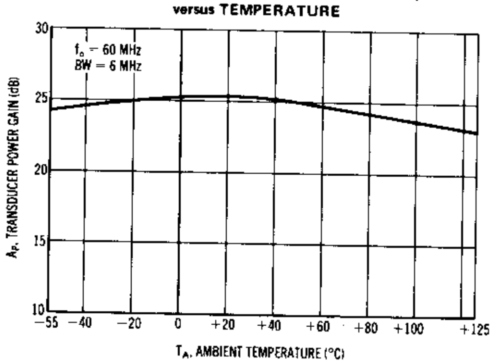



**FIGURE 10 – TRANSDUCER POWER GAIN versus TEMPERATURE**

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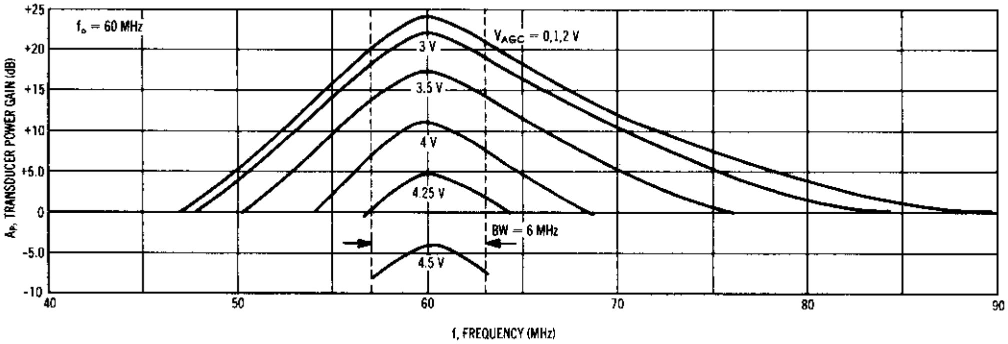
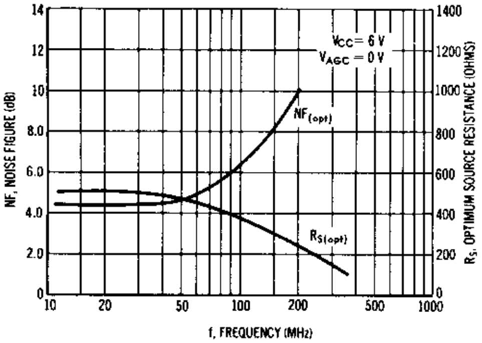
## TYPICAL CHARACTERISTICS (continued)

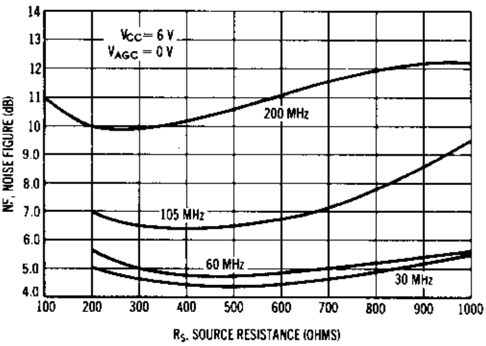
### FIGURE 11 – TRANSDUCER POWER BANDWIDTH versus AGC VOLTAGE



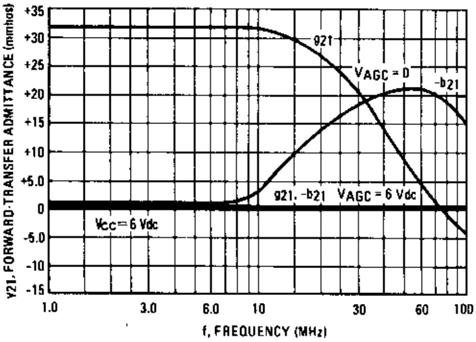

### FIGURE 12 – NOISE FIGURE AND OPTIMUM SOURCE RESISTANCE versus FREQUENCY



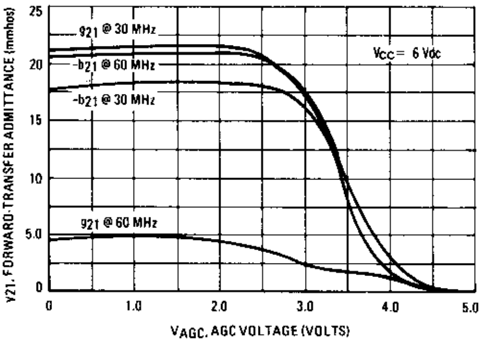

### FIGURE 13 – NOISE FIGURE versus SOURCE RESISTANCE




### FIGURE 14 – $y_{21}$, FORWARD-TRANSFER ADMITTANCE versus FREQUENCY




### FIGURE 15 – $y_{21}$, FORWARD-TRANSFER ADMITTANCE versus AGC VOLTAGE



## TYPICAL CHARACTERISTICS

($V_{CC}$ = 6.0 Vdc, $T_A$ = +25°C unless otherwise noted.)

**FIGURE 16 – $y_{12}$, REVERSE TRANSFER-ADMITTANCE versus FREQUENCY**

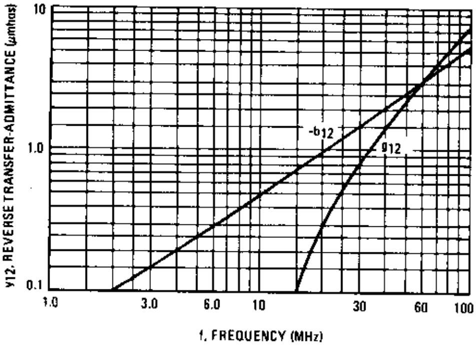
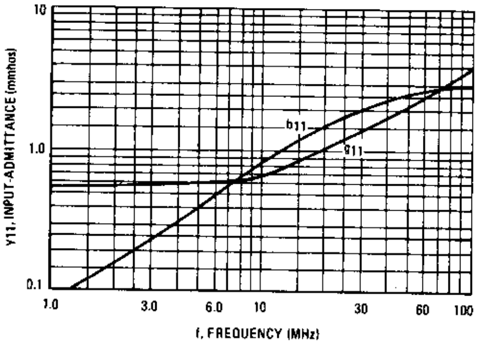



**FIGURE 17 – $y_{11}$, INPUT-ADMITTANCE versus FREQUENCY**




The $y_{12}$ shown in Figure 16 illustrates the extremely low feedback of the MC1550 with no contribution from the external mounting circuitry. However, in many cases the external circuitry may contribute as much or more to the total feedback than does the MC1550.

To perform more accurate design calculations of gain, stability, and input – output impedances it is recommended that the designer first determine the total feedback of device plus circuitry.

This can be done in one of two ways:

(1) Measure the total $y_{12}$ or $s_{12}$ of the MC1550 installed in its mounting circuitry, or

(2) Measure the $y_{12}$ of the circuitry alone (without the MC1550 installed) and add the circuit $y_{12}$ to the $y_{12}$ for the MC1550 given in Figure 16.

**FIGURE 19 – $s_{11}$ AND $s_{22}$, INPUT AND OUTPUT REFLECTION COEFFICIENT**

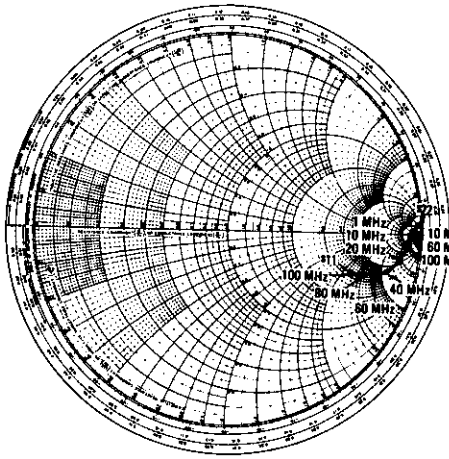
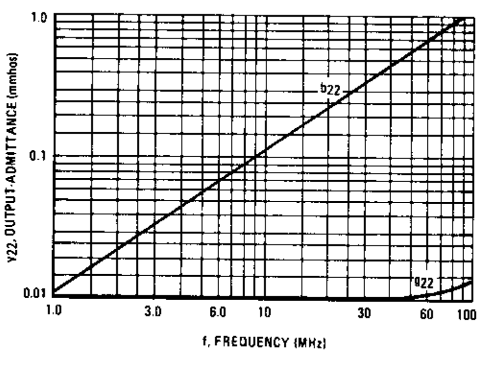



**FIGURE 18 – $y_{22}$, OUTPUT-ADMITTANCE versus FREQUENCY**

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## TYPICAL CHARACTERISTICS (continued)

($V_{CC}$ = 6.0 Vdc, $T_A$ = +25°C unless otherwise noted.)

FIGURE 20 – $s_{11}$, INPUT REFLECTION COEFFICIENT versus FREQUENCY

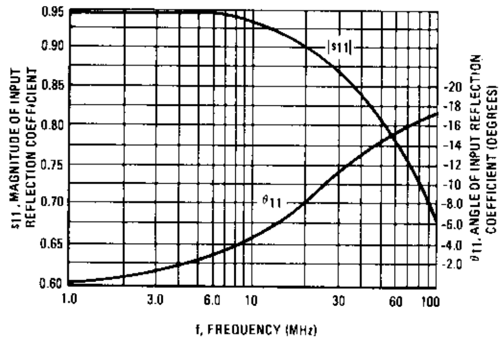



FIGURE 21 – $s_{22}$, OUTPUT REFLECTION COEFFICIENT versus FREQUENCY

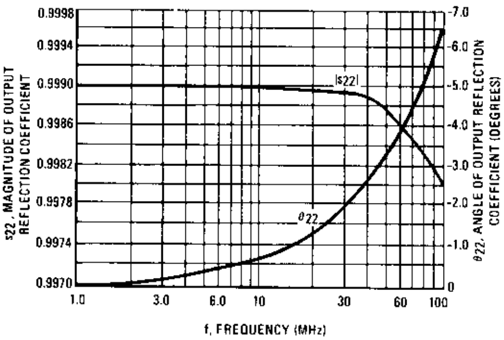



FIGURE 22 – $s_{21}$, FORWARD TRANSMISSION COEFFICIENT (GAIN)

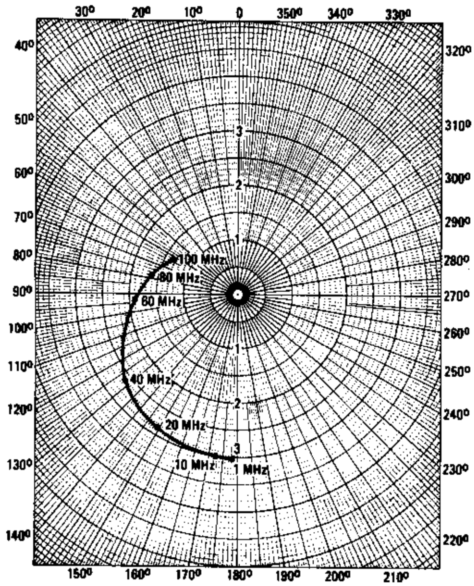
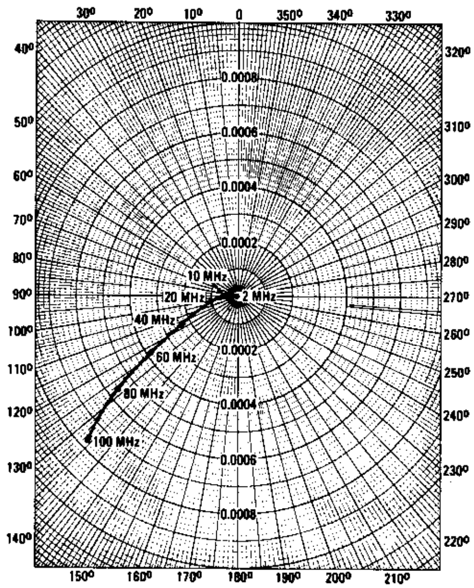



FIGURE 23 – $s_{12}$, REVERSE TRANSMISSION COEFFICIENT (FEEDBACK)

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